



GDS ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS

IN PARTNERSHIP WITH



research/into/action™

AND



Proposal To:

Pennsylvania Public Utility Commission

Statewide Evaluator RFP



January 11, 2013

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January 11, 2013

Darren Gill, Deputy Director
Bureau of Technical Utility Services
Pennsylvania Public Utility Commission
3rd Floor West, Commonwealth Keystone Building
400 North Street
Harrisburg, Pennsylvania 17120

RE: GDS Associates Team Proposal in Response to RFP-2012-8 for the Act 129 Statewide Evaluator

Dear Darren:

GDS Associates, Inc. is pleased to submit the enclosed technical proposal to the Pennsylvania Public Utility Commission in response to RFP-2012-8 relating to the Act 129 Statewide Evaluator. GDS has assembled a nationally known and recognized team of evaluation experts to perform the required scope of work. Our subcontractors include Nexant Planning & Evaluation, LLC, Research Into Action, Inc. and Apex Analytics. Our Team exceeds all of the minimum qualifications listed in Section I-31 of the Commission's RFP. We would welcome the opportunity to present our proposal to the Commission at a time convenient for you and your staff.

Our proposal remains valid for 180 days from January 11, 2013. The GDS Associates Team also exceeds all of the requirements and qualifications listed in the Commission's RFP.

Please contact me if you have any questions about our proposal.

Sincerely,

Richard F. Spellman
President



December 14, 2012

Mr. Richard F. Spellman
President
GDS Associates, Inc.
1850 Parkway Place, Suite 800
Marietta, GA 30067

Re: Commitment Letter to GDS Associates, Inc. in Response to the Pennsylvania Public Utility Commission's RFP 2012-8 for Act 129 Statewide Evaluator

Dear Mr. Spellman:

Nexant Planning & Evaluation, LLC, is pleased to join GDS Associates, Inc. under exclusive agreement in responding to the above-referenced RFP. We have reviewed the requirements for the technical and cost proposals. Should GDS Associates, Inc., be awarded the contract, we are prepared to provide the staff and resources necessary for the successful execution of this project.

As President of Nexant Planning & Evaluation, LLC, I am fully authorized to commit the firm's resources.

Sincerely,

A handwritten signature in black ink, appearing to read 'Deborah Rimmler', is written over a horizontal line.

Deborah Rimmler
President
Nexant Planning & Evaluation, LLC
Email - drimmler@nexant.com
Phone – 914.609.0329
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research/into/action^{inc}

January 11, 2013

Mr. Dick Spellman
President
GDS Associates, Inc.
1850 Parkway Place, Suite 800
Marietta, GA 30067

Re: Commitment Letter to GDS Associates, Inc. in Response to Pennsylvania Public Utility Commission
RFP-2012-8: Act 129 Statewide Evaluator

Dear Mr. Spellman:

Research Into Action, Inc. is pleased to join GDS Associates, Inc. under exclusive agreement in responding to the above-referenced RFP. We have reviewed the requirements for the technical and cost proposals. Should GDS Associates, Inc. be awarded the contract, we are prepared to provide the staff and resources necessary for the successful execution of this project.

As President of Research Into Action, Inc., I am fully authorized to commit the firm's resources.

Sincerely,

Jane S. Peters
President and Owner



research/into/action^{inc}

RESEARCHINTOACTION.COM / 503.287.9136 / PO BOX 12312 - PORTLAND, OR 97212



1717 Bluebell Avenue
Boulder, CO 80302

January 4, 2012

Mr. Salil Gogte
Nexant, Inc.
44 S. Broadway
White Plains, NY 10601

Dear Mr. Gogte:

Apex Analytics, LLC is pleased to join GDS and Nexant, Inc. under exclusive agreement in responding to the New York State Energy Research and Development Authority's RFP-2012-8: Act 129 Statewide Evaluator. We have reviewed the requirements for the technical and cost proposals. Should GDS be awarded the contract, we are prepared to provide the staff and resources necessary for the successful execution of this project.

As President of Apex Analytics, LLC, I am fully authorized to commit the firm's resources.

Sincerely,

A handwritten signature in cursive script that reads "Scott Dimetrosky".

Scott Dimetrosky
President

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EXECUTIVE SUMMARY

The Pennsylvania Public Utility Commission Act 129 Phase II Implementation Order states that the Commission shall issue a Request for Proposal for a Statewide Evaluator (SWE) to evaluate the Phase II (Programs Years ending in 2014, 2015, and 2016) energy efficiency and conservation programs implemented by the seven electric distribution companies (EDCs) in Pennsylvania subject to the requirements of Act 129. GDS Associates, Inc. (GDS) has assembled a nationally recognized and experienced team of evaluation, measurement and verification (EM&V) experts to provide the Statewide Evaluator services presented in the Commission's RFP. Our subcontractors include Nexant Planning & Evaluation, LLC (Nexant), which was a key member of the GDS SWE Team for Phase I, and two additional members, Research Into Action, Inc. (Research Into Action), and Apex Analytics, which will provide additional expertise required by the Phase II SWE activities described in the RFP. This GDS Team brings the following important keystones to the Phase II Statewide Evaluator effort:

1. The GDS Team brings together experienced consultants that collectively have decades of experience with evaluation, measurement and verification tasks (EM&V).
2. Our Team of veteran consultants has served the Commission as the SWE for the past four years. Selection of our Team for Phase II will harness our broad and deep knowledge of energy efficiency markets in Pennsylvania, our knowledge of the Act 129 audit framework and statutory requirements, our existing stakeholder relationships, our knowledge of the Phase I baseline and market potential studies, and the lessons learned from our evaluations of Phase I programs to complete Phase II tasks expertly and cost-effectively.
3. During our four years as the Pennsylvania SWE, we wrote the Phase I Evaluation Framework (Audit Plan), annual updates to the Technical Reference Manual (TRM) and Total Resource Cost Test (TRC) Order, Phase I baseline studies, the May 2012 Energy Efficiency Potential Study, more than 18 EM&V guidance memos, and more than 30 custom measure protocols.
4. We understand the appliance saturation, electric energy usage, population, housing and business characteristics of the Commonwealth of Pennsylvania due to the extensive baseline research we conducted during Phase I.
5. We have developed effective working relationships with the stakeholders implementing and evaluating the Pennsylvania Act 129 Energy Efficiency Programs.
6. In addition, the Bureau of Technical Utility Services (TUS) staff is thoroughly familiar with our team's analytical skills, systems, and the high quality of our work.
7. Our team has a significant local presence; many of our consultants work and reside in Pennsylvania.
8. We will enhance our audit approach to reduce costs and save time as well as focus audit activities on measures and programs that require high levels of rigor.

Serving as the Statewide Evaluator for Phase I of Act 129 since 2009, the GDS Team brings four years of experience to the Phase II evaluation work and we can hit the ground running ...

Serving as the Statewide Evaluator for Phase I of Act 129 since 2009, the GDS Team brings four years of experience to the Phase II evaluation work and we can hit the ground running due to our familiarity with the Act 129 framework, statutory requirements, stakeholder relationships, accomplishments and challenges of the EDCs, and the credibility of the EDC staff and EM&V contractors. Our team already has the staff, processes and procedures in place to continue audit activities seamlessly from Phase I to Phase II. Further, we have expanded the team's capabilities in the specific areas where our Phase I experience

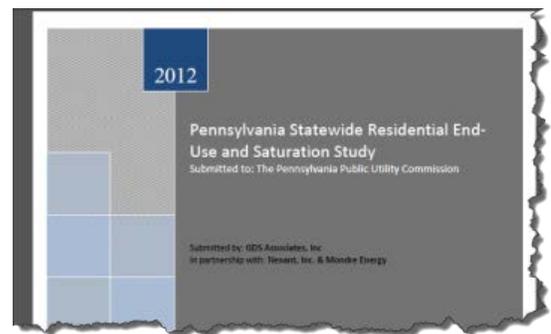
suggests there are opportunities for enhancing and improving our processes: regulatory reporting, stakeholder engagement, process evaluation, market evaluation, and project management.

Our Work Plan for Phase II

Our proposal provides detailed information about our understanding of the issues the Commission seeks to explore in Phase II, and the strategies and methods the GDS Team will use to evaluate the impacts and operating procedures of the Energy Efficiency and Conservation (EE&C) Programs of the seven EDCs in Pennsylvania.

As the SWE, we will conduct the following key activities identified in the RFP during Phase II:

1. Update the SWE Audit Plan.
2. Review and critique evaluation plans and reports from EDC evaluation contractors.
3. Verify program costs, kWh and kW savings and Total Resource Cost Test benefit/cost ratios reported by each EDC for each of the three years of Phase II.
4. Conduct audits of EDC EM&V reports for all Act 129 programs.
5. Conduct spot checks of the engineering analysis underlying kWh and kW savings for a random sample of commercial and industrial sites where energy efficiency measures have been installed
6. Conduct residential and non-residential metering studies adhering to the recently published DOE Uniform Methods Project (UMP) protocols where applicable.
7. Complete technical, economic and engineering analyses for new energy efficiency measures proposed for inclusion in the Pennsylvania Technical Reference Manual.
8. Design and complete energy efficiency baseline studies for the residential, commercial and industrial sectors. Ensure the Phase II baseline studies integrate with and update the results of the Phase I baseline studies.
9. Update previously conducted EDC-specific and Statewide energy efficiency potential studies.
10. Develop kWh and kW savings targets for a possible Phase III of Act 129.
11. Provide quarterly and annual SWE reports to the Commission. These reports should provide verified gross savings for each EDC for each Act 129 program. These reports also should provide the SWE Team's recommendations for program modifications and enhancements.
12. Provide monthly SWE progress reports to the PA Technical Utility Services Bureau.
13. Assist the PUC TUS staff with annual updates to the TRM, TRC Order and the Phase III implementation Order, if appropriate.
14. Provide bi-annual EM&V best practices workshops for the seven Act 129 EDCs.
15. Prepare for and conduct Program Evaluation Group (PEG) meetings with the EDCs and Act 129 stakeholders, including ensuring transparency and adequate exchange of information as directed by TUS staff.
16. As needed, provide EM&V guidance memos to the EDCs.
17. Update the Act 129 public website on a quarterly basis to provide ongoing kWh and kW savings for the Act 129 programs by EDC.
18. Provide ongoing technical and engineering consulting support to TUS staff on energy efficiency and demand response issues.
19. Develop and provide testimony as needed for evidentiary and other regulatory proceedings



20. Conduct an EDC-specific and Statewide Demand Response Market Potential Study that builds on the results of the Special Demand Response study conducted by the GDS Team in Phase I. (Optional)¹

Our work plan presented in Section 3 of this proposal provides detailed explanations of our approach to each of these key activities, and highlights our ability to add value because of our prior work completed in Phase I.

Why Select the GDS Team?

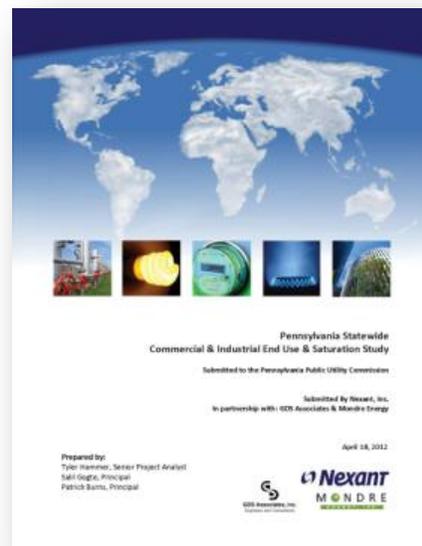
GDS MISSION:

Help our clients succeed by anticipating and understanding their needs and by efficiently delivering quality services with confidence and integrity.

Our incumbent SWE team offers several important assets to ensure achievement of these key tasks during Phase II of the Act 129 programs:

1. **As the Phase I Statewide Evaluator, the GDS Team has achieved many major accomplishments:**

- Developed the initial and first revision of the audit plan for the Pennsylvania Act 129 Energy Efficiency Programs: This plan provides a roadmap for ensuring that reliable estimates of program kWh and kW savings are developed and reported, and that SWE resources are focused on the programs and measures having the largest savings or greatest uncertainty.
- Identified key EM&V policy and technical issues and developed solutions to ensure the reliability of program savings estimates
- Prepared quarterly and annual audit reports for Program Years 1, 2, and 3
- Conducted all required on-site visits to verify measure installation and savings
- Performed major updates to the TRM for three years in a row
- Developed and issued over 18 guidance memos on technical issues relating to program and measure kWh and kW savings
- Checked and verified EDC calculations of program savings and benefit/cost ratios
- Designed and completed EDC-specific and Statewide baseline and energy efficiency potential studies
- Presented baseline and market potential study results at stakeholder meetings
- Organized and participated in weekly teleconferences of the TUS staff and the SWE Team and prepared minutes and action items for all such meetings
- Organized and participated in bi-weekly meetings of TUS staff, the SWE Team, and EDC staff
- Organized and participated in monthly meetings of the Program Evaluation Group (PEG).
- Developed and filed testimony in evidentiary hearings before the Commission relating to kWh and kW savings targets for Phase II.

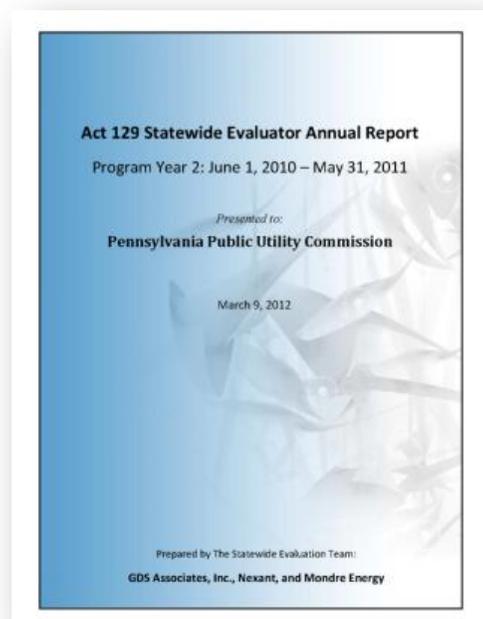


¹ The GDS team understands that the demand response study is optional work. It will be up to the PUC to decide if the demand response study will be conducted.

- Responded quickly to requests for information and technical assistance from TUS staff and the EDCs.
- Completed four years of direct experience working together to plan and conduct SWE audit activities: We work well as a team, and we know how to solve problems as soon as they arise. In addition, as SWE for Phase I, we have fostered mutual understanding among and between the EDCs and our team, and our team has earned the EDCs' trust regarding the quality of the information our team provides
- Gained proven experience in Act 129 Phase I and on projects for other clients performing engineering analyses, statistical billing analyses, building energy simulation modeling, and metering to determine savings from the installation of energy efficiency measures.

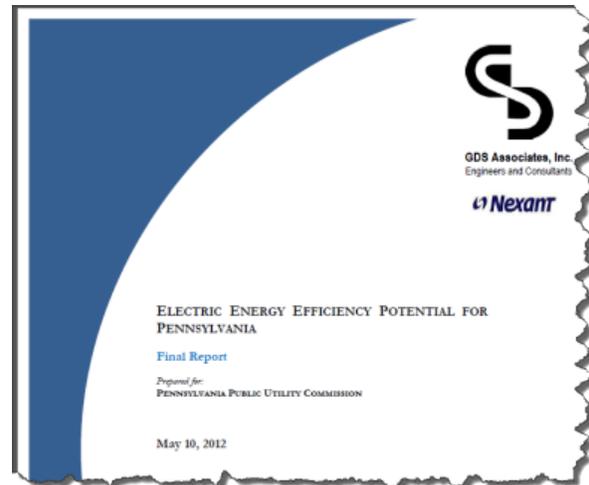
We can hit the ground running and there will be no learning curve for our team.

2. **Reduced costs** – Based on the lessons learned from the Phase I operations, we have identified several procedures that we will implement to reduce SWE costs during Phase II. These procedures include significant reductions in the number of SWE Team members attending meetings and weekly SWE/TUS teleconferences, finding less expensive labor to conduct recruiting and on-site surveys for the baseline studies, and standardization of consultant billing rates for GDS, Nexant, Research Into Action and Apex Analytics. Furthermore, our costs for the development of the audit plan revision and ramping up for Phase II audit activities will be significantly lower than those proposed by any other bidder due to our prior experience with all of these activities.
3. **Our Team's engineers have extensive experience** conducting in-field assessments for baseline and logging/metering studies. Our engineers have authored industry accepted engineering protocols such as IPMVP and the DOE FEMP M&V guidelines. Salil Gogte, Deputy Project Manager of this project, is an IPMVP Technical Committee member and plays a key role in the development and approval of IPMVP measure-specific M&V plans. Our Team has an extensive tool kit of metering equipment worth over a million dollars available for this project at no cost to the Commission. Appendix C shows our inventory of metering equipment. Many of our Team members have their Professional Engineer (PE) and/or Certified Measurement and Verification Professional (CMVP) designation.
4. **Increased management efficiency** – During 2012, our Team continued to improve our management approach for SWE activities. We have fine-tuned the work assignments and responsibilities for each task/project with one primary speaker/leader for each such task. To streamline all team meetings, including the monthly PEG and weekly teleconferences with TUS staff, a maximum of five SWE representatives will attend each meeting. Others will be invited as needed with prior approval by TUS staff. This approach will ensure that all SWE meetings with TUS staff and the EDCs will be as efficient and cost-effective as possible. Our Team has identified several other practices we will implement to make our SWE activities more efficient and less expensive. We recognize this as an important improvement to our Phase I approach. We will ensure that we limit meeting attendance to the



primary speakers for each meeting. If we need additional speakers, we will request prior approval from TUS staff. Our proposal explains these new concepts in more detail.

5. **We have proven that we work effectively on a collaborative basis** with the TUS staff, the EDCs, the EDC evaluation teams, and the Energy Association. We demonstrate respect for people, and we provide constructive criticism of ideas, not criticism of people. GDS and Nexant also have prior experience working with Research Into Action and Apex Analytics on projects for other clients.
6. **We are committed to continuous improvement** of our audit and reporting responsibilities. We are always looking for ways to be more efficient and to ensure that our communications with the TUS staff, EDCs, EDC evaluation teams, and the Energy Association are concise and clear.
7. **Our proposal provides five key strategies** to reduce audit costs during Phase II:
 - a. Due to our years of experience with the SWE functions and reports during Phase I, we can perform SWE tasks in Phase II at a lower cost than other bidders because we already have developed audit procedures, report formats, sampling approaches, baseline study survey instruments and potential study models that will be necessary for the completion of Phase II SWE tasks.
 - b. We will continue to designate one member of the SWE team (Kaytie Ruditys) to issue and track data requests to EDCs, and we will continue to have a systematic procedure for EDCs to upload data responses to the SWE central SharePoint site.
 - c. We will continue to refine the audit schedule and requirements to reduce the amount of data requested from EDCs and to allow the use of an annual audit instead of quarterly audits wherever this is practical.
 - d. We will perform a complete review of all audit activities to see which of them we can do more efficiently and which of them can be eliminated for Phase II.
 - e. We will include no more than five SWE Team members at in-person meetings at the Commission. We will obtain approval from TUS staff if we would like to have additional team members attend a specific in-person meeting.
 - f. We will use the new Audit Tracking Database developed by Nexant to automate data collection and reporting of our audit activities.
8. **We understand the technical and economic feasibility of demand response (DR) programs** in Pennsylvania, and we understand PJM's EM&V requirements for DR programs. Our team has completed several DR feasibility and M&V studies in the PJM, NY-ISO and New England ISO forward capacity markets for clients, including but not limited to: Efficiency Maine, PSEG in New Jersey, the Delaware PSC, NYSERDA, the Vermont PSC and the New York Power Authority. Through our work on the Special Demand Response study in Phase I, we are very knowledgeable about the intricacies of the PJM and Act 129 DR program interventions in Pennsylvania.
9. **We understand the economic/demographic characteristics of electricity consumers** in Pennsylvania. During 2011 and 2012, our team conducted residential and commercial baseline



studies, and we now have a full understanding of the building, economic/demographic and appliance characteristics of electricity consumers in the State.

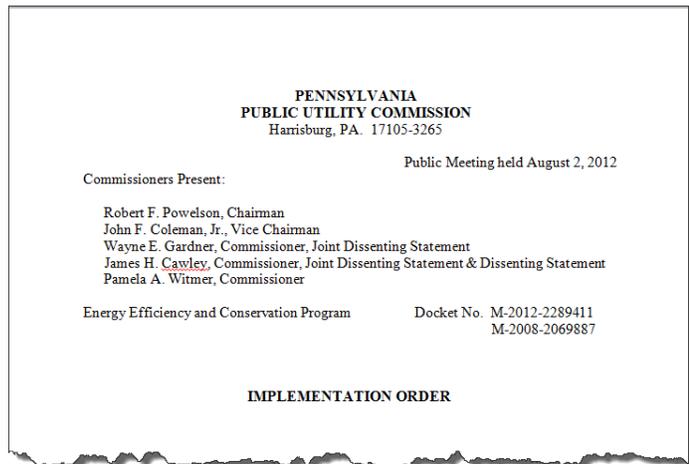
10. Because we completed the Pennsylvania Energy Efficiency Potential Study in May 2012, we **can target our efforts to achieve the most promising and cost-effective electricity savings.**
11. **Our expanded team brings new capabilities, experience, and perspectives:** We have added Jane Peters of Research Into Action, GDS Principals Scott Albert and Rich Hackner, and Scott Dimetrosky of Apex Analytics to the GDS Team to provide new perspectives on market research, analytical approaches, process evaluations, regulatory issues, and planning studies – important enhancements to improve the work we did for Phase I. Jane’s firm has been added to strengthen the team’s process evaluation capabilities to help improve the efficiency and effectiveness of Act 129 programs. Scott Albert and Rich Hackner of GDS, principal engineers each having more than two decades of engineering experience in the energy efficiency field, will strengthen our team’s engineering capabilities and program implementation knowledge. Scott Dimetrosky of Apex Analytics, a highly regarded industry veteran, brings especially relevant experience in regulatory reporting and stakeholder engagement.
12. **Increased focus on subject matter experts:** Patrick Burns and Irwin Kim of Nexant will be heavily involved in leading discussions and writing reports; and presenting the baseline study, metering study, Market Potential Study, and TRM results to the Commissioners and stakeholders.
13. **Professional Editing:** We have added Marnie McPhee from Research Into Action to our Team to perform professional editing of the SWE’s major technical reports to the Commission. Marnie has 35 years’ experience as a writer and editor, specializing in energy efficiency and renewable energy. For the past ten years, she has edited technical EM&V reports for Research Into Action and other clients. In addition, we have allocated funds in our budget for bringing in a professional editing firm if needed.

In summary, the GDS Team is prepared to offer high-value and cost-effective services to support the advancement of Pennsylvania’s energy efficiency and demand response programs. This will ensure that Pennsylvania rate payers continue to benefit from access to world-class programs.

1.0 STATEMENT OF THE PROBLEM (II-1)

1.1 Introduction to the Need for the Statewide Evaluator

As part of the Commission's Act 129 Phase II Implementation Order and Act 129, the Commission seeks a Statewide Evaluator (SWE) to evaluate the Phase II Energy Efficiency and Conservation (EE&C) programs implemented by the seven electric distribution companies (EDCs) in Pennsylvania during program years 2013, 2014, 2015, and 2016. We understand that these Phase II programs are being implemented pursuant to Act 129 of 2008 (Act 129) and that the evaluations shall be conducted within the context of the Commission's August 2012 Implementation Order and Act 129.² Through this RFP, the Commission articulates the following tasks for the SWE: monitor and verify EDC data collection, quality assurance processes, and performance measures, by customer class. The RFP requires that the SWE review and evaluate each EDC's program and portfolio demand and energy savings results on an annual basis, and the entire EE&C program at the end of Phase II. Near the end of Phase II, our team will produce an accurate assessment of the potential for electric energy and demand savings through updated baseline studies and market potential assessments.



In this section, we provide detailed information about our understanding of the issues the Commission seeks to explore in Phase II and the strategies and theoretical and practical frameworks we will use to evaluate the impacts and operational processes of the EE&C programs. Act 129 of 2008 requires the Commission to establish an evaluation process that monitors and verifies data collection, quality assurance and the results of each EDC plan and the program as a whole, in accordance with the Total Resource Cost Test (TRC). In this "Statement of the Problem" section, we describe the theoretical and practical framework in which we will conduct the evaluation activities.

In Section 3, we present the activities we have planned for each of the tasks specified in the RFP. The EM&V approach we describe in Section 3 builds upon our team's experience as the SWE for Phase I and provides a fine-tuned plan to evaluate the individual EDC EE&C programs annually and the program as a whole during Phase II.

The scope of work approach proposed by the GDS Team meets or exceeds all of the requirements for tasks and deliverables listed in the Commission's November 30, 2012 RFP. Based on the pre-bid meeting and our audit experience from the Phase I evaluation activities, it is the GDS Team's understanding that formal and comprehensive impact and process evaluations that would duplicate the sampling and data collection done by the EDCs are not anticipated. Our scope of work approach provides the required level of verification described in the RFP and at the pre-bid meeting and our approach will "spot check" the work done by the utility evaluators.

² In 2008 the Commission was charged by the Pennsylvania General Assembly pursuant to Act 129 of 2008 ("Act 129") with establishing an energy efficiency and conservation program. 66 Pa.C.S. §§ 2806.1 and 2806.2. The energy efficiency and conservation program requires each EDC with at least 100,000 customers to adopt a plan to reduce energy demand and consumption within its service territory. 66 Pa.C.S. § 2806.1. In order to fulfill this obligation, on January 16, 2009, the Commission entered its first Implementation Order at Docket No. M-2008-2069887. The Commission issued the Implementation Order for Phase 2 of Act 129 in August 2012. As part of the 2012 Implementation Order and Act 129, the Commission seeks a Statewide Evaluator to evaluate the EDCs' Phase 2 energy efficiency and conservation programs.

1.2 Our Team's Accomplishments During Phase I of Act 129

Selecting our Team will ensure continuity of an experienced and proven SWE with the local presence, skills and capability to carry out the full range of responsibilities of the SWE. GDS Associates and Nexant have served the Commission as the SWE for the past four years. Selection of our Team for Phase II will allow for continuity of SWE Team personnel and will leverage our knowledge of the lessons learned from Phase I programs. During Phase I we authored the following reports and studies:

- Phase I Evaluation Framework
- Quarterly and Annual Statewide Evaluator Reports to the Commission
- Annual updates to the Technical Reference Manual (TRM)
- Phase I baseline studies (published in April 2012)
- May 2012 statewide Energy Efficiency Potential Study
- More than 15 EM&V guidance memos
- More than 30 custom measure protocols.

Because we completed the Pennsylvania Energy Efficiency Potential Study in May 2012, we now have a thorough understanding of where the electricity savings exist that have the most potential and are the most cost-effective. We also have the models and databases from the 2012 Energy Efficiency Potential Study and we will use these models to update that study during Phase II. We held weekly teleconferences of our Team with the Commission's Technical Utility Services (TUS) staff, and we held bi-weekly teleconferences with each EDC. The TUS staff is well aware of our analytical skills. We have the staff resources, communication networks, and project management infrastructure to ensure that our Team will be 100% operational and effective at the start of the new contract.

Our Team has a local presence in Pennsylvania, with many of our consultants working and residing in Pennsylvania. We have a thorough understanding of the appliance saturation, electric energy usage, population, housing and business characteristics of the State due to the baseline research we conducted as Phase I SWE. We are able to implement enhancements to our audit approach that will reduce costs and save time as well as focus audit activities on those measures and programs requiring high levels of rigor.

1.3 Key Elements of Our Proposed Scope of Work for Phase II

The quarterly and annual reports produced by the SWE will include an analysis of each EDC's program portfolio from both a process and impact standpoint, program impacts (demand and energy savings), and cost-effectiveness according to the Total Resource Cost Test (TRC). The GDS Team will provide quarterly report updates to the TUS staff as well as biannual improvement workshops with the EDCs. As our Team has done in our Phase I reports, the annual reports produced for Phase II will provide the Commission with recommendations for EE&C plan and program improvements. Additionally, the GDS Team will continue to provide and enhance the public web-accessible database and reporting system for the Commission's website so that the general public may continue to be kept abreast of the impacts of the EE&C program results for each EDC. As the Phase II SWE, we will also produce an accurate assessment of the future potential for electric energy and demand savings through a Market Assessment Study.

"Confirming our recent discussion, the ... meeting between PPL, SWE, and Cadmus was effective and productive. The personnel and process changes you implemented are working. Your team was organized, prepared, focused, and provided practical, clear, and consistent information and guidance."

Memo from Pete Cleff to Dick Spellman, Phase I SWE Project Lead

While all of these tasks are related, each has distinct goals.

- **Impact evaluation** reviews seek to *quantify* the energy, demand, and possible non-energy impacts that have resulted from demand-side management (DSM) program operations.
- **Process evaluations** seek to *describe* how well those programs operate and to *characterize* their efficiency and effectiveness.
- **Market characterization and assessment studies** seek to *determine* the attitude and awareness of market actors, *measure* market indicators and *identify* barriers to market penetration.
- **Baseline studies** *collect* statistically valid estimates of electric equipment saturations, space and water heating fuel saturations, the baseline efficiency levels for existing electrical equipment; and *pinpoint* the existing saturation levels of energy efficiency measures.
- **A market potential study** *develops* estimates of the technical, economic, achievable and program potential for energy efficiency and demand response measures and programs.

The GDS Team is thoroughly experienced with each of these types of studies and with cost-effectiveness testing based upon our Phase I evaluation experience and work for other clients throughout the U.S. and Canada. We will follow standard professional practices as documented in the literature and practices outlined in the Pennsylvania TR) and 2012 TRC Order adopted by the Commission to help fulfill the evaluation and audit process requirements when conducting our reviews of the EDCs' EE&C programs and cost effectiveness calculations.

IMPACT EVALUATION OVERVIEW

We will conduct the audits of the EDC impact evaluations on an annual basis for each EDC program. Our audits of the EDC impact evaluations will conform to the processes and procedures our team developed in Phase I. As we did in Phase I, we will assign individual program types (e.g., residential, low-income residential, small commercial, large commercial/industrial, and those offered by governmental and educational entities) to team leads with the most experience in each area. These team leads will design and plan the most appropriate evaluation and audit activities for the EDCs for each assigned program type. Additionally, we will update the audit plans for each program based on the lessons we learned during Phase I.

Fundamentally, impact evaluations seek to quantify the *net* savings that have been realized by the programs under review by determining the *gross* savings realized by projects enrolled in the programs, and *net-to-gross* (NTG) ratios. *Gross* savings are the change in energy and demand requirements for program participants as reported by program administrators, while *net* savings are the changes in energy use that occur outside of the program (*spillover*) or that would have occurred naturally without the program's influence (*free ridership*.) The basic overarching relationships in the impact evaluation are presented in the November 2011 SWE Audit Plan. Figure 1-1 below summarizes the general approach to the impact evaluation process.

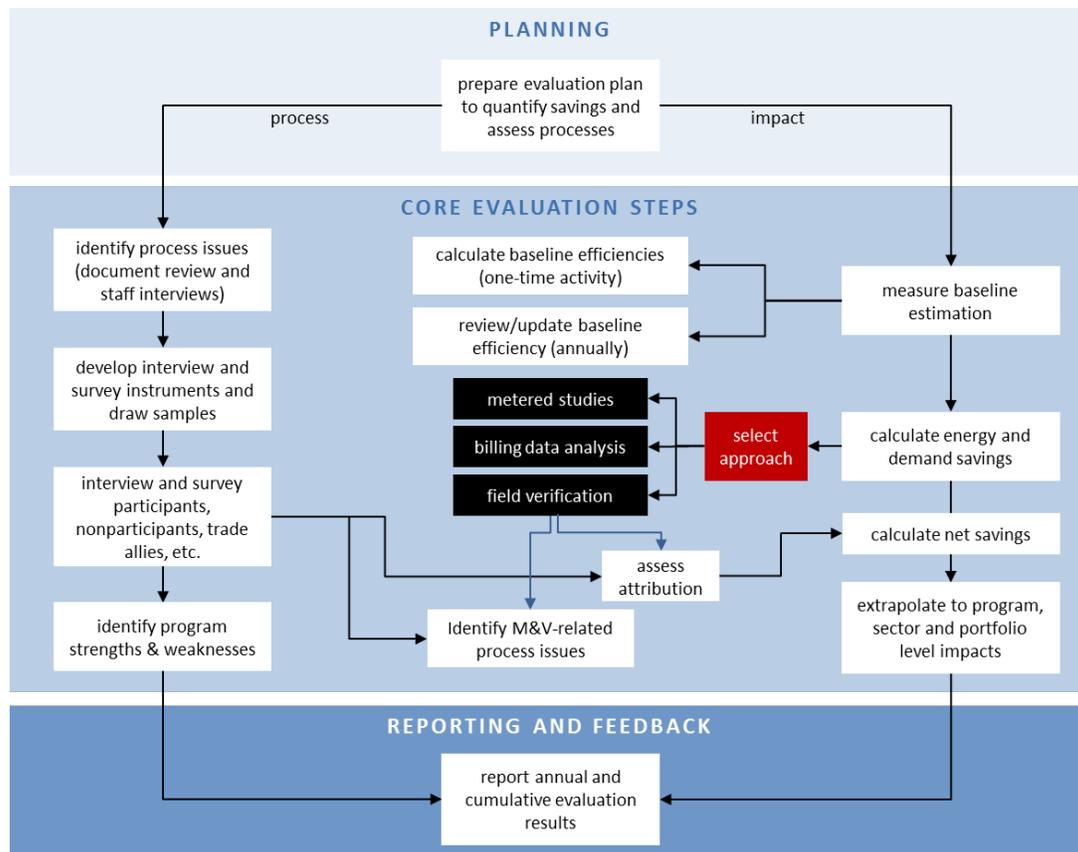


Figure 1-1: The Impact Evaluation Process

The GDS Team will assess whether the EDCs are following the TRM deemed savings framework and the fundamental calculations shown above in conducting their impact evaluations of the Act 129 programs. Techniques that we will use to verify that the EDCs accurately calculate the program impacts will include the following:

- Checking receipts and invoices versus data entered into tracking databases;
- Verifying that EDC savings calculations use correct deemed savings from the TRM;
- Measurement and verification using engineering methods;
- Site inspections and data collection (accurate metering of end use systems – *install a meter on anything that results in energy savings if project has a significant impact without reinventing the wheel*);
- Computer simulations;
- Billing analysis; and,
- Where necessary, interviews with program participants and nonparticipants.

The cost-effectiveness analysis will use the net savings determined through each EDC's impact evaluation, and program and participant costs recorded by the program administrators enhanced by published cost data from other sources (such as RS Means), and measure life data obtained from previous studies, ASHRAE or public data sources such as the Northwest Power and Conservation Council's Regional Technical Forum database, California's Deemed Energy Efficiency Resource database, NYSERDA Deemed Savings Database and avoided-cost data furnished by each respective EDC. The associated costs will include administrative, marketing and outreach and other implementation costs. The benefit/cost results will be calculated in accordance with the Commission's August 2012 TRC Order.

The primary determinants of impact evaluation costs are the sample size and the reliability of metered energy use data, while the accuracy of the study findings is in turn dependent on these parameters. We

will continue to rely upon the sampling procedures described in the 2012 Pennsylvania Statewide Auditor Evaluation Framework.

Thus, the results of the SWE annual impact evaluations will do the following:

- Identify the cost-effectiveness of each program,
- Ensure that the claimed measures are being properly installed and utilized, and
- Ensure that the installed measures are obtaining the claimed energy savings or reductions.

The GDS Team also will review and verify the TRC benefit/cost ratios developed by the EDCs.

PROCESS EVALUATION OVERVIEW

The process evaluations done by the Pennsylvania EDCs use interview and survey techniques to gather relevant information about program operations, which can be compared to original design intent; and to measure participant satisfaction and program performance, which can be analyzed to identify gaps between program goals and results. These EDC process analyses provide conclusions and recommendations to enhance program performance by highlighting areas for improvement and identifying best practices that may be implemented in the future.

During Phase II, the GDS Team will serve as a **technical advisor** to the Commission's TUS staff on process evaluation methodology and the design of sampling plans and survey instruments, and will verify that the EDCs review and act on process evaluation recommendations. The GDS Team will not perform process evaluations of the individual EE&C programs.

The net savings analyses done by the EDCs are tied to the process evaluation. During Phase I, the EDCs integrated these activities. For example the data collected through site inspections will inform the process evaluation, which will be conducted on a subset of the participant sample to minimize sample sizes and control the evaluation budget. Due to our extensive experience conducting data collection, data analysis, and report writing for process evaluations, we will be able to oversee the EDC process evaluations and ensure that they are conducted with an appropriate focus and methodology.

EDC EE&C PROGRAMS EVALUATIONS AND AUDITS

The GDS Team will carry out the SWE responsibilities for auditing and evaluating the EDCs' Act 129 programs during Phase II. We will monitor and verify data collection, quality assurance, and the results of each EDC plan on an ongoing basis in accordance with the revised Audit Plan approved under the new contract. We will continue to review and audit each EDC's program tracking system to assess each EDC's ability to meet the Audit Plan and Commission-established targets in a cost-effective manner. We understand that the activities identified in the Audit Plan, and related to our responsibilities for monitoring and verifying data collection, quality assurance, and results of each EDC plan will include, but are not limited, to the following activities:

- Maintaining an evaluation and management database
- in coordination with each EDC's independent evaluator, conducting random spot verification of each EDC's EM&V measurements and data
- Acquiring data from EDCs and other source, and verifying EDC-supplied data
- Reviewing each EDC's plan to determine whether EDCs are meeting energy savings targets
- Providing reasonable assurance that the claimed measures are properly installed and utilized
- Providing reasonable assurance that the installed measures are obtaining the claimed energy savings and demand reductions in accordance with the Commission-approved TRM or other approved methods
- Reviewing and verifying each EDC's performance by having trained personnel accompany EDC evaluators on spot field inspections, in coordination with EDC and Commission staff
- Conducting spot verifications, in coordination with the EDCs' and Commission staff, utilizing short-term and long-term metering equipment on participating customer property

- Auditing and providing comments on EDC survey instruments
- Reviewing and verifying, in coordination with the EDCs, the EDC evaluators' customer and trade ally satisfaction surveys and reports
- Coordinating the development and approval of the methodologies for net-to-gross (NTG) studies to be performed by EDCs
- Conducting limited market baseline studies for the impact evaluations of specific programs
- Analyzing verification data collected by EDC evaluators
- Interfacing and coordinating with Commission staff and EDCs
- Critiquing reported energy and demand savings utilizing field verification, TRM-derived savings, approved custom measure-derived savings, M&V, and large-scale billing analyses
- Verifying reported cost-effectiveness of EDC plans using the TRC methodology adopted by the Commission
- Reviewing and monitoring EDCs' EM&V plans and their execution of them

We have structured our technical evaluation approach, evaluation sequence and schedule, and costing based on the program metrics required to determine cost-effective energy and demand savings by customer class. The GDS Team, using the techniques described in this section, will be able to coordinate and consult with each EDC in their efforts to measure and collect the necessary data needed to quantify the connected, seasonal and peak/off-peak demand, and energy savings so that we may effectively analyze program impacts with reasonable auditing efforts. We understand that this will be an ongoing M&V audit and evaluation project and we have extensive experience in making ongoing evaluations cost-effective and technically sound.

We will prepare detailed quarterly and annual reports that present the audit results and final evaluations in a way that is useful to the Commission, the program administrators and the public to fully document the impacts these programs have had on the energy landscape and market in Pennsylvania. Our reports will explain our assumptions, list subjects for follow-up research, and make recommendations for improving the accuracy of program results and for modifying program operations to better align them with goals. In Section 3.0 of this proposal, we describe our technical approach to the key research issues outlined in the RFP.

ENERGY EFFICIENCY BASELINE STUDY OVERVIEW

The GDS Team will conduct updates to the baseline studies completed by our Team in Phase I to inform the Commission regarding establishing mandates for Phase II and a possible Phase III. The baseline studies are needed to support an update to the May 2012 Market Potential Analysis and Report to the Commission to provide guidance for a Phase III of Act 129 EE&C Programs for Pennsylvania.

Because of significant differences among customer market segments, our team understands that several distinct baseline studies may be needed for each EDC service territory. In Section 3.0 of our proposal, we explain our approach to developing cost-effective study plans and methodologies to support specific customer group targets or carve-outs in the update of the May 2012 SWE Market Potential Report.

Our Team understands that the primary objectives of the baseline studies include the following:

- Select a representative random sample of select customer groups for participation in the baseline study;
- Profile electric customers groups at the sector and end-use level;
- Determine the current saturation of energy-using equipment in residential households, commercial and industrial facilities, etc.
- Determine the current saturation of energy-efficient HVAC and appliances and energy efficiency measures and practices in the residential, commercial and industrial sectors;
- Determine average baseline levels of energy use for lighting, plug loads, space heating, space cooling and water heating by end use; and
- Determine the percent of energy-using equipment by end use that is already high efficiency.

The Commission's RFP for Phase II indicated that the Commission directed that each EDC service territory's residential sample and commercial and industrial sample be statistically significant at a confidence level of 90% and a margin of error of 10% at the EDC service territory level. Section 3 of our proposal includes our recommendations for statistical confidence and precision levels for the updates of the baseline studies.

The GDS Team has extensive experience completing market characterizations, market assessments, and energy efficiency potential studies. Detailed descriptions of similar baseline study projects we have completed are provided in Appendix B of our proposal.

ENERGY EFFICIENCY POTENTIAL STUDY UPDATE

Our Team will conduct a statewide Market (energy efficiency) Potential Study to determine the remaining opportunities for cost-effective electric energy efficiency savings in the service territories of the seven EDCs in Pennsylvania that are subject to Act 129. We describe our study methodology in Section 3.0 of our proposal. This study will focus on kWh and kW targets to be achieved between June 1, 2016 and May 31, 2021. Our Market Potential Study will be completed no later than December 2014. Our Team understands that the exact delivery date for the report to the Commission will be determined at a later date and will be consistent with the Commission's timeframe for implementing a potential Phase III of Act 129.

EE&C PROGRAMS

Our study will cover all of the requirements listed on pages 35 and 36 of the Commission's RFP.

TECHNICAL REFERENCE MANUAL AND TRC TEST UPDATE

Our Team will coordinate and participate in an annual update of the TRM as it relates to the calculation of savings for standard energy efficiency measures. These tasks involve working with the Commission, EDCs and other stakeholders to identify measures for inclusion in the TRM and to revise existing savings calculations based on primary research from SWE metering/logging studies, Act 129 data from EM&V activities, secondary research sources, as well as changes in technology and/or government/industry standards and building codes.

DATA MANAGEMENT AND COMMISSION REPORTS

As required by the Commission's RFP, our Team will be responsible for maintaining program data and information, a SharePoint site, and to prepare quarterly and annual reports on EE&C Program performance. We will continue to be responsible for designing, implementing and maintaining the statewide database of program and portfolio data by EDC and for the Commonwealth as a whole. The database will contain information on energy and demand savings and cost-effectiveness reporting.

We will continue to be responsible for maintaining a secure SharePoint site for the exchange of non-public/confidential data and information. We will maintain and archive electronic and paper files and data collected during the conduct of our SWE duties using this secure SharePoint site. We will continue to prepare and submit SWE quarterly and annual reports to the Commission according to the schedules listed in the Commission's RFP.

LOGGING/METERING STUDIES

Our Team will be responsible for conducting statewide metering/logging studies to update the hour-of-use values in the Pennsylvania TRM. We helped develop the recommendations to the Pennsylvania Program Evaluation Group that one study is needed for the residential sector and another for the commercial/industrial sector.

Section 3 of our proposal provides our sampling plan and technical methodology for each sector study. Our proposed methodology meets the requirements for statistical significance at a confidence level of 90% and a margin of error at 10%. Our logging/metering studies will be completed in time to incorporate new values into the TRM version that will be effective for potential Phase III programs beginning June 1, 2016.

2.0 MANAGEMENT SUMMARY (II-2)

This section of our proposal includes a brief narrative description of our proposed approach to the scope of work, our project management practices and a list of the services or items to be delivered by the GDS Team, and our project organization chart. We also describe our project management practices and present our project organization chart. Our experienced and proven SWE Team has a local presence and the skills and capability to carry out the full range of responsibilities required of the SWE.

The GDS Team is comprised of project managers, engineers and analysts well versed in designing, implementing and evaluating energy efficiency and demand response programs. In addition, our Team has already served the Commission as the SWE for Phase I of Act 129. For Phase II, we have added additional engineering and process evaluation expertise in order to effectively accommodate a growing work load as the Pennsylvania Act 129 programs expand. As such, the GDS Team brings years of Pennsylvania specific experience, knowledge, local presence and the tools required to accurately and effectively evaluate the EDCs' Phase II programs and to determine the future of such programs based on current and best practices for program implementation and evaluation.

The members of the GDS Team have conducted hundreds of program impact and process evaluations across the U.S., including SWE audits for all of the EDCs' programs implemented in Phase I of Act 129. The GDS Team therefore is well equipped to build upon – and refine – the evaluation framework we developed for Phase I for use in Phase II. The evaluation framework we created in Phase I standardized the EDC's M&V practices so that the data collected for the Phase I programs would provide for accurate and reliable estimates of program costs and impacts (including demand and energy savings, participation numbers, and program costs). As part of the evaluation planning and framework we developed for Phase I, the GDS Team presented best practices workshops and spot-check criteria to ensure that the EDCs are properly implementing the framework and EM&V protocols so that the EDCs' annual reports are not only accurate but also use standardized metrics and evaluation methods.

For the Phase II SWE evaluation, the GDS Team will conduct annual reviews and spot-checking of the individual EDC's annual reports submitted to the Commission summarizing the impacts of their EE&C programs for the year. As part of these annual reviews, the GDS Team will verify that the M&V practices are being implemented according to the protocol standardized in the audit plan, the 2013 TRM, or custom measure protocols. As part of this process, the GDS Team will perform spot checks to verify some of the in-field savings measurements, inspect some of the equipment used by the EDCs to take energy and demand measurements, and review the utility bills, program budgets, and participation numbers. We will continue to review and verify each EDC's TRC benefit/cost ratio calculations. Using these verification practices, the GDS Team will review the EDCs' annual reports to verify the energy and demand savings, the programs' cost-effectiveness, and the effectiveness of the current implementation strategies. The GDS Team will include in this review a list of recommendations for the future of the programs based upon best practices and the findings of each annual review.

During Phase II, the GDS Team will conduct a full Market Assessment and Market Potential Study in order to determine the potential for EE&C efforts within the service territories of the seven Act 129 EDCs. This study will include a review of the overall program performance and progress of the collective EDC EE&C efforts to date along with the current market saturations of energy-efficient equipment and practices. Using this information, the GDS Team will be able to determine the technical, economic, achievable and program energy efficiency potential within the region. We then will recommend kWh and kW savings targets for each EDC for a possible Phase III of Act 129.

Based on our understanding of the RFP requirements, the following table contains a list of the services and deliverables to be provided by the GDS Team to the Commission during the course of this Phase II evaluation contract. We have also included the page number within our response where the

Task/Service is located. A more detailed and technical description of each deliverable can be found in Section 3 of this proposal.

Table 2-1: Phase II Deliverables

Task and/or Deliverable	
Statewide Studies	
Conduct electric energy efficiency baseline studies to support Market Potential	3.7
Conduct electric energy efficiency Market Potential Study for targets to be achieved in a potential Phase III EE&C Program from 6/1/16 to 5/31/21.	3.8
Optional at Commission’s discretion – conduct a Demand Response Potential Study for targets to be achieved in a potential Phase III Demand Response Program from 6/1/16 to 5/31/21.	3.0-A
Conduct logging/metering studies to update the hours-of-use values in the TRM for residential and C&I lighting.	3.6
Initiate and coordinate annual updates to TRM and interim updates (new protocols).	3.4
Initiate, scope, and conduct/coordinate statewide site inspections, statewide site metering studies, review of data/studies from PA and other states, etc. to determine if the PA TRM estimates savings and/or to revise PA TRM protocols.	3.4
Coordinate the development of and approve the methodologies for EDC net-to-gross studies consistent with net-to-gross white paper. Update white paper as needed.	Page 33
Audit and Assess EDC Phase II Programs and Results	
Review and approval of EDC evaluation plans.	3.3
Review and update existing Phase I Audit Plan. Thereafter, update Audit Plan as needed.	3.2
Review/audit all EDC evaluation results-impact evaluation, process evaluation, NTG analysis and cost-effectiveness evaluation.	3.3
Databases	
Establishing and implementing quality control reviews of EDC program tracking databases.	3.5
Statewide Data Management and Quality Control. Design, implementation and maintenance of statewide database of program, portfolio, EDC and statewide energy and demand savings and cost- effectiveness reporting.	3.3
Develop and maintain secure SharePoint site for maintenance and exchange of confidential data and information with EDCs.	3.5.1
Primary Data Collection and Impact Analyses	
Audit and assess EDC evaluator performance of EM&V Plans.	3.3
EDC Plan Review	
Review of filed EDC EE&C plans and provide advice to Commission staff on ability of plans to cost-effectively meet targets (includes cost- effectiveness analyses)	3.3

Review of EDCs' EM&V plans and provide advice to Commission staff on ability of plans to adequately measure energy savings	3.3
Reporting (Annual and Quarterly)	
Develop the Statewide quarterly and annual report templates. Review EDCs' reports and advise the Commission of program and portfolio results: net and gross impacts and cost-effectiveness and EDC progress in reaching targets. Prepare Statewide Annual and Quarterly Reports to the Commission.	3.4.5
Best Practices	
Preparation of best practices recommendations for improvements to impact evaluation processes	3.9
Prepare best practices recommendations for program modifications and improvements	3.9
Other	
Prepare materials and reports in support of Commission analysis of efficiency programs	3.5.4
Organize and conduct periodic and stakeholder meetings on evaluation results of EE programs, proposed changes to the TRM, etc.	3.2

The GDS Team understands that the Commission may require additional services (such as expert testimony) based upon the evaluations, reviews, and recommendations resulting from this project. Several members of the GDS Team have experience developing and delivering expert testimony regarding all aspects of EE&C programs and will provide effective testimony regarding Phase II activities as appropriate.

2.1 Enhancements to the Statewide Evaluation Process

Listed below are enhancements we will make to our daily operations to make the Statewide Evaluation activities more efficient and effective:

- a. We will examine all EM&V audit and research processes to make them more efficient and effective. This is a continuous improvement process that we employ in all of our ongoing EM&V projects. For example, we will expand the use of hand-held computers for the on-site data collection for the baseline studies.
- b. We propose using new program evaluation software where applicable to make the tracking, storing and analysis of data more efficient. For example, we would like to introduce a single-benefit/cost model for all of the EDCs to use for their TRC calculations and we will provide a pre-developed electronic *MS Access* database for tracking the audit and verification activities at no additional cost to the Commission.
- c. Our team already has developed detailed *Excel* models that support the residential and commercial energy efficiency potential estimates, so we will need to update only the input data – a significant cost savings. We will continue to provide guidance to the Commission and the EDCs on evaluation policies and new methods for determining measure costs and savings.
- d. We are proposing a new, cost-effective methodology for the completion of the optional demand response study.

- e. We will conduct baseline studies of the residential, commercial and industrial sectors. We plan to add questions to the survey instrument to address issues such as residential and commercial lighting baseline issues, refrigerator/freezer replacement issues, and the saturation of energy efficiency measures in low-income households.
- f. For Phase II, we have added a process evaluation component. As a member of the GDS Team, Research Into Action will serve as a technical advisor to the Commission's TUS staff, providing input on process evaluation methodology issues, sampling plans and survey instruments; analyzing the EDCs' process evaluation studies to improve the efficiency and effectiveness of the EDCs' Phase II programs; and verifying that the EDCs' managers review and act upon recommendations from process evaluations done by the EDCs' evaluators. The GDS Team will not perform process evaluations of individual programs.
- g. Based on lesson learned from Phase I, we will refine our approach for spot checks to maximize their usefulness. The main refinement will be to discuss our spot-check findings and recommendations with the EDCs during the first bi-weekly teleconference each month with each EDC. We will make this a regular agenda item for these bi-weekly phone calls.
- h. We will continue the ride-along audit inspections for a sample of commercial- and industrial-sector energy efficiency projects in order to ensure that the EDC evaluators are employing proper EM&V techniques and calculations. We will increase our tactical efficiencies with better coordination with the EDC evaluators and CSPs.
- i. As appropriate, we propose that the EDC evaluators obtain pictures of commercial and industrial (C&I) sites to help the GDS Team reduce labor and non-labor costs to travel to project sites. The purpose of the pictures is to provide our SWE engineers with more information about the type of equipment installed so that the SWE can better estimate actual energy and demand savings.
- j. We will provide and implement a new information management system to collect and organize all SWE on-site visit data on the SharePoint site at no additional cost to the Commission. As we did in Phase I, we will assign one person (Kaytie Ruditys of GDS) to send all data requests and major SWE reports to TUS staff and the EDCs.
- k. We will continue to have weekly SWE Team teleconferences with TUS staff on Mondays at 10 AM Eastern. We will limit the number of SWE Team members at these weekly teleconferences and at monthly Program Evaluation Group meetings to a maximum of five persons.
- l. All in-field and telephone data collection for the audit activities and baseline surveys will be completed on a Tablet PC (iPad or similar). This will automate the data collection procedures and will save time and money. We will upload this data automatically to the Audit Tracking System or the SharePoint site. The GDS Team will provide these tools and equipment at no additional cost to the Commission.

2.2 Project Management Practices

We will use the following project management practices to ensure that we meet project deadlines and stay within approved budgets:

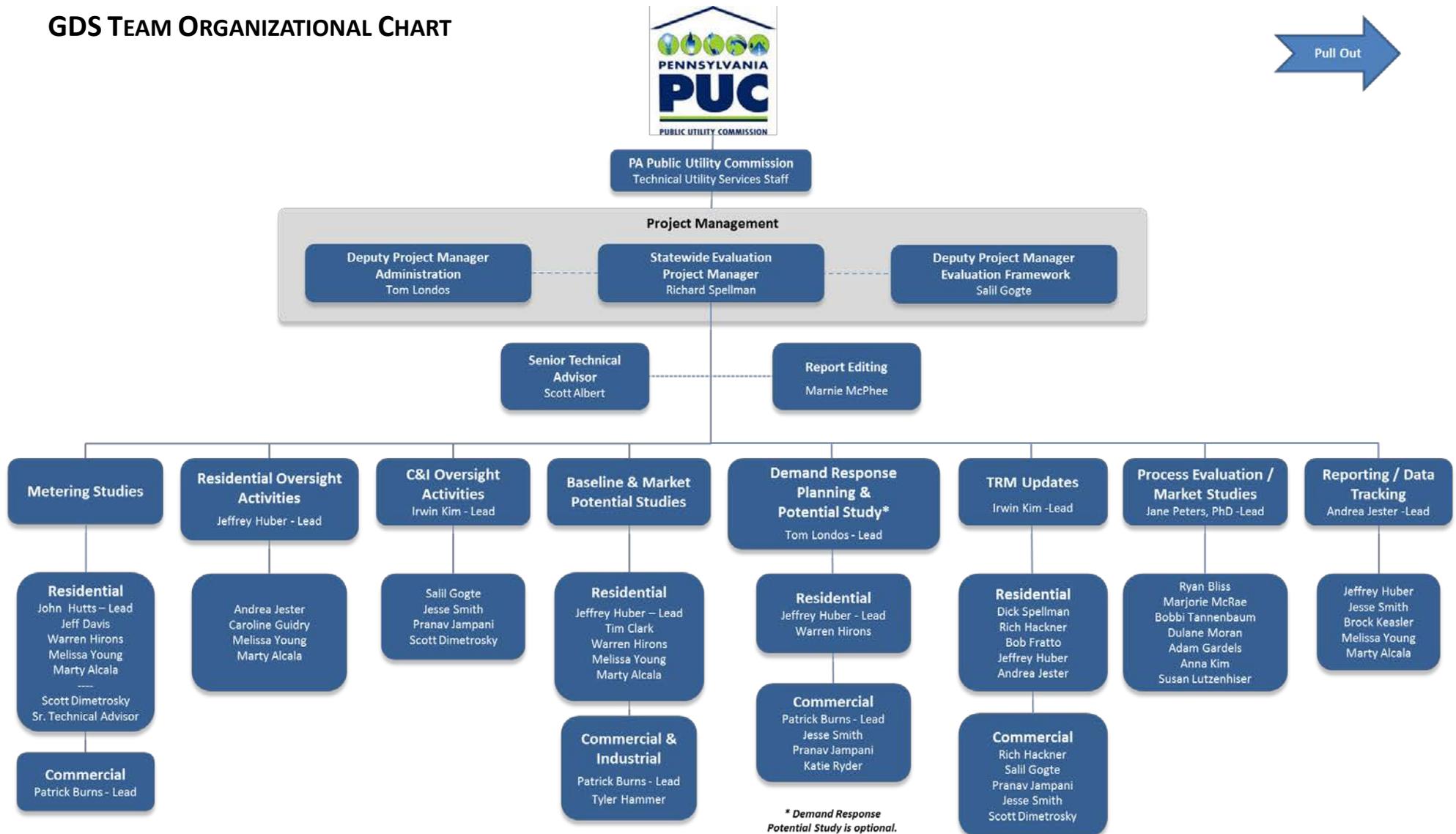
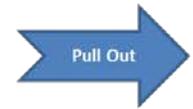
1. Our Project Manager, Dick Spellman of GDS, will continue to serve as the individual responsible for managing overall work assignments and project activities and he will serve as the principal point of contact for all of the Commission's communications with our Team. He has served in this role since 2009 and will be available to continue to serve this role throughout Phase II.
2. Dick Spellman will continue to communicate with designated Commission staff on a regular basis regarding the progress of the work, the results to date, and any problems encountered. The GDS Team will continue the practice of having weekly teleconferences with TUS staff to discuss work assignments, teleconferences, meetings, and deliverables for the coming week. SWE Team members will report any delays or unforeseen difficulties to the GDS Team Project Manager and the Commission. The GDS Team will limit attendance at these weekly teleconferences to no more than five (5) persons from the SWE Team.
3. GDS will continue to maintain and administer a SharePoint site in order to facilitate the exchange of data and documents with the TUS staff, the seven EDCs, and the EDC evaluation teams.
4. GDS will be responsible for the administration of subcontracts with all SWE subcontractors. GDS will flow down provisions in the master contract with the Commission to all subcontractors. GDS will be responsible for providing a consolidated, monthly invoice to the Commission, as we did during Phase I.
5. The GDS Team will provide Commission staff with drafts of all major deliverables for review, comment, and approval.
6. During this contract, our Team also will seek ways to continuously improve our work and communications with client staff. We will assign one individual (Kaytie Ruditys of GDS) to be the sole point of contact for our communications with the EDCs regarding SWE reports and SWE data requests.
7. Our Team will seek prior approval from the Commission Project Manager before undertaking any significant planning or development tasks. At the beginning of the project, our Team's key personnel will attend the kick-off meeting with Commission staff to review the work plan and schedule.
8. Dick Spellman, will provide written monthly project status reports to the Commission Project Manager, summarizing project status by activity and identifying any difficulties or delays, and recommending corrective action, as needed. We propose to have two Deputy Project Managers, one for Management and Administration issues (Tom Londos of GDS), and one for Project Planning and Execution issues (Salil Gogte of Nexant).
9. We will take minutes at the weekly teleconferences between Commission staff and the SWE Team. Any work assignments or action items distributed at such meetings will be highlighted in these meeting minutes. We will distribute these meeting minutes to Project Team members and appropriate Commission staff.

10. GDS requires that its employees and subcontractors turn in receipts for all travel expenses and all non-labor expenses. Project Team members will keep accurate logs of all hours worked on this project as well as records of travel and other expenses, and maintain copies of all time and expense records required by the Commission. GDS will take special care to ensure that any work done for only one EDC is charged only to that EDC.
11. The GDS Project Manager will make use of any appropriate total quality management tools, such as monthly timelines, monthly work schedules, budget variance reports, and "percent work task completed" reports to increase the efficiency and effectiveness of project management.
12. Our Team will review all deliverables for quality before we submit them to the Commission and others. The GDS Project Manager will be responsible for ensuring the quality of all project reports and memos.
13. When an *ad hoc* task or question arises, the GDS Project Manager will work with the Commission's SWE Project Manager to identify the issue, define what work needs to be done to resolve it, and establish a team or task force to complete the work. Once that task and deliverable are defined, we will establish a completion date and select the appropriate SWE Team members and TUS staff to do the work. We will base our selection of the SWE Team members who will serve on each task force on the subject matter, the staff person's availability, and the tasks that need to be done. Each task force will report progress/findings during the weekly teleconferences until the deliverables are completed.
14. The GDS Project Manager will work very closely with the Commission Project Manager to arrange the meetings and public workshops that are outlined in the work plan.
15. All project presentations will be made by key project team members, and any audiovisual aids and other presentation materials will be made available to the Commission Project Manager for review before presentation.
16. The GDS Team will make it a high priority to respond to the needs of Commission staff as rapidly as possible. Each key project team member will be briefed on techniques to use during the project to increase the "customer satisfaction" of Commission staff. Examples include: returning phone call and e-mail requests promptly and submitting required reports on time. Team members will be assigned a level of work hours to the major project tasks based on their area of expertise and the estimated work hours for each major task. The key staff identified in our proposal have committed to be available to work these hours.

Project Organization Chart

The organization chart for the GDS Team is provided on the next page.

GDS TEAM ORGANIZATIONAL CHART



3.0 WORK PLAN (II-3)

This section of the GDS Team proposal provides our proposal work plan for each required task.³

3.1 Task 1: Prepare for and Attend Project Kick-off Meeting

Once GDS has executed a contract for the Phase II SWE scope of work, key members of the GDS Team will meet with the Commission's TUS staff to discuss and finalize our proposed technical approach to complete the required scope of work for Phase II, finalize the project deliverables, discuss reporting schedules and establish a time and date for weekly SWE Team teleconferences with TUS staff. The GDS Team will prepare a draft agenda for the kick-off meeting for review by TUS staff, and we will prepare detailed minutes and action items for this kick-off meeting. Listed below are the items that we recommend be included on the agenda for this kick-off meeting:

1. Introductions of the TUS staff and GDS Team key consultants for this project
2. Review of and revisions to agenda
3. Discussion of project objectives and required schedule
4. TUS comments on GDS Team proposed scope of work and research approach
5. Project schedule by task
6. Project deliverables
7. Roles and responsibilities for TUS, EDCs and GDS Team
8. Initial concepts for the updating of the Audit Plan
9. Communication plan
10. Other

DELIVERABLES: AT THE KICK-OFF MEETING THE PARTIES WILL REVIEW AND DISCUSS THE PROJECT SCHEDULE PROPOSED BY THE GDS TEAM AND WILL MODIFY THE SCHEDULE IF NECESSARY. THE GDS TEAM WILL PROVIDE THE DRAFT AGENDA FOR THE KICK-OFF MEETING, THE MEETING MINUTES AND ACTION ITEMS, AND IF APPLICABLE, AN UPDATED TECHNICAL WORK PLAN AND PROJECT SCHEDULE BASED ON FEEDBACK RECEIVED AT THE KICK-OFF MEETING.

3.2 Task 2: Update and Revise Audit Plan

During the development of the Phase II Audit Plan, we will work directly with TUS staff and the Program Evaluation Group to identify new subjects and content that will be incorporated in Phase II and beyond. It is important to note that the revised audit plan can be an evaluation framework as comprehensive as the 500-page California Public Utilities Commission (CPUC) Evaluation Framework covering a wide range of evaluation policies, approaches, and issues, or a 10-page policy document providing general policy and operational guidance for key evaluation policy issues and decisions. We expect our final product to be somewhere in between and more focused on guidance to the EDCs while stating the Commission's policy directives.

Task 2 will begin with a review of the existing Audit Plan revised by the GDS Team in the third year of Phase I. Salil Gogte will lead this task with support from our evaluation framework experts, Jane Peters, Scott Dimetrosky and Scott Albert. As explained previously, our new management approach will engage a small subset of GDS Team experts to spearhead the Audit Plan update. The task/project team will be represented by one primary spokesperson. In Phase II, our focus will be to build a more streamlined audit plan that combines the content of a technical evaluation framework with policy directives from the Commission. The new Audit Plan will focus on mandatory versus discretionary protocols for the EDCs and their evaluators while emphasizing the need to standardize protocols across the Commonwealth and between the Conservation Service Providers (CSP) and evaluators for each EDC. The

³ It should be noted that we reference, in most instances, the GDS Team as the proposing members for Phase II and the SWE Team in reference to the work we have performed in Phase I or tasks normally attributed to any SWE Team.

audit plan will continue to provide two main sections – Guidelines and Requirements for EDC independent evaluations and audit activities conducted by the SWE Team.

In order to define expectations up-front, we will work to create ample discussion with TUS staff and solicit stakeholder input (if deemed appropriate by TUS staff) into the Framework development. One important approach we will use to ensure transparency and provide direction for the audit plan update will be to leverage the Program Evaluation Group PEG meetings. The PEG discussions will be strictly technical and all policy discussions will be held in closed-door conferences with TUS staff and other Commission advisors.

In advance of all meetings, we will provide possible Framework topics to be included in the Phase II Audit Plan. Providing a selection on topics in advance of the collaborative meetings will allow ample time for attendees to review the topics and consider how these can or should fit into the Audit Plan.

During the Audit Plan update meetings, the GDS Team will lead discussions focusing on the topics and issues that must be considered by TUS staff, the PEG and other stakeholders as they make decisions about which EM&V approach will be most aligned with the Commission policy objectives in Pennsylvania. If we engage in technical or informational meetings with the stakeholders, we will convey the importance, scope, and function of each topic to the Stakeholder Group, using this information to facilitate a forum that ensures ample opportunity for both discussion and feedback. We will use the PEG and possible Stakeholder meetings and associated follow-up discussions, e-conference meetings, and e-messaging, to provide the basis for the development of a draft Phase II Audit Plan for review. We will then gather feedback primarily from TUS staff and other Commission advisors. The TUS, PEG and Stakeholder review process will be carefully choreographed, with strict deadlines, consolidation of comments and proactive responses provided by the SWE Team.

As noted in the RFP, the Audit Plan will be a living document that will be updated or modified as appropriate. The historical Act 129 experience of the GDS Team – combined with the extensive experience of our new, very experienced team members developing evaluation frameworks in states evaluating programs for the first or tenth time – illuminates the need for sensitivity, clarity, and flexibility while still preserving the integrity of the evaluation when accommodating new decision-making processes in a regulatory environment.

Though a collaborative process with the PEG members and the Stakeholders is what we desire, we know how easily collaboration can reduce operating efficiencies. Our goal in Phase II will be to segregate the technical and policy aspects of the Audit Plan working with TUS staff and other Commission advisors. As we encounter evaluation issues specific to the Pennsylvania programs and address them in a collaborative manner, we will aim to continually improve based upon feedback from all parties involved.

Below is a minimum set of new/revised topics we will cover in the Phase II Audit Plan. Note that the list is not an outline of the Audit Plan. The new version of the Audit Plan will build on the previous product and will retain key areas for consistency and continuity.

- Redefinition of the function, scope and purpose of the Audit Plan
- Evaluation standards, ethics and expertise
- Transparency of the evaluation efforts and results
- Timing of the evaluation planning cycle
- Detailed schedule of TRM and TRC updates and orders
- Mandatory versus discretionary EDC protocols
- Early feedback policy and approach
- Effective useful life of technologies and behaviors
- Discounting, carbon values, avoided cost values, and other key cost-effectiveness metrics
- Cost-effectiveness tests and their formulas and definitions
- Rigor of the evaluation efforts

- Risk mitigation approaches for program- and portfolio-level reliability
- Types of analysis appropriate for evaluation (impact, process, market effects, etc.)
- Approaches to address threats to reliability and uncertainty
- Appropriate approaches for gross and net analysis
- Attribution approaches
- Revised sampling protocols and levels of precision
- SWE audit protocols defined by program/activity type
- Standards and approaches for surveys and interviews
- Logic models and program theories
- Streamlined data requests and approach for collecting utility information
- Incorporation of results into forward program planning and goal-setting
- Communication protocols

SCHEDULE OF DELIVERABLES: Assuming a contract start date of March 15, 2013, the SWE Team will circulate a draft Audit Plan for TUS review by April 30, 2013. Assuming a two-week review period, we will plan to complete the update by May 15, 2013. We anticipate conducting two PEG meetings and one optional Stakeholder meeting (if approved by TUS staff) during the Audit Plan development. If written comments are solicited from the Stakeholders, we anticipate a two-week review period after May 15 to finalize the Audit Plan by May 31, 2013.

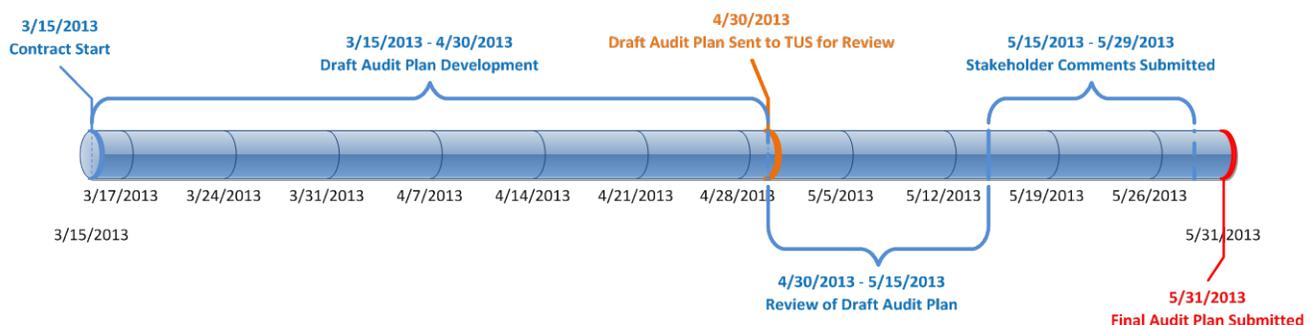


Figure 3-1: Audit Plan Development & Delivery Timeline

DELIVERABLE TASK2: THE GDS TEAM WILL UPDATE AND REVISE THE EXISTING AUDIT PLAN. THE UPDATES PHASE II AUDIT PLAN WILL BE MORE STREAMLINED AND EMPHASIZE THE NEED TO STANDARDIZE PROTOCOLS ACROSS THE COMMONWEALTH. THE AUDIT PLAN WILL BE A LIVING DOCUMENT THAT CAN BE UPDATED OR MODIFIED AS APPROPRIATE.

3.3 Task 3: Auditing and Verification

The GDS Team will audit and verify all aspects of EDCs' programs, including the planning process, implementation, and evaluation. Based on our experience from Phase I, we are fully knowledgeable of all components of the EDC programs and have the ability to conduct all activities to provide the Commission with the necessary assurance that EDC programs are being cost-effectively run to the satisfaction of all stakeholders. The major objectives of the audit and verification, based on the requirements set forth in the RFP, include:

- Overseeing development of EDC plans and verifying compliance with Act 129 legislation and other related Commission orders, such as the Implementation Order, TRM Order, and TRC Order.
- Collecting, recording, maintaining, and parsing EDC program data.
- Overseeing and reviewing evaluation activities, including standardization of evaluation approaches, review of EM&V plans, review of survey tool development, and audit of evaluation results.

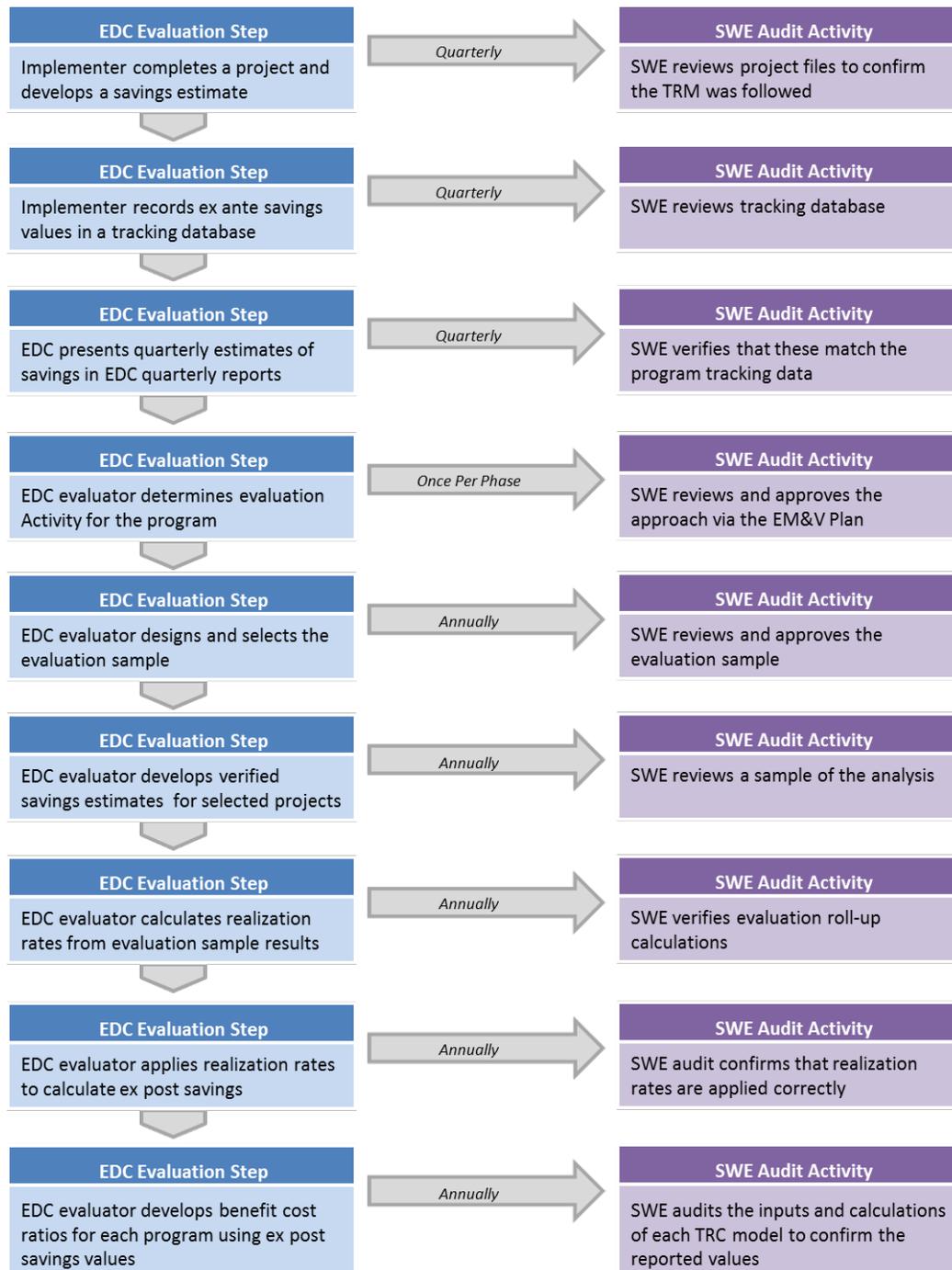
- Verifying proper installation and operation of claimed measures, and appropriateness of savings claims of installed measures through project audits and spot verification inspections.
- Quantifying electricity and non-energy benefits resulting from EDC programs and verifying compliance with Act 129-mandated savings targets.
- Calculating and verifying cost-effectiveness of EDC programs using the Total Resource Cost Test.
- Reporting program data in a meaningful and understandable manner to the Commission.

The activities identified in the RFP are comprehensive and varied in nature, ranging from data collection to data tracking, engineering, statistics, and policy. The GDS Team is fully equipped to tackle all identified tasks and is confident that we can bring expertise and in-depth industry knowledge to any additional tasks that need to be accomplished as the SWE.

Experience as Act 129 Phase I SWE

The GDS Team holds considerable skill and ability to carry out all audit and verification tasks efficiently and effectively, stemming from years of experience completing evaluations across the nation. This is especially true because of the audit activities we completed as the SWE Team for Act 129 Phase I. We have extensive experience and unique familiarity with the EDC programs, structures, and personnel that can be leveraged for further efficiency. During Phase I, the GDS Team developed a systematic approach toward auditing and verifying the EDC programs. We have conducted a careful review of our existing audit and verification processes and have developed the streamlined approach for the Phase II activities shown in Table 3-1 below.

Table 3-1: Summary of Audit Activities



During each step of the process, the GDS Team will ensure that EDC programs are run effectively by providing the Commission with both a high-level summary of EDC progress and detailed spot checks of specific processes. We will conduct verifications at various time intervals and at different stages of the implementation and reporting process to ensure that ratepayer funds were properly used throughout the program cycle. The SWE audit process will also verify that EDCs are using correct kWh and kW savings values from the Pennsylvania TRM.

The GDS Team will report any issues identified during this process and will address them through collaborative communication with the Commission, EDCs, and the EDCs' program evaluators, as

necessary. We will issue guidance memos to memorialize decisions, which will provide clarification to EDC teams to improve both implementation and evaluation practices.

The Audit Process

In this section of the proposal, we outline the specific steps to accomplish all of the audit activities outlined by the RFP. The GDS Team's audit and verification process will build upon the foundation created during Phase I to audit and verify EDC programs, and include improvements based on our past experience. We have grouped all of the activities identified by the RFP into the following eight (8) audit tasks:

1. Planning and Compliance
2. Data Collection and Tracking
3. Savings Review
4. Impact Verification
5. Process & Market Evaluation Review
6. Net-to-Gross and Cost-Effectiveness Review
7. Baseline and Potential Study
8. Interfacing and Coordination

Each task is described below.

AUDIT TASK 1: PLANNING AND COMPLIANCE

This task addresses the following activities identified by the RFP:

- Reviewing the EDCs' plans to determine whether the EDCs are meeting energy savings targets
- Review and monitor the EDCs' EM&V plans and execution
- Auditing the EDC survey instruments
- Reviewing and verifying the EDC evaluators' customer and trade ally satisfaction surveys and reports, in coordination with the EDCs.

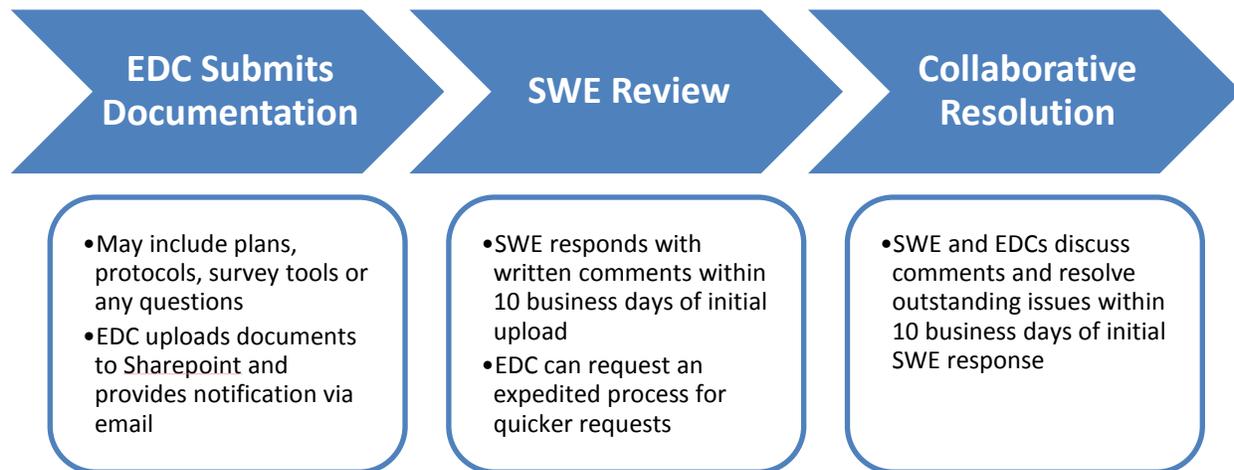
Since there are many parties involved in Act 129, it is critical that rules and regulations are explicitly stated and followed. During Phase I of Act 129, the GDS Team provided feedback to the Commission regarding various planning documentation filed by the EDCs, including EDC program plans, TRC ration calculations, quarterly reports and annual reports. In addition, the GDS Team reviewed and approved evaluation documents submitted by the EDCs, such as EM&V plans, survey instruments, and sampling plans. The GDS Team provided critical feedback and initiated conversations when EDCs were not adhering to agreed-upon protocols to ensure that savings claims were measured and reported accurately.

For Phase II, we will continue to review all EDC program plans to determine compliance with established energy savings targets and EDC EM&V plans and evaluation instruments. To determine compliance with the revised Audit Plan, we also will provide qualitative feedback to the Commission regarding EDC program plans for Phase II, especially with regards to measure and program offerings. We believe that upfront communications with the EDC teams about program implementation, evaluation activities, and reporting will help to pre-emptively resolve issues and mitigate any disputes throughout the program cycle.

As such, we will implement a formal documentation review strategy⁴ to complete all first reviews within two weeks of receiving documentation to ensure that review procedures do not impede progress of activities. We will complete any revisions noted within two additional weeks. In addition, we will track

⁴ Timelines for some documents may vary, due to the comprehensiveness of some submissions. This will be the case for most quarterly and annual reports, which have their own review schedules.

all revisions to documents on the SharePoint (3.5.1 SWE SharePoint site) site to manage version control and verify timeliness of all reviews.



The GDS Team will review a number of EDC documents throughout the entirety of the program cycle. This may include, but is not limited to, the following:

- Program Plans
- EM&V Plans
- Annual Sampling Plans
- Savings Protocols
- Evaluation Instruments
- Impact and Process Evaluation Reports
- Quarterly and Annual Reports⁵

All reviews will be accompanied by written comments and tracked on SharePoint. We also will review project pipeline management information to ensure that EDCs are tracking annual milestones, and we will provide comments to the TUS staff if we notice that one or more EDCs are off-track.

AUDIT TASK 2: DATA COLLECTION AND TRACKING

This task addresses the following activities identified by the RFP:

- Maintaining an evaluation and management database, and
- Acquiring data from EDCs and other sources and verifying data supplied by EDCs.

In Phase I, the GDS Team created a series of audit data requests that EDCs completed on a quarterly and annual basis. This included key data points detailing all projects completed during the previous quarter or year. We compiled this information and used it to generate statewide summaries of key indicators, such as energy (mWh) and demand (mW) savings.

For Phase II, we will fine-tune existing data requests to collect relevant EDC program data on a quarterly and annual basis. The collection of quarterly data will provide assurance to the Commission that EDCs are progressing toward their savings goals at a realistic rate and allow concurrent evaluation that can directly feed into the implementation, thereby immediately improving EDC program delivery. We also will verify that EDCs stay within their program budget limit of 2% of annual 2006 revenues.

⁵⁵ See Footnote 4.

The most important activity in this task is development of the participant database extract for all EDC programs. At a minimum, the database will include:

- All projects, including those that are completed and in progress
- Measure details for each participant
- Incentive amount for each participant
- Reported savings claims for each measure
- Project completion date

The GDS Team will also use a comprehensive audit and verification data collection system, the Nexant Audit Tracking Database, which will allow easy access to and manipulation of all evaluation data. The audit tracking database will focus primarily on collecting and organizing all data collected during on-site visits of projects installed through commercial and industrial energy efficiency programs. The database will also enable the generation of custom reports as requested by any stakeholder. All results from the previous program cycle will be merged into the new system. In addition, the GDS Team will maintain the current Share Point site and public website.

For additional information regarding the Nexant Audit Tracking Database, please see [3.5.3: Audit Tracking Database](#).

AUDIT TASK 3: SAVINGS REVIEW

This task addresses the following activities identified by the RFP:

- Critiquing reported energy and demand savings utilizing field verification, TRM derived savings, approved custom measure derived savings, M&V, and large-scale billing analyses
- Providing reasonable assurance that the installed measures are obtaining the claimed energy savings and demand reductions in accordance with the Commission-approved TRM or other approved methods.

In Phase I, the GDS Team reviewed measure savings assumptions and updated the TRM on an annual basis. The first update consisted of a major expansion of the TRM, adding dozens of new measures. The GDS Team revisited measures each year to ensure that they were in line with current best practices and previous evaluation studies. After measure protocols were established, the GDS Team reviewed evaluation results to ensure that the installed measures were claiming savings according to the TRM and other established protocols.

For Phase II, we will continue to update the TRM on an annual basis and review current assumptions based on the most current information. We will use focused evaluation results from both Phase I and Phase II to provide Pennsylvania-specific assumptions for key values, such as hours of use and equivalent full load hours (EFLH) values. The statewide metering studies will be tied into the audit savings review to drive efficiencies while cutting costs since we will be in the field doing similar activities in both tasks. The GDS Team also will update the Audit Plan to accurately lay out processes for claiming and evaluating savings for deemed and custom measures.

The GDS Team will continue to administer the interim measure protocol process, which is a means for EDCs to introduce new measures into the TRM. This provides an iterative and collaborative review process to vet measures in an orderly and manageable fashion. We also will follow protocols established in prior guidance memos to determine effective dates of interim measure protocols.

For additional information regarding savings protocols and the TRM, please see [Task 4a: Technical Reference Manual](#). For additional information regarding metering studies, please see [Task 6: Logging/Metering Studies](#).

AUDIT TASK 4: IMPACT VERIFICATION

This task addresses the following activities identified by the RFP:

- Provide reasonable assurance that the claimed measures are being properly installed and utilized
- Review and verify EDCs' performance by having trained GDS Team personnel accompany EDC evaluators on spot field inspections, in coordination with EDC and Commission staff
- Conduct random spot verification coordinated with the EDCs' independent evaluator of EDC EM&V measurements and data
- Spot verify, in coordination with EDCs' and Commission staff, utilizing the GDS Team's short-term and long-term metering equipment on participating customers' property
- Analyzing verification data collected by the EDCs' program evaluators.

The impact verification tasks are a critical piece of the audit process through which the Commission is able to observe and understand the EDC program evaluations. In Phase I, the GDS Team performed audit activities for each program run by the EDCs to oversee evaluation activities conducted by the EDC evaluators. Each year, we conducted quarterly database and documentation reviews for a sample of projects to provide reasonable assurance that claimed measures were being tracked appropriately. Our team also reviewed and verified data and regression equations developed for the impact evaluations of residential low income and conservation voltage reduction programs.

For Phase II, we will improve current practices by streamlining and customizing impact verification activities for each EDC program. For programs that have been established and running for some time and where we have already verified analytical approaches, the requirements for audit may be lessened at little risk due to the confidence in savings estimates generated by the evaluators. For new programs and programs where it has been difficult to identify savings, the GDS Team will increase rigor accordingly. The GDS Team has developed a level of reliance on the EDC evaluators which will likely enable a reduction in time and money invested in the audit activities. Our experience as the Phase I SWE provides significant continuity and reliability value to the PUC. Major activities will include:

- Database review
- Desk audit and project file review
- Review of regression equations for residential low income and conservations voltage reduction programs
- On-site inspections with EDC evaluators (ride-along inspections)
- On-site inspections without EDC evaluators (independent inspections)
- Review of TRC calculations

For the residential sector, the GDS Team will pull a random sample of participants for each program each quarter and review project files. In addition, we will review the database for consistency with project files and consistency between reporting periods (quarters). For the low-income sector, we will conduct site inspections to verify that measures were actually installed, installed properly and review project documentation. Our Team will also verify that EDCs are using correct values from the Pennsylvania TRM in their calculations of measure and program savings.

For the nonresidential sector, the GDS Team will select a random sample of projects and conduct two types of site inspections – ride-along inspections and independent inspections. This combination will provide a window into the effectiveness and reliability of the EDC evaluator's activities.

Ride-along inspections will consist of random spot verification coordinated with the EDC evaluator. The goal of these inspections will be to verify that claimed measures are properly installed and utilized, and to verify that the EDC evaluator is conducting evaluation activities effectively and reliably. Independent inspections will consist of site inspections not selected by the EDC evaluator, to observe if evaluation visits are biasing on-site results from a quantitative and qualitative perspective. At the end of each

program year, we will review all verification data collected by the EDC evaluators to ensure that ex post savings values and realization rates are being calculated properly. Results will be used to identify potential updates to savings protocols.

Audit Activity Checklist

In Phase I, the GDS Team saw the need for a systematic approach to SWE auditing activities that was congruent across the Commonwealth but also specific to each EDC's programs. To meet this need, the SWE developed "Audit Activity Checklists" for each of the Energy Efficiency Programs offered by the EDCs. The checklists were developed by evaluation professionals and provide a concise overview of specific audit activities that would take place for each program. Based on the EDC EE&C Plans and the expertise of SWE Team members, the checklists denote items such as whether savings for the program are deemed or custom, what measures are included in the program, and what steps the SWE planned to take to audit the program. An example of an Audit Activities Checklist for an Appliance Removal Program is in Appendix E. These checklists provide the SWE team and the TUS staff a complete roadmap for all audit activities that will be conducted.

The GDS Team believes that improvements made to the checklists in Phase II would help make the checklist an even more useful tool. While there have not been many systematic changes in the EDC programs since their inception in Phase I, the SWE has gained invaluable hands-on experience auditing these programs. The SWE will leverage the experience of the program leads and evaluators to create more comprehensive checklists.

Sampling Approach for Inspections

Since on-site activities will make up a significant portion of our audit activities, we have developed initial criteria for conducting inspections. Because of the importance of this task, the GDS Team will work closely with the EDCs to ensure that site inspections are carefully planned and executed and that site inspectors have the appropriate experience and training. It would be unreasonable for the GDS Team to perform site inspections at the same statistical level as those conducted by the EDCs (i.e., 90/10 at the sector level and 85/15 at the program level), as this could be perceived as replicating the work already completed by the EDCs' evaluators. However, spot checking the evaluators' work is essential and cannot be compromised. In the commercial and industrial sectors, the GDS Team will perform a combination of ride-along and independent site inspections for a sample of projects for programs where the savings contribution to the overall portfolio warrants the additional level of rigor. In the residential sector, the GDS team will continue to conduct on-site inspections for participants in low income programs where necessary.

The GDS Team proposes conducting inspections according to the following guidelines:

- Inspections will be conducted for the following programs
 - Programs for which EDC evaluators conduct site inspections
 - Programs with populations that are positively skewed (i.e., a relatively small percentage of projects make up a large percentage of program savings)
 - EDC residential low income programs where EDCs do not have a comprehensive on-site inspection program already in place.
 - Programs with custom measures (and therefore uncertain savings)
- Inspections for the C&I sectors will be conducted at the following statistical level
 - Inspections will target 90/10 at the statewide level for each sector
 - Inspections will be allocated to each EDC by savings contribution
 - Inspections will be allocated to each program by savings contribution

Value of Information Approach for C&I Site Inspections

Site inspections are essential for accurate evaluation of programs and will represent a significant portion of the EDCs' EM&V efforts. In its role as SWE in Phase I, the GDS Team conducted the following types of site inspections:

- **Joint Impact Evaluations:** The SWE performed "ride-along inspections," during which an SWE auditor accompanied the EDC evaluator conducting on-site inspections to assess performance of the evaluation activities. The EDC evaluator and the SWE jointly conducted EM&V activities on a subset of the EDC evaluation sample with a focus on high-impact projects. The site-specific savings were then adjusted based on the findings and recommendations of the SWE.
- **Independent Evaluation:** The SWE performed "independent site inspections," in which the SWE selected a high-impact project to verify savings estimates and minimize bias that would influence the EDC evaluator's results. The SWE submitted independent site inspection reports to the EDCs that contained observations on the performance of the measure and a savings estimate by the SWE auditor for comparison to the claimed or reported savings.

The GDS Team found that the interaction between the SWE auditor and the EDC evaluator that took place on ride-along inspections often would be very constructive. SWE suggestions and corrective actions could be immediately incorporated by the EDC evaluator. Similarly, any questions that the SWE auditor had for the EDC evaluator could be answered quickly and efficiently. By contrast, the EDCs and their evaluators rarely would comment on findings contained in SWE independent site inspection reports, thereby reducing the opportunity for constructive interaction with the SWE.

In Phase I, the SWE established the principle of Value of Information (VOI), which recognizes that the cost incurred to obtain information should be balanced against the value of the information received. When this principle is applied to independent site visits, the SWE concludes that they are less valuable than ride-along inspections but are just as costly to undertake. Therefore in Phase II, the SWE proposes to reduce the number and the associated costs of independent site visits.

For more information regarding the program-specific verification activities, please see [Table 3-2: Audit Approach by Program](#).

AUDIT TASK 5: PROCESS & MARKET EVALUATION REVIEW

The Process Evaluation Protocol developed in Phase I by the GDS Team provides the Commission and other stakeholders the assurance that there is a minimum set of standards for process evaluations across the EDC portfolios, allowing the necessary flexibility and control for program administration and process evaluation management. The results of the EDC process evaluations will help to:

- Highlight areas for improvement;
- Identify when program approaches should be changed; and
- Identify best practices that can be implemented on a going-forward basis.

The Phase I Evaluation Framework states that each process evaluation should have a program-specific or program-group-specific detailed process evaluation plan to guide the evaluation efforts. These detailed plans should include the process evaluation approach, identification of program-specific, or program-group-specific focus of the evaluation efforts, detailed researchable issues to be addressed, activity timing issues, and the resources to be used. We will apply this assessment to both process and market evaluation activities, as market activities often are part of process evaluations.

During Phase II, the SWE Team will play an important role in process evaluation tasks. **Research Into Action** consultants serving on the SWE Team will undertake the following process evaluation tasks:

- Verify that EDC evaluation teams prepare robust process and market evaluation plans and then follow the approved plans

- Review and critique process and market evaluation plans, draft survey instruments, and sampling plans before a process evaluation is conducted
- Review all process and market evaluation reports to understand EDC evaluator findings
- Review EDC evaluator recommendations for program changes and modifications
- Review EDC evaluator recommendations for working with the market and increasing market engagement with energy programs
- Conduct follow-up research with EDCs to ensure that EDCs act upon process and market evaluation findings and recommendations in a timely manner
- Prepare recommendations for inclusion in SWE quarterly and annual reports regarding modifications that should be made to the design or operation of implemented programs
- Conduct best practices workshops on process and market evaluation methods, sampling approaches, and best practices for the design of interview and survey instruments
- On an as needed basis, refine the Evaluation Framework to clarify and improve process and market evaluation requirements for EDCs.

We will review the EDCs' process evaluations to ensure that they are meeting the Framework goals in terms of several factors:

Scheduling and Timing of Process Evaluations

Most programs do not need a process evaluation for every year of their implementation cycle. As stated earlier, new programs or programs that have been changed recently may benefit from an EDC evaluator conducted process evaluation in the year after initiation and should involve the program evaluation staff early in the design process. Questions to explore include:

- Are the evaluations providing feedback into the program design phase so program design processes can be improved?
- Are the evaluations occurring early enough in the program process to provide feedback to improve implementation?
- Are they providing feedback after the program changes occur to ensure the changes are improving implementation?
- Are the largest volume programs getting regular process evaluations and the smaller programs with potential to improve getting evaluation support?

Completeness and Appropriateness of Process Evaluation Research Objectives

We will review the research objectives of the EDC evaluator conducted process and market evaluation and ensure they address key issues, including:

PROGRAM DESIGN

- Program design, design characteristics, and design process
- Program mission, vision and goal setting, and its process
- Assessment or development of program and market operations theories and supportive logic models, theory assumptions and key theory relationships - especially their causal relationships
- Use of new practices or best practices

PROGRAM ADMINISTRATION

- Program oversight and improvement process
- Program staffing allocation and requirements
- Management and staff skill and training needs
- Program information and information support systems
- Reporting, and the relationship between effective tracking and management, including both operational and financial management

PROGRAM IMPLEMENTATION AND DELIVERY

- Description and assessment of the program implementation and delivery process
- Clarity and effectiveness of internal staff communications
- Quality control methods and operational issues
- Program management and management's operational practices
- Program delivery systems, components, and implementation practices
- Program targeting, marketing, and outreach efforts
- Level of financial incentives for program participants
- Program goal attainment and goal-associated implementation processes and results
- Program timing, timelines, and time-sensitive accomplishments
- Quality control procedures and processes

CUSTOMER AND TRADE ALLY RESPONSE

- Customer interaction and satisfaction (both overall satisfaction and satisfaction with key program components and including satisfaction with key customer-product-provider relationships and support services)
- Customer or participant energy efficiency or load reduction needs and the ability of the program to meet those needs
- Market allies interaction and satisfaction
- Market allies practices relative to efficiency and DR products and services, with and without the programs
- Low participation rates or associated energy savings
- Market allies' needs and the ability of the program to provide for those needs
- Reasons for excessive free-riders or low market effects, free-drivers or spillover

Completeness of Data Collection Activities

EDC evaluator conducted process and market evaluations can include a wide range of data collection efforts. However, the sample sizes and the methods used for the data collection should be developed consistent with the research objectives.

EDC EVALUATOR INTERVIEWS WITH PROGRAM MANAGEMENT, ADMINISTRATORS, AND IMPLEMENTERS

Program management and staff can be a valuable source of information, as they typically know the program best. Interviews with lead program planners and managers, their supervisors, and a sample of program staff, including both central staff and field staff, can help the evaluator assess the program design and operations in order to recommend changes that will improve the ability of the program to cost-effectively obtain energy savings.

Subjects important for EDC evaluators to cover across different personnel include: communications within the program, communications with customers, and communications with stakeholders. In addition, the EDC evaluator interviews can obtain impressions of the program's strengths and weaknesses and perceptions of the program's successes and the quality of work that can be compared and contrasted with those perceptions from stakeholders and participants. These interviews provide an opportunity to gather recommendations for program improvements from the interviewed personnel.

EDC EVALUATOR INTERVIEWS, SURVEYS, OR FOCUS GROUPS WITH CUSTOMER AND TRADE ALLY PARTICIPANTS AND NONPARTICIPANTS

One purpose of virtually all process evaluations is to understand the experience of the customers participating in the program, in order to design program improvements based on those experiences. Program participants have valuable perspectives regarding which aspects of the program work well and any aspects that represent barriers to participation or satisfaction. Detailed feedback from participants

also is important for determining whether the customer's perceptions of specific program attributes and delivery procedures conflict or mesh with program design and management perceptions. Beneficial detailed feedback can include levels of satisfaction with the program and the customer's participation experience and satisfaction with various elements of the program, including; satisfaction with the product(s), the organization, scheduling, educational services, quality of work performed, attitude of site staff, responsiveness to questions/concerns, level of savings achieved, etc.

AUDIT TASK 6: NET-TO-GROSS & COST-EFFECTIVENESS REVIEW

In Phase II, the GDS Team will verify that the Net-to-Gross (NTG) methodology used by each EDC is appropriate. Our Team will conduct the following activities identified by the RFP:

- Coordinate the development of, and approve the methodologies for, NTG studies to be performed by EDCs
- Verify reported cost-effectiveness of EDC plans using the Commission-adopted TRC.

In Phase I, the GDS Team studied available NTG methodologies and completed a white paper on our research to the Commission. Our team has extensive experience conducting NTG research in other jurisdictions. We will draw on that knowledge and experience as we work closely with EDCs to verify that NTG methodologies are appropriate for their respective programs. Methodologies to consider include:

- **Customer adoption or technology diffusion models:** Applied to specific markets, and using various market sales and shipping data
- **Stipulated NTG ratios:** Based on historic studies of similar programs
- **Self-report surveys:** With information reported by program participants and nonparticipants
- **Enhanced self-report surveys:** Where self-report surveys are augmented with third party interviews (e.g., supply-side market actors) and documentation review and analysis
- **Econometric models:** In conjunction with billing analyses to estimate gross energy savings, these models use participant and nonparticipant data and statistical methods to address complicating bias factors.
- **Multi-state models:** Where statistical models are constructed to compare adoption rates of certain technologies between regions with utility programs and regions without (quasi experimental design)
- **Delphi methods:** Where researchers collect judgmental estimates from a panel of experts and develop a consensus or central range estimates. This approach typically is used only if more objective methods are not available.

The GDS Team is in the process of verifying the cost-effectiveness of EDC EE&C Plans for Phase II (we are reviewing the EDCs Total Resource Cost Test calculations) Our team has experience with other cost-effectiveness tests, such as the Participant Test, RIM test, Societal Test and Program Administrator Test, which can be used to identify cost-effectiveness from other perspectives. In addition, we have developed a Pennsylvania specific incremental cost database that will be used to standardize costs for energy efficiency measures across all EDCs. The GDS Team also has great familiarity with the TRC Orders and discussions surrounding cost-effectiveness.

For more information regarding our cost-effectiveness tasks, please see [Task 4b: TRC Order Updating](#).

AUDIT TASK 7: BASELINE STUDY

This task addresses conducting limited market baseline studies to establish baselines as needed for the impact evaluations of specific programs, as identified by the RFP.

In Phase I, the GDS Team conducted a residential and nonresidential baseline study and Market Potential Study for Act 129 Phase I. This included site inspections and on-site surveys of homes and

businesses to collect information regarding existing equipment and energy consumption characteristics across the Commonwealth.

For Phase II, the GDS Team will conduct targeted baseline studies to assist with the impact evaluation of EDC programs. The Phase II baseline studies will investigate approximately 500 data points in each market segment (residential sector and commercial/industrial sector) and will provide granular information in important market sub-segments (food, retail, low income, multifamily etc.). It is important to note that the GDS Team has the unmatched ability to merge the data collected in the Phase II baseline study with the Phase I baseline study efficiently since we will be working with our own systems and databases.

For additional information regarding baseline studies, please see [Task 7: Energy Efficiency Baseline Studies](#).

AUDIT TASK 8: INTERFACING AND COORDINATION

This task addresses the interfacing and coordinating with Commission staff and EDCs, as identified by the RFP.

Although communication is neither a physical task nor a deliverable, the GDS Team views interfacing and coordinating with Commission staff and EDC evaluators as critical and valuable. During our tenure as the Phase I SWE, the GDS Team established weekly meetings with the Commission TUS staff to provide updates, assign work, and discuss evaluation-related issues. In addition, we communicated with each EDC through bi-weekly teleconferences to discuss any issues, from evaluation plans to savings estimation techniques to reporting of program results. Monthly program evaluation groups meetings chaired by the Commission staff and GDS Team resolved large-scale technical issues.

For Phase II, the GDS Team will continue to cultivate cooperative and collective collaboration environment with the Commission and EDCs through bi-weekly meetings and monthly program evaluation group meetings. In addition, we will meet in person with each EDC at least once each year to review progress and address EDC-specific issues. We will ensure that our meeting agendas are well defined and that only the primary SWE speakers will attend telephone conferences and in-person meetings.

Audit Approach by Program

This section presents the technical approach the GDS Team will use to audit each program type. The approach generally will be common across the state, although we will modify some activities for unique programs.

Each program will receive a standard audit, which includes:

- **Database review** – a comprehensive review of the implementer database to confirm that summary data reported in quarterly and annual reports match database values and other project data provided by program contractors. For example, we will verify whether data collected by program contractors to EDCs matches data recorded in EDC tracking databases.. Any errors or inconsistencies will be identified and brought to the attention of EDCs immediately for corrective action.
- **Desk audit** – a review of project files, including project application, incentive agreement, project invoices, equipment receipts, equipment specifications, and other measure-related documentation. A major purpose of this audit is to ensure that project files exist to support equipment purchase and installation records and to support claimed kWh and kW savings at the measure level.
- **Evaluation audit** – a review of evaluation reports completed by the evaluator. This may include a review of survey instruments, inspection plans, data files, logged data, regression analyses, metering data and electricity savings calculations.

In addition to the standard audit, [Table 3-2: Audit Approach by Program](#)

provides a preliminary and high-level example summary of the data collection and analysis methods envisioned for the engineering review by program.

Table 3-2: Audit Approach by Program

PROGRAM TYPE	MEASURES / HIGHLIGHTS	ANTICIPATED EVALUATION ACTIVITIES	PROPOSED AUDIT ACTIVITIES
Residential Equipment & Appliance Program	<ul style="list-style-type: none"> Residential Air Conditioner & Heat Pump Rebates Central Air Conditioning Retrofits High Efficiency Water Heaters, Programmable Thermostats ENERGY STAR Lighting, Appliances ENERGY STAR Windows 	<ul style="list-style-type: none"> Verify installation, conduct audits Conduct metering activities (install hourly meter, collect billing data) Collect nameplate info (type, efficiency, rating, size etc.) Conduct RESFEN, DOE2 simulations Collect data (house type, CAC/Furnace/Heater/AC model and efficiency (EER, COP, AFUE, R-value) Collect Manual J Sizing Data Perform engineering calculations to calculate savings Reconcile program database and invoices 	<ul style="list-style-type: none"> Reconcile program database and sample of invoices Verify methods and results of metering activities Perform engineering calculations to verify savings Review and verify model simulation savings estimates
Residential Upstream Lighting Program	<ul style="list-style-type: none"> CFL Giveaways CFL Retail Discount LED Lighting 	<ul style="list-style-type: none"> Survey participants to verify installation Conduct measure-by-measure evaluation of installation, energy savings calculation, reporting Conduct light logger studies to collect data on hours of use of CFL and LED bulbs 	<ul style="list-style-type: none"> Review survey results Verify installation-rate results, energy savings calculations and reporting Reconcile program database and sample of invoices
Residential Appliance Retirement Program	<ul style="list-style-type: none"> Refrigerator and Freezer Recycling Room Air Conditioner Retirement 	<ul style="list-style-type: none"> Conduct telephone surveys to verify removal, determine part-use factors, etc. Calculate regression-based econometric savings estimates 	<ul style="list-style-type: none"> Review and verify survey results and energy savings calculations Verify inputs and outputs of regression-based savings calculation

PROGRAM TYPE	MEASURES / HIGHLIGHTS	ANTICIPATED EVALUATION ACTIVITIES	PROPOSED AUDIT ACTIVITIES
<p>Residential New Construction Program</p>	<ul style="list-style-type: none"> • High Efficiency Heating/Cooling • Higher Insulation Levels • High Performance Windows • Reduced Air Infiltration • House-as-a-System Concept • Contractor Certified Homes • <85 Points HERS Rating • ENERGY STAR Lighting, Appliances • High Efficiency Water Heaters 	<ul style="list-style-type: none"> • Conduct telephone surveys to help gather data to feed engineering analysis • Conduct on-site visits to help conduct testing and metering • Conduct blower door/duct blaster tests • Collect nameplate info (type, efficiency, rating, size, etc.) • Conduct metering activities (install hourly meter, collect billing data) • Calculate HERS rating using (REM/Rate Software or other applicable home energy rating software) • Deploy loggers (lighting, TOU, kW short term metering) • Conduct RESFEN, DOE2 simulations 	<ul style="list-style-type: none"> • Conduct REM/Rate Software or other applicable home energy rating software model review, including check for reasonableness of results • Review on-site pictures and documentation • Review results from metering, logging, and testing performed by EDC evaluators • Perform site visits, if warranted
<p>Home Energy Audits Program</p>	<ul style="list-style-type: none"> • Education • Walk-through audits • Energy efficiency kits • CFLs • LED Lighting • Furnace Whistles • Low-Cost Water Heating Measures • Smart Power Strips 	<ul style="list-style-type: none"> • Conduct customer surveys to capture in-service rates, persistence, and changes to occupancy or home size that affect energy use • Conduct site visits • Reconcile program database and invoices • Perform energy savings calculations • Analyze billing data 	<ul style="list-style-type: none"> • Review survey and site visit results • Verify that in-service rates and other adjustments from TRM deemed values are consistent with survey results • Reconcile program database and a sample program of invoices • Verify energy savings calculations and billing analysis results

PROGRAM TYPE	MEASURES / HIGHLIGHTS	ANTICIPATED EVALUATION ACTIVITIES	PROPOSED AUDIT ACTIVITIES
<p>Low-Income Residential Program</p>	<ul style="list-style-type: none"> • Residential Air Conditioner & Heat Pump Rebates • Low Income Housing Retrofits (Appliances, Air Sealing/CFLs etc.) • Central Air Conditioning Retrofits • Water Heaters, Thermostats • Low Flow Showerheads and Faucet Aerators • LED Night Lights • Appliance Recycling 	<ul style="list-style-type: none"> • Verify installation, conduct audits • Conduct metering activities (install hourly meter, collect billing data) • Collect nameplate info (type, efficiency, rating, size etc.) • Conduct RESFEN, DOE2 simulations • Collect data (house type, CAC/Furnace/Heater/AC model and efficiency (EER, COP, AFUE, R-value)) • Collect Manual J Sizing Data • Perform engineering calculations and billing regression analyses to calculate savings 	<ul style="list-style-type: none"> • Conduct site visits to verify measure installations as well as space heating fuel and domestic hot water heating fuel for weatherization projects • Review survey data to ensure consistency with reported in-service rates and other adjustment factors • Reconcile program database and contractor invoices • Verify energy savings calculations • Review and verify engineering calculations and billing regression analyses
<p>C&I Prescriptive Program</p>	<ul style="list-style-type: none"> • Pre-qualified measures and incentive based on performance • High Efficiency HVAC, Lighting, EMS Systems, Refrigeration Equipment 	<ul style="list-style-type: none"> • Conduct on-site inspections • Review project records/site audits/retro commissioning study • Obtain list of installed measures for visual inspection, review ESCO submittals • Develop site inspection plan, conduct site inspection: obtain nameplate equipment information (model, efficiency, etc.), conduct deemed savings review • Obtain energy savings calculation input parameters • Calculate savings (engineering approach/billing analysis/DOE2 simulations) 	<ul style="list-style-type: none"> • Reconcile program database and sample of invoices • Verify methods and results of metering activities • Perform engineering calculations to verify savings • Review and verify model simulation savings estimates • Review site inspection and EM&V plans • Review logger and metered data • Conduct ride-along and independent site inspections

PROGRAM TYPE	MEASURES / HIGHLIGHTS	ANTICIPATED EVALUATION ACTIVITIES	PROPOSED AUDIT ACTIVITIES
<p>C&I Custom Program</p>	<ul style="list-style-type: none"> • Unique Measures, Performance-based Incentives • Process, Complex HVAC, Industrial Applications, Large Lighting Installations 	<ul style="list-style-type: none"> • Conduct on-site inspections • Conduct on-site metering and logging of end-use energy consumption parameters (kW, amperage, temperature, pressure, etc.) • Review project records/site audits/retro commissioning study • Obtain list of installed measures for visual inspection, review ESCO submittals • Develop metering plan/review existing metering records • Develop site inspection plan, conduct site inspection: obtain nameplate equipment information (model, efficiency, etc.), conduct deemed savings review • Deploy metering equipment (if required) • Obtain energy savings calculation input parameters • Calculate savings (engineering approach/billing analysis/DOE2 simulations) 	<ul style="list-style-type: none"> • Reconcile program database and sample of invoices • Verify methods and results of metering activities • Perform engineering calculations to verify savings • Review and verify model simulation savings estimates • Review site inspection and EM&V plans • Review logger and metered data • Conduct ride-along and independent site inspections • Perform independent M&V (if required)

PROGRAM TYPE	MEASURES / HIGHLIGHTS	ANTICIPATED EVALUATION ACTIVITIES	PROPOSED AUDIT ACTIVITIES
C&I New Construction Program	<ul style="list-style-type: none"> • Buildings operating at efficiency levels greater than state energy codes • Conceptual design based approach for the entire building, performance based incentives 	<ul style="list-style-type: none"> • Conduct on-site inspections • Review project records/site audits • Obtain list of installed measures for visual inspection • Develop metering plan/review existing metering records • Develop site inspection plan, conduct site inspection: obtain nameplate equipment information (model, efficiency, etc.), conduct deemed savings review • Obtain energy savings calculation input parameters • Check compliance with code and calculate savings compared to energy code as the baseline • Calculate savings (engineering approach/billing analysis/DOE2 simulations) 	<ul style="list-style-type: none"> • Reconcile program database and sample of invoices • Verify methods and results of metering activities • Review and verify model simulation savings estimates
Government and Non-Profit Program	<ul style="list-style-type: none"> • Prescriptive and custom measures • Measures typically identical to those offered by C&I programs, with different incentive structures and/or eligibility requirements 	<ul style="list-style-type: none"> • See C&I prescriptive and custom programs. 	<ul style="list-style-type: none"> • See C&I prescriptive and custom programs.
Conservation Voltage Reduction	<ul style="list-style-type: none"> • Reduction of system voltage at the distribution level 	<ul style="list-style-type: none"> • Development of CVR regression equations by EDCs 	<ul style="list-style-type: none"> • Verification of regression equations developed by EDCs

PROGRAM TYPE	MEASURES / HIGHLIGHTS	ANTICIPATED EVALUATION ACTIVITIES	PROPOSED AUDIT ACTIVITIES
Behavioral and Education Programs	<ul style="list-style-type: none">• Activities undertaken by customers to reduce electricity use (installation of motion sensors, turning back thermostats, turning out lights when not needed, etc.)	<ul style="list-style-type: none">• Conduct surveys and statistical billing analysis	<ul style="list-style-type: none">• Review of surveys and statistical billing analyses

Quality Control and Quality Assurance of Audit Activities

The audit of EDC EM&V activities will include any audit activities required to assess the quality control, accuracy and uncertainty of EDC EM&V activities and evaluations. The audit will focus on customers, measures, projects and programs that exhibit the greatest demand and energy savings impacts. We will determine verified impacts through a combination of desk audits, engineering analyses and site inspections for a random sample of program participants. For C&I projects, we will conduct desk reviews in preparation for the site visits and will complete them when the site visit is complete. Site inspections are essential to the accurate evaluation of programs and will represent a significant portion of the EDCs' EM&V efforts. Because of the importance of this task, the GDS Team will follow two steps for C&I site inspection audit activities to evaluate the credibility and accuracy of the EDC-verified results:

- 1) Conducting on-site inspections and writing site inspection reports; and
- 2) Conducting internal quality assurance or quality control (QA/QC) peer review process.

First, the GDS Team may randomly accompany EDC evaluators in the field for site inspections, as well as conduct independent audits. We describe the key aspects of the ride-along and independent inspections in [Sampling Approach for Inspections](#). We will ensure that the EDC evaluator's methodology and calculations used to estimate verified savings is in accordance with the TRM and that the EDCs have implemented the M&V protocol as outlined in the Audit Plan. We do not plan to conduct ride-along inspections for residential programs.

In addition to conducting site inspections, we will develop C&I site inspection reports at the project level which will focus on the verified gross impacts identified by the EDC evaluators as well as the process findings related to program delivery. A review and critique of the EDCs' evaluator's site findings, methodology, and calculations used to determine verified energy and demand savings and SWE findings and recommendations for each site inspection will be discussed in the reports. Ride-along C&I site inspection reports will be written for ride-along inspections and likewise, independent site inspection reports will be written for independent inspections. The C&I site inspection reports will clearly describe: the project details; inspection performed by the evaluator, including gathered information; evaluator's analysis, including any discrepancies or issues; SWE adjustments to evaluator's savings calculations; summary of application, reported, evaluator-verified and SWE-audited savings and realization rates; and recommendations for EDC evaluator and implementer. Each C&I site inspection report also will include any relevant supporting documentation. This approach will ensure that the SWE results are reported transparently and will allow the EDCs and their evaluators to review, comment on and amend the reports as needed.

We will establish an additional layer of internal QA/QC peer review process by having another SWE Team member examine both the EDC evaluator's and SWE's analysis and findings presented in the site-inspection report. This will increase the level of confidence in the SWE-audited results when they are submitted to the Commission and stakeholders (when appropriate).

Through this process – C&I on-site inspections and QA/QC peer-reviews -- the GDS Team is committed to working collaboratively with the EDCs and the EDC evaluators to audit and verify the accuracy of verified savings and realization rates. Our Team will also provide information to the TUS staff and Commissioners to examine differences in mWh and MW savings across EDCs.

DELIVERABLES TASK 3: THE GDS TEAM WILL AUDIT AND VERIFY ALL ASPECTS OF EDCS' PROGRAMS, INCLUDING THE PLANNING PROCESS, IMPLEMENTATION, AND EVALUATION. THE GDS TEAM WILL REPORT ANY ISSUES IDENTIFIED DURING THIS PROCESS AND WILL ADDRESS THEM THROUGH COLLABORATIVE COMMUNICATION WITH THE COMMISSION, EDCS, AND THE EDCS' PROGRAM EVALUATORS, AS NECESSARY.

3.4 Task 4a: Technical Reference Manual

During Phase I, the GDS Team led the development and update of the Pennsylvania Technical Reference Manual (TRM). The GDS Team was able to expand the original 2009 PA TRM by adding over 60 new measures while increasing the overall professional quality of the TRM. We refined measure assumptions to reflect the latest technical information available, focusing on the residential lighting, residential appliance recycling, commercial and industrial lighting, and commercial and industrial HVAC protocols. These measures represented a significant share of the EDC programs' savings in Act 129 Phase I.

Having served as the SWE in Phase I, the GDS Team thoroughly understands the history of each measure, and will ensure that further development of protocols will reflect accurate energy and demand savings values.

The GDS Team has valuable experience developing and maintaining TRMs in many other jurisdictions, and has demonstrated the ability to coordinate and participate in the annual update of the Pennsylvania TRM. In particular, we updated the calculation of savings for standard energy efficiency measures to ensure that the TRM accurately captures EE&C program measure savings. The GDS Team will recommend any changes to the TRM needed to ensure that the TRM meets the Commission's policy objectives regarding an up-to-date TRM.

The GDS Team will work with the Commission, EDCs and their evaluators, and other stakeholders through a collaborative process to provide guidance on revising the document. Our work will: 1) improve existing protocols based on primary research from metering studies, Act 129 program data from EM&V activities, secondary research sources, as well as changes in technology and/or government/industry standards and building codes; and 2) update TRM formatting to ensure consistency and ease of use.

Having served as the SWE in Phase I, the GDS Team thoroughly understands the history of each measure, and will ensure that further development of protocols will reflect accurate energy and demand savings values.

3.4.1 Structure and Form of the TRM

In Phase I, the GDS Team led the development, refinement, and maintenance of the TRM and implemented significant improvements to the previous TRM editions. The revisions were made in conjunction with TUS staff and consistent with the Commission's Formal Order process in Phase I. In Phase I, we have developed five editions of the TRM since the inception of the Act 129 EE&C program in 2009.

Act 129 categorized all measures and/or programs into three main categories:

1. Deemed Measures
2. Partially Deemed Measures
3. Custom Measures

Deemed measures are defined as measures which require no additional measurement to determine savings. Only verification of installation must be conducted in order to effectively estimate the realization rate of these measures. **Partially deemed measures** include both stipulated and open variables, thereby requiring the verification of installation and the measurement of certain variables in order to define and evaluate the energy and peak demand savings. Lastly, **custom measures** are complex measures requiring metering, modeling, or billing analysis to determine impacts and are outside the scope of the TRM altogether.

Any measure not included in the current version of the TRM is classified into one of two categories: **interim measures**, which are potential standard measures, which can be incorporated into future versions of the TRM; and **custom measures**. Interim measures are addressed by the interim measure

protocol (IMP) process and the second category by the custom measure protocol (CMP) process. IMPs exist primarily to allow EDCs to claim savings for measures that do not have TRM protocols, and also to approve alternative measurement methodologies where the TRM is insufficient. The GDS Team has worked with the EDCs and their evaluators to develop IMPs for new measures the EDCs offered. For custom measures, we collaborate with the EDCs to define general guidelines for savings protocols that have the potential to capture significant savings. The GDS Team holds periodic meetings with the EDCs, their evaluators, and the Commission to review, clarify, improve and add new savings protocols to the TRM, and also to define guidelines for acceptable measurement protocols for custom measures in order to mitigate risks to the EDCs.

3.4.2 TRM Update Activities

The GDS Team will conduct a review of all measure attributes and parameters in the TRM for Phase II updates to identify data gaps in source documentation, savings assumptions, cost effectiveness assumptions, savings estimation equations and protocols. We also will assess the uncertainty of measure parameters and their assumptions. We will determine which measure attributes and parameters will benefit from additional study and prioritize them based on their relative contribution to energy efficiency savings and the level of uncertainty in the assumptions. Additionally, we will supplement findings from this research with surveys conducted with each EDC. We will update the protocols using the EDC’s impact evaluation studies, SWE metering studies, and latest available secondary information to ensure that savings methodologies will stay current and relevant.

Based on our experience in Phase I, we determined that the high-priority measures of the EDCs’ current and projected savings include lighting for the residential and commercial sectors, and HVAC and motors and variable frequency drives (VFD) measures for the C&I sectors. We anticipate these measures will continue to deliver the bulk of Phase II savings, based on the Market Potential Study we completed in Phase I. We will update the key assumptions for these measures in future versions of the TRM. Table 3-3 provides a summary of these measures.

Table 3-3: High-Priority Measure-Specific Updates for Phase II TRM

High-Priority Measure	Update Activity
Residential Lighting	Residential lighting programs alone achieved over 50% of residential sector savings for the EDCs during Phase I. The protocol for calculating savings is relatively simple, but is dependent on a few key assumptions. One assumption that requires review is the average daily hours-of-use value for CFLs. Although many studies have been done in different regions of the US at different times, there has not been a Pennsylvania-specific residential lighting logging study that is directly applicable to Act 129 programs, resulting in much contention across EDCs. This protocol will be updated with Pennsylvania-specific values once they are measured.
Residential Appliance Recycling	Appliance recycling accounts for approximately 10% of residential-sector savings across all EDCs for Phase I. The protocol relies on default ENERGY STAR values. However, studies have been conducted that are able to factor in the exact mix of vintages and types of refrigerators and freezers that have been recycled. We will investigate these studies and update the protocol using the best available information.
C&I Lighting	Similar to the residential sector, lighting makes up a significant portion of the C&I-sector savings and likewise is driven largely by hours-of-use values. The legacy values in the current TRM are from other jurisdictions and do not

	accurately reflect Pennsylvania characteristics. In order to update these hours-of-use values, we will conduct a C&I light logger study to discern the proper hours of use values for several critical building types. This will enable EDCs to report electricity savings more in-line with Pennsylvania-specific characteristics.
C&I HVAC	HVAC measures are weather-dependent, so evaluators must use Pennsylvania-specific weather information to produce the most accurate results for the Commission. Current methodologies rely on using degree-day ratios to convert savings factors from one state to another. We will use eQuest modeling software to develop Pennsylvania-specific models, which will most accurately reflect conditions in Pennsylvania.
C&I Motors and Drives	Motors and drives measures are weather-dependent, like HVAC measures. In many instances, they function as distribution processes for HVAC equipment, such as chilled water pump motors or cooling tower fan motor variable speed drives. We will use eQuest modeling software to develop Pennsylvania-specific models, which will most accurately reflect conditions in Pennsylvania.

The GDS Team will conduct metering studies to ensure that the TRM incorporates the most accurate hours-of-use (HOU) values for residential and C&I lighting measures installed in the EE&C programs. We will conduct two separate studies: one for the residential sector and second for the C&I sector. The GDS Team will use computer simulation models such as eQUEST to update key savings assumptions for high efficiency HVAC, motors, and VFD measures. These assumptions include, but are not limited to equivalent full load hours (EFLH) for HVAC measures and operating hours for motors and VFD measures. In addition to updating HOU values for C&I lighting, we will leverage the information collected from the metering study to update key assumptions for the C&I HVAC, motors, and VFD measures. We provide a detailed description of the key aspects of the lighting metering studies and the information derived from these metering studies that will be leveraged for eQUEST modeling in Table 3-4: List of Improvements to the TRM for Phase II.

The GDS Team will use a variety of sources for updating the protocols in the TRM to ensure consistency with industry best practices. These sources may include:

- **Recent impact evaluations of EDCs’ programs** – Impact evaluations are very helpful in providing Pennsylvania-specific values for many deemed savings assumptions. Impact evaluations generally present very accurate data regarding technology baselines, HOU values, and measure cost assumptions as examples. Since the data collected for these evaluations come from actual EDC programs, they are highly applicable in TRM updates.
- **Other energy efficiency program sources** – By benchmarking the Pennsylvania TRM against other standout industry TRMs we will be able to identify opportunities to improve the documents. We can compare measure lists and TRM structures with existing TRMs and review discrepancies to ensure that the Pennsylvania TRM is on par with industry best practices.
- **National resources** – The GDS Team will leverage national resources to determine the appropriateness of baseline assumptions for the TRM. National resources offer strong research databases from which deemed savings assumptions can be pulled with a high level of certainty.

We present an overview of the steps we plan to take to review and annually update the TRM in Table3-4.

Table 3-4: List of Improvements to the TRM for Phase II

Task	Areas of Potential Improvement
Review of TRM structure	For accurate tracking and reporting, measures need to be well defined and organized to allow for ease of use during program implementation and evaluation. The GDS Team will review measures in the TRM to identify any needed improvements in measure definitions and consistency. We will focus on consistency of measures across technology and measure classes. This improvement will ensure that the TRMs will be easy to navigate and audit, and will improve the update process for future versions.
Addition of new measures	We will review the existing list of measures in the TRM and develop interim protocols for new standard measures the EDCs offer in their programs. Examples of potential measures may include: <ul style="list-style-type: none"> • ENERGY STAR data storage servers • Server virtualization • Optimization of HVAC units • Industrial nozzles We also will review current measures for continued applicability to the EDCs' program offerings.
Review of measure description	We will review and clarify the description and applicability of the measures. This includes: <ul style="list-style-type: none"> • Classification (whether the measure is deemed, partially deemed, or custom); • Sector (residential, commercial, industrial, or government); • Segment (weather-sensitive or non-weather sensitive); • Application or Measure type (retrofit, early replacement, replace-on-burnout, new construction, major renovation); • Category or End-use (appliance, heating, cooling, lighting, etc.); • Subcategory or Equipment type (dishwasher, boiler, air conditioner, CFL, etc.); • Fuel type (electricity or natural gas); • Delivery mechanism or Program type (direct install, upstream, or rebate); and • Building type (single family, multi-family, retail, school, etc.).
Review of codes and standards	We will identify and evaluate the applicable local, state, and federal energy codes and standards, as well as current market conditions that have an impact on the efficiency levels of the baseline equipment and efficient equipment and provide recommendations for modification as necessary. We also will consider replacement scenarios that affect baseline assumptions (such as new construction, early replacement, and replacement upon burnout) to ensure that measure savings reflect the appropriate baseline for each replacement scenario.
Review of savings algorithms and assumptions for key parameters	We will examine algorithms included in the TRM to ensure that proper savings calculations are being used and that these are consistent with industry best practices. Additionally, we will review any input assumptions for key parameters to make sure they are appropriate and are up-to-date. Examples of the types of

	<p>assumptions we would anticipate reviewing include:</p> <ul style="list-style-type: none"> • Hours of operation (e.g., using a metering study for residential and C&I lighting measures); • Equivalent full load hours (e.g., using eQUEST modeling for HVAC measures); • Load factor; • Coincidence factor; • Capacity; • Climate zone or location; and • Interactive effects (indirect impacts of lighting, motor replacements, etc. on the heating and cooling systems).
Review of deemed savings values	<p>Our team will examine the literature referenced in the TRM, which supports the deemed savings assumptions, including the review of the population or tests from which the data were derived, and recommend the appropriate population or technologies to which the generalizations should be applied in Pennsylvania. We also will conduct a review of other deemed savings databases in the US to determine how other regions are using assumptions and estimating deemed savings.</p>
Review of measure lives	<p>We will review and update measure lives for all measures in the TRM to reflect current equipment technology advancements and to ensure that consistent assumptions are used across all EDCs.</p>
Addition of deemed cost assumptions	<p>Our team will develop the assumptions used to determine measure costs for the EDCs' programs. We will develop measure costs in collaboration with the EDCs to ensure that they reflect current pricing and that consistent assumptions are used across measure categories (e.g., incremental cost versus full measure cost), technology, measure classes, and all EDCs.</p>
Review of source documentation	<p>We will review source documentation used for assumptions, algorithms, and other data for protocols in the TRM and validate the reliability of the data sources. This will ensure that the latest available information is used while updating the TRM. We also will compile and store important source documents on SharePoint so that everyone has access to them.</p>

3.4.3 Schedule of TRM Updates

The GDS Team will work with the Commission to develop a schedule that will achieve the level of detail required to establish a comprehensive update to the TRM while providing enough lead time for EDCs to incorporate changes into their EE&C program plans. Table 3-5 displays an estimated schedule for approval of the TRM and effective dates. The intent of the six-month period between the approval date and the effective date is to allow EDCs sufficient time to update program documents, marketing materials, tracking databases, and other miscellaneous program or system processes. Through our work with the EDCs in Phase I, we understand the challenges of developing the TRM update schedule so that the EDCs will have modifications available well before the changes go into effect at the beginning of a new program year. The TRM schedule directly affects the EDCs' ability to make systematic changes and deliver savings in light of market conditions and revised standards. We anticipate having in-depth discussions with TUS staff on the schedule of TRM changes associated with the metering studies and other analyses we have to revise the TRM savings assumptions.

Table 3-5: Schedule for TRM Updates

TRM Version	Program Year	Approval Date	Effective Date
2014 TRM	PY2 Phase II	December 31, 2013	June 1, 2014-May 31, 2015
2015 TRM	PY3 Phase II	December 31, 2014	June 1, 2015-May 31, 2016
2016 TRM	PY4 Phase II	December 31, 2015	June 1, 2016-May 31, 2017
2017 TRM	PY1 Phase III	December 31, 2016	June 1, 2017-May 31, 2018

QUALITY ASSURANCE & QUALITY CONTROL OF THE TRM UPDATE PROCESS

The GDS Team will maintain an active Technical Working Group (TWG), which will include technical experts from the utilities and other independent experts as needed to clarify and improve the TRM. We Team will organize and conduct periodic Program Evaluation Group (PEG) and TWG stakeholder meetings on proposed changes to the TRM.

We will conduct the following to produce a high-quality product:

- Recommend protocols for high-impact measures for immediate review and clarification or modification
- Collaborate with the EDCs to review each protocol and analyze the specific algorithms and definitions of terms to ensure that the protocols use accepted industry standards, reasonably estimate savings, and that the methodologies for implementing the protocol are clearly defined and can be effectively implemented.
- Maintain a catalog of new measure protocols and documents pertaining to key updates for existing measures on the SWE SharePoint site in order to provide transparency
- Engage a professional editor to manage formatting and presentation of the TRM

DELIVERABLE TASK 4A: THE GDS TEAM WILL WORK WITH THE COMMISSION, EDCS AND THEIR EVALUATORS, AND OTHER STAKEHOLDERS TO PROVIDE GUIDANCE ON TRM REVISION AND EXPANSION FROM THE ADDITION OF NEW MEASURES.

Task 4b: TRC Order Updating

The GDS Team understands the importance of continuing the process of clarifying the Commission's Total Resource Cost (TRC) test Order to address questions that arise during Phase II from the EDCs, Commission staff, or other stakeholders. Based on our four years of experience conducting audits of the EDCs' calculations of the TRC for their Act 129 programs, we have prepared a list of new issues that may need to be addressed in a future Commission TRC Orders during Phase II of Act 129. These TRC issues include the following:

1. **Establishment of limits on the level of energy and peak demand line loss savings that can be claimed by EDCs.** During Phase I, some of the EDCs have claimed line loss savings at the time of the system peak as high as 20 percent. EDCs should be required to provide the basis for all line loss numbers they use in TRC calculations, and the Commission should establish an upper limit on line loss percentages EDCs can use in those TRC calculations.
2. **Clarify operation and maintenance savings that can be included.** The Commission should review and clarify the types of operation and maintenance savings that can be included in TRC calculations. For example, if a program participant replaces a halogen light bulb with an LED bulb that lasts 20 times longer, the Commission needs to determine if the savings that result from avoiding the purchase of 20 halogen bulbs can be counted as a benefit in the TRC calculation.

3. **Clarify savings of other fuels that can be included in the TRC calculation.** The Commission should review how other state commissions consider savings of other fuels when an energy efficiency measure is installed. For example, if attic insulation is installed in a home that has electric air conditioning and natural gas space heat, should the Commission allow the savings due to reduced use of natural gas for space heating to be allowed as a benefit in the calculation of the TRC test?

As we have done in Phase I of Act 129, the GDS Team will continue to provide technical support to the TUS staff on such technical issues. Our team has significant experience with developing and reviewing benefit/cost calculations in other states across the US (for example, California, Connecticut, Florida, Georgia, Indiana, Maine, New Hampshire, Maryland, North Carolina and Vermont), and we will assist the TUS staff as needed to research and resolve such issues. We also will assist the TUS staff in understanding and addressing specific TRC-related questions raised by the EDCs and other stakeholders.

DELIVERABLE TASK 4B: THE GDS TEAM WILL PROVIDE TECHNICAL SUPPORT TO THE TUS STAFF ON TECHNICAL ISSUES ASSOCIATED WITH THE TOTAL RESOURCE COST (TRC) TEST ORDER.

3.5 Task 5: Data Management and Commission Reports

As the Phase I SWE, the GDS Team used several approaches to effectively and efficiently manage data and produce Commission reports. The main data channel used by the SWE was the SWE SharePoint site, a secure website we developed and which was available only to the EDCs, TUS Staff and the SWE team. This site allowed the SWE to communicate directly with EDCs (individually and collectively), and allowed the EDCs to upload confidential customer records and trade-secret data to a secure site. The SWE Team also made use of the Commission's public website as a resource for sharing Baseline and Potential Studies, TRM updates, Quarterly and Annual reports and other public documentation with stakeholders. The GDS Team plans to make improvements to the organization and functionality of the SharePoint site in Phase II and to work with TUS staff to ensure that documents are posted to the Commission's public website in a timely fashion and present clear and transparent impacts from Act 129 programs to interested parties.

In Phase I, the GDS Team established a SWE SharePoint site that allowed all approved users to upload and access documents of all sizes. These EDC directories on the SharePoint site are used to exchange program tracking data, project files and evaluation results with the SWE. It is a proven and invaluable resource for the exchange of large amounts of information during Phase I of Act 129. Each EDC has its own secure directory on the site which is accessible only to the SWE, TUS and that EDC's staff and evaluation

3.5.1 SWE SharePoint site

In Phase I, the GDS Team established a SWE SharePoint site that allowed all approved users to upload and access documents of all sizes. These EDC directories on the SharePoint site are used to exchange program tracking data, project files and evaluation results with the SWE. It is a proven and invaluable resource for the exchange of large amounts of information during Phase I of Act 129. Each EDC has its own secure directory on the site which is accessible only to the SWE, TUS and that EDC's staff and evaluation contractor. We established this structure to protect the confidentiality of each EDC's or evaluation contractor's data.

The SharePoint site also has a general home page that can be accessed by all EDCs. The home page houses items such as guidance memos, data requests, white papers and the agendas and minutes from PEG meetings. The SWE Team coordinates access to the site and is responsible for granting access (usernames and passwords) to EDC members.

In Phase II, the GDS Team plans to continue maintaining the SWE SharePoint site and using it as the primary data exchange platform between the EDCs and the SWE. We plan to implement certain organizational changes to improve the usability of the site for EDCs and their evaluators. First, we will establish a central location on the general home page for all guidance memos and data requests. This central location will include a tracking spreadsheet that lists key information for all users. We will organize data requests so that only the most current version of the request is posted on the site, and the tracking spreadsheet will list due dates and track when an EDC submits its response. This approach will give the EDCs a single reference point to view upcoming requests and know if it has been fulfilled. In addition, the intent and subject matter of guidance memos will be identified in the tracking spreadsheet. The tracking spreadsheet also will list the status of the memo (draft, final or no longer active) and indicate if any information has been superseded by subsequent memos.

3.5.2 PUC Public Website

The GDS Team will continue to provide documents for sharing on the Commission's public website which provides information to interested stakeholders on the actual kWh and kW savings from the Act 129 programs as well as the EDCs' expenditures on such programs. During Phase I of Act 129, information was presented primarily in report format to interested parties. The GDS Team plans to work with the TUS staff to identify additional content, such as SWE audit reports and statewide savings summaries, to present on the public website.

3.5.3 Audit Tracking Database

The GDS Team will utilize the Nexant Audit Tracking Database™, a proprietary Nexant software, to leverage the existing and new program tracking data submitted to the SWE team by program evaluators and provide a central, transparent repository for these data. The Nexant Audit Tracking Database™ is a new tracking system developed by Nexant in 2012 and will be offered to the Commission at no additional cost in Phase II. Our team anticipates publishing key queries and reports from the database directly to the SharePoint site to provide the Commission and the EDCs easy access to selected ongoing audit activities, metrics, and findings. We will include multiple layers of control to provide the TUS staff secure access to information that will not be available to the EDCs.

Figure 3.1 shows an example screenshot of the Project View Summary and the fully configurable "Dashboard" from the Nexant Audit TrackingDatabase™.

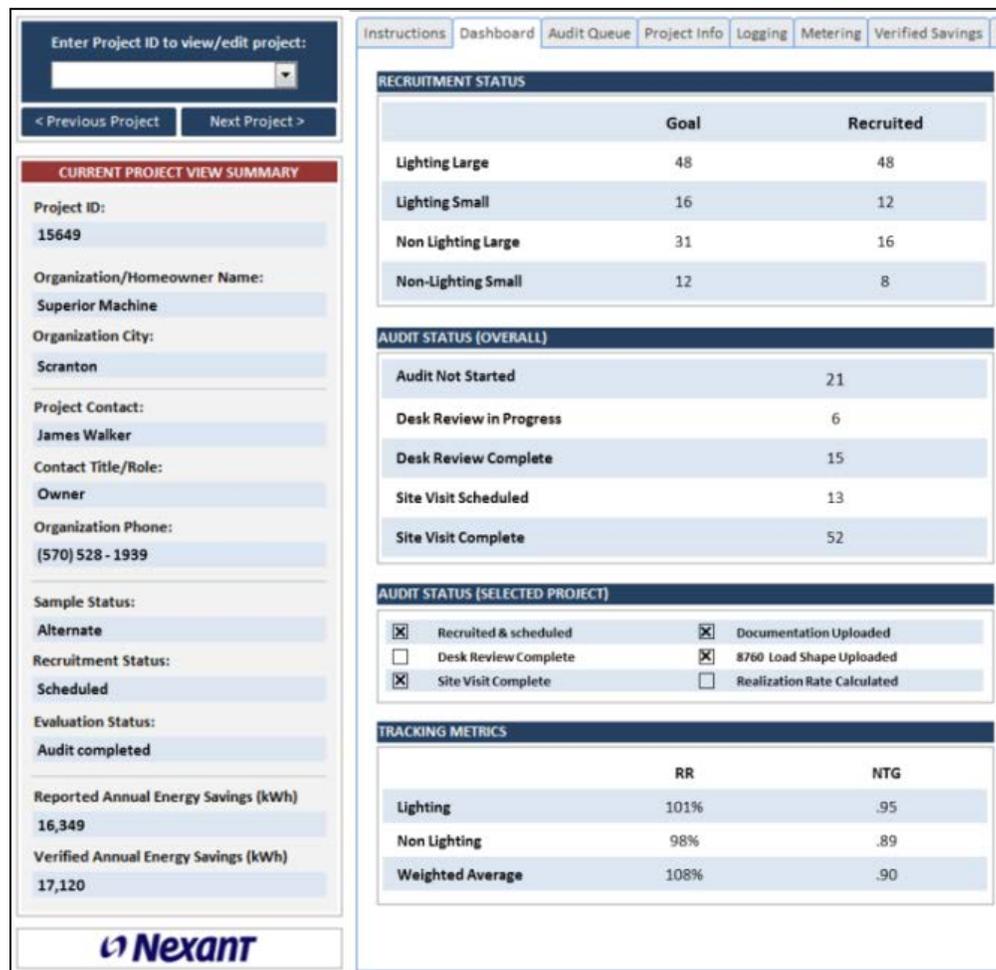


Figure 3-1: Screenshot of Nexant DSM Project Tracking Database Dashboard

During Phase I of Act 129, the GDS Team developed a standard data format for EDCs to use when submitting quarterly program tracking data from nonresidential programs to the SWE. Standardization of the data format and field names allowed for bulk uploads of program tracking data into a single database. Having each of the EDC's data in a single repository allows for fast access to EDC data and simple comparisons between EDCs. In Phase II, the GDS Team plans to begin uploading tracking data from residential and non-residential programs to the tool and use this tracking data repository as the foundation for the Nexant Audit Tracking Database™ we will use during Phase II.

SWE audit activities always begin with a comparison of some program component with EDC tracking data. The Nexant Audit Tracking Database™ facilitates this step. Instead of searching through tabs of spreadsheets, a SWE team member just inputs a unique identifier for a completed energy efficiency project and the system displays reported impacts for the project. This functionality will improve the efficiency and accuracy of SWE desk audits, project file reviews, ride-along site inspections and independent site inspections. Our team will create forms in the Nexant Audit Tracking Database™ for each of the SWE audit activities. Figure 3-2 shows an example screenshot of a CFL audit input form.

Instructions	Dashboard	Audit Queue	Project Info	Logging	Metering	CFL Audit	Recruiting/Data
--------------	-----------	-------------	--------------	---------	----------	-----------	-----------------

Account Number	1234567890	EDC	PPL
Engineer Name	Andrew Smith	Program Year	2011
Install Date	7/31/2012	Program Qtr.	1
Installed Bulb Wattage	14	Sector	C
Region	NW	Build Type	Mfg

	Reported	Verified
Qty. Installed Lamps	12	9
Baseline Wattage	60	60
Installed Bulb Wattage	14	14
Hours of Use	900	1,220
Number of occupants	3	3
Approximate square footage	3,400	3,400

Preliminary Audit Findings:
Participant purchased 12 lamps, but only installed 9, holding onto the others for future use. Hours of use were under-reported as participant installed 5 of the lamps in a common area that is in use most of the time.

Figure 3-2: Screenshot of Nexant DSM Project Tracking Database CFL Audit Input Form

The EDC-reported impacts from the program tracking data are displayed for the SWE auditor for quick comparison and there are input fields for the auditor to record their findings from the audit activity. The data entered into these audit forms are stored in a table in the database. As audit activities accumulate, the SWE can run queries to summarize findings by EDC, program, or equipment type. Maintaining all audit results in a central location will make it much easier for the SWE to identify patterns in the audit findings and summarize audit activities for quarterly and annual reports. The GDS Team will grant read-only access to the tool to TUS staff to allow 24/7 access to summary queries and reports of EDC savings and SWE audit activities.

The Nexant Audit Tracking Database™ also will streamline the development of SWE Quarterly and Annual reports. One of the key SWE audit activities is to compare the energy savings, demand savings and incentive payment summary figures in EDC reports to the contents of that EDC’s program tracking data. Because all program tracking data will be provided to the SWE in standardized format across the seven EDCs and uploaded into the Nexant Audit Tracking Database™, this comparison can be automated to a large extent. The GDS Team has implemented this approach successfully for nonresidential programs in Phase I and believes data standardization improves EDC reporting and increases the accuracy and efficiency of the SWE.

3.5.4 Schedule for Quarterly and Annual Reports

We will provide quarterly reports to the Commission for the first, second, and third quarters of each year, as well as an annual report at the end of the reporting year. The SWE quarterly reports will summarize and review the data reported by the EDCs in their quarterly reports, and provide information on the SWE audit activities in that quarter. Quarterly reports will focus on the reported, or ex ante,

savings achieved by EDC programs. These quarterly reports will be completed including incorporation of any TUS comments or edits 45 days after the EDC reports for the quarter are due. Table 3-6 shows the timing of EDC and SWE quarterly reports to the Commission.

Table 3-6: Quarterly Report Schedule

Quarter	EDC Report Due	SWE Report Complete
Quarter 1	October 15	December 1
Quarter 2	January 15	March 1
Quarter 3	April 15	June 1
Quarter 4 (Preliminary Annual)	July 15	No SWE Report

The SWE annual report will provide a more comprehensive review of the EDC programs over the course of the program year. The primary focus of the annual reports is the verified, or ex post, savings achieved by the programs. Verified gross savings are the estimates used for compliance and cost-effectiveness calculations in Pennsylvania and are based on the EDC’s independent evaluation contractor’s findings. SWE annual reports will include a detailed review of the evaluation methodologies, sampling strategies and results of the evaluation. Annual reports also include a summary of the benefit/cost modeling and resulting TRC ratios, along with SWE recommendations based on an audit of the EDC TRC models. By including Research Into Action to our team, a firm with extensive and respected experience in this area, we will increase the focus on net savings analysis and process evaluation in Phase II annual reports. Table 3-7 shows the important dates in the SWE annual report development.

Table 3-7: Annual Report Timeline

Milestone	Date
EDC Annual Reports Due	November 15
SWE Draft Annual Report to EDCs	January 16
EDC Comments on Draft Annual Report Due	January 23
SWE Final Draft Report Due to TUS Staff	January 30
Commission Staff Provides Comments on SWE Final Draft Report	February 13
SWE Final Annual Report Provided to the Commission	February 28

3.5.5 Quality Assurance and Editing of Quarterly and Annual Reports

The GDS Team strives to deliver reports that are both technically sound and clearly written so that they are meaningful to multiple audiences. The body of our reports will be written in a style that meets regulatory requirements, and focuses on a summary of findings and key recommendations. We will include technical discussions in appendices. During Phase II, we will ensure that a professional editor will edit all key deliverable, such as the SWE quarterly and annual reports to the Commission, These key deliverables will also be proofread by our Project Manager. We have identified Marnie McPhee of Research into Action as our internal editor. As needed, our team will engage a professional editing firm for our reports. This quality control will ensure cohesive, clear, well organized, and professional products that can be relevant to readers who do not have technical expertise in the subject matter. Reports will include standardized tables and charts so that the Commission and stakeholders will see a consistent format from report to report.

We will discuss our process for ensuring the quality of all of our deliverables at the kick-off meeting for Phase II.

DELIVERABLES TASK 5: THE GDS TEAM WILL ENSURE THE PROPER ORGANIZATION AND FUNCTIONALITY OF DATA SHARING BETWEEN THE GDS TEAM, TUS STAFF, EDCS AND THEIR EVALUATIONS, AND OTHER STAKEHOLDERS. THE TEAM WILL USE THE NEXANT AUDIT TRACKING DATABASE™ TO LEVERAGE THE EXISTING AND NEW PROGRAM TRACKING DATA SUBMITTED BY THE SWE TEAM BY PROGRAM EVALUATORS AND PROVIDE A CENTRAL, TRANSPARENT REPOSITORY FOR THESE DATA. THE TEAM WILL PROVIDE QUARTERLY REPORTS TO THE COMMISSION FOR THE FIRST, SECOND, AND THIRD QUARTERS OF EACH YEAR, AS WELL AS AN ANNUAL REPORT AT THE END OF THE REPORTING YEAR.

3.6 Task 6: Logging/Metering Studies

The GDS Team understands that the Phase II SWE will be responsible for designing and implementing a statewide metering study to inform TRM assumptions for residential and C&I lighting measures. As the Phase I SWE, we recommended these studies and believe that the results will help reduce the uncertainty associated with the savings estimates for the Act 129 lighting projects. Below is a summary of our approach for each study.

3.6.1 Residential Lighting Metering Study

APPROACH

The results of the Residential Lighting Metering Study will be used to inform TRM assumptions and algorithms in support of TRM revisions for residential-sector lighting measures. We believe that the outcomes of the Residential Metering Study will allow development of more accurate values for hours-of-use (HOU) and coincidence factor (CF) than the current values in the TRM that are based on secondary research.

The project manager for the Residential Lighting Metering Study will be John Hutts, GDS Principal, who will lead a team of highly experienced engineers and analysts in the deployment and retrieval of data logging equipment and the collection of primary data. Key tasks will include designing data collection instruments and establishing metering plans for homes. Mr. Hutts will be responsible for incorporating the results from the study into the TRM revisions, inclusive of updates to the assumptions and algorithms for the residential-sector lighting measures. Scott Dimetrosky will be the senior technical advisor for this study. Mr. Dimetrosky was the lead author of the Uniform Methods Project (UMP) Residential Lighting Evaluation Protocols⁶, and is currently conducting metering for residential lighting in over 250 homes in four Mid-Atlantic and Northeast states.

This study's methodology, which will be used to establish HOU and CF values, will be adapted from the UMP Residential Lighting Evaluation Protocol. The methodology involves the use of sinusoidal modeling⁷ to annualize the data collected from the loggers, and the derivation of relative weightings by room type, to find the average HOU for a residential lighting fixture. A CF also can be estimated based on the sinusoidal models once a peak demand period has been defined for Phase III of Act 129.

SAMPLE DESIGN

Equation 1 is used to calculate the sample size required to meet the confidence and precision targets of the study. The sample frame for this study is all residential lighting fixtures in the state of Pennsylvania

⁶ Dimetrosky, Scott. *Residential Lighting Evaluation Protocol*, as part of the Uniform Methods Project October 2012.

⁷ Sinusoidal modeling assumes that HOU will vary inversely with hours of daylight over the course of a year. Sinusoidal modeling shows that (1) HOU changes by season, reflective of changes in the number of daylight hours and weather, and (2) these patterns will be consistent year to year, in the pattern of a sine wave.

so a finite population correction factor is not necessary in the calculation of required sample size. The GDS Team assumes a coefficient of variation (C_v) of 1.0 for all residential fixtures combined and a C_v of 0.6 for fixtures within a single room type because lighting hours-of-use are expected to vary more between room types than within a room type.

Equation 1: Required Sample Size Calculation

$$n_0 = \left(\frac{z * C_v}{D} \right)^2$$

Where:

- n_0 = The required sample size
- Z = A constant based on the desired level of confidence. Equal to 1.645 for 90%
- C_v = Estimated Coefficient of Variation (standard deviation/mean). Equal to 1.0 for all rooms combined and 0.6 for a single room type.
- D = Desired relative precision. Equal to 10% for this study

Our proposed sample includes a total of 200 homes, split evenly between single-family and multifamily residences. Assuming slightly fewer than 8 loggers per home (to allow for some homes with few fixtures or the site evaluator’s inability to enter rooms), we assume that we will install 1,570 loggers, providing an overall precision of 4% at the 90% confidence level. We then divided the sample into areas of high, medium, and low socket saturation, as determined from the 2012 Pennsylvania Statewide End-Use and Saturation Study we conducted during Phase I. For areas of high socket saturation, we targeted confidence/precision levels of 90/10, for medium we targeted 90/12, and for areas with few lights we targeted 90/15. Table 3-8 shows the proposed sample design by housing type and room type.

Table 3-7: Proposed Sample Size and Confidence/Precision by Housing and Room Type

Room Type	Interior Socket Saturation*		Number of Loggers			Precision (at 90% Confidence)**		
	SF	MF	SF	MF	Total	SF	MF	Total
Basement	16%	6%	100	70	170	10%	12%	8%
Bathroom	14%	18%	70	100	170	10%	12%	8%
Bedroom	17%	22%	100	100	200	10%	10%	7%
Closet	3%	2%	45	45	90	15%	15%	10%
Dining room	7%	5%	45	70	115	15%	12%	9%
Foyer/Hallway	8%	6%	45	70	115	15%	12%	9%
Garage	6%	0%	100	0	100	12%	0%	10%
Kitchen	12%	17%	70	100	170	12%	10%	8%
Living room	11%	20%	70	100	170	12%	10%	8%
Office/den	4%	4%	45	45	90	15%	15%	10%
Other	4%	1%	45	45	90	15%	15%	10%
Exterior	NA	NA	45	45	90	15%	15%	10%
Total	100%	100%	780	790	1570	6%	6%	4%

*Based on the 2012 Pennsylvania Statewide End-Use and Saturation Study, GDS Associates, with Nexant and Mondre Energy.

**We have assumed a CV of 1.0 for all rooms combined, and a CV of 0.6 per room type.

DATA COLLECTION

The GDS Team plans to incent participating homes with a \$75 gift card to bolster recruitment and offset the disruption of having an engineer make two separate trips to the home. The initial visit will involve a complete lighting audit of the home (including the location, wattage, bulb type of every fixture), and

installation of the lighting data loggers. During this initial visit, the participant will be asked to estimate the hours-of-use of the lighting fixtures on which the data loggers are installed. We will use this information during data clean-up to assess the validity of the data collected. We will install approximately eight data loggers per home: four targeted at CFLs and four on random fixtures. Including non-CFL bulbs in the sample will help estimate the remaining potential for future installations of high efficiency lighting, including LEDs.

Our team will install a mix of HOB0® U9-002 light on/off, HOB0® U12-012 light intensity and HOB0® U12-006 AC Current data loggers in the homes to capture the operating hours of the selected fixtures. The GDS Team will primarily deploy lighting state loggers (U9-002 and U12-012) for the Metering Study because the installation is less invasive than metering the electric load of the fixture. Our team also holds an inventory of over 600 of these data loggers which can be used for both the Residential and Commercial & Industrial Lighting Metering studies for a small monthly rental fee. We can acquire additional loggers if needed. The on/off meters (U9-002) will be used in fixtures where sunlight or other ambient light is not present, such as in internal bathrooms and bedrooms. In situations where ambient light is present, such as a lamp on a table with overhead lights or windows nearby, we will use a light intensity data logger (U12-012) and the engineer installing it will calibrate it so it records hours-of-use only when the intensity is at the level emitted by the bulb in the lamp. Current-sensing instrumentation (U12-006) will be reserved for outdoor fixtures where direct sunlight potentially could inflate the metered hours-of-use values recorded by lighting state loggers.

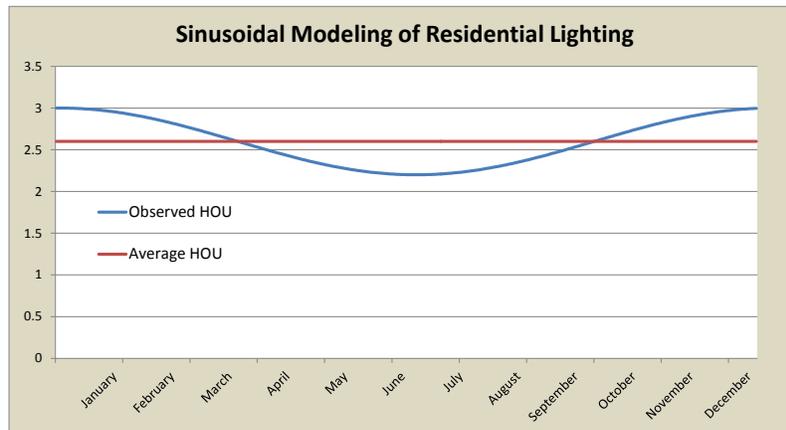
We propose a logging period of six months for each home in the sample. We will install logging equipment either in discrete batches or on a continuous basis so we collect data for summer, winter, and at least one shoulder season (spring or fall) . We will install and monitor a relatively larger proportion of data loggers during the summer to achieve better precision in determining the coincidence factor (CF).

On-site data collection will be accomplished using an electronic form installed on a tablet computer, which does not require an internet connection. Instead, the engineer will sync the tablet to a central Microsoft Access database stored on a server in the GDS Team's offices at the completion of each day of installations once a broadband connection is available. Site inspection forms will be reviewed regularly and if any key fields are missing or questionable, the record will be flagged for review by the engineer collecting the data loggers.

OUTPUTS

After we have collected the data loggers from the participating homes, an analyst will verify the raw data and we will upload the information into a central database, along with key parameters gathered during the initial site visit. The analyst will identify and eliminate erroneous readings, including those that may have been caused by faulty data loggers or loggers that were removed by the participant for a period of time. Our analysts will annualize the verified data using a sinusoidal modeling technique, following the methodology discussed and referenced in the UMP protocols. This step is necessary because of the seasonal variation in residential lighting produced by changing hours of daylight. Figure 3-2 illustrates the expected relationship between lighting hours and season.

Figure 3-2: Seasonal Variation in Residential Lighting



Using sinusoidal modeling to account for seasonal variations, we will extrapolate data from each fixture logged to a full year. We will determine a CF from the data collected via the loggers, consistent with the peak period defined by the Commission. For each data logger, the fraction of daily use during the peak period can be determined. The CF would be the fraction of daily use multiplied by the total HOU over the peak period, divided by the total hours during the peak period.

Load shape development will be another critical outcome of the Residential Metering Study. Based on logger data, we will calculate average load shapes and provide them to the EDCs for use in their benefit/cost models to promote the accuracy and consistency of TRC ratios for residential lighting measures across the state.

3.6.2 Commercial & Industrial (C&I) Lighting Metering Study

APPROACH

The GDS Team believes that there will be four primary outcomes of the study that will represent a substantial improvement over the use of values taken from secondary research. These outcomes are:

- 1) hours-of-use (HOU)
- 2) coincidence factor (CF)
- 3) lighting control factor, and
- 4) interactive effect assumptions used in the Pennsylvania TRM (PA TRM).

This metering study will be led by our Professional Engineers, Irwin Kim and Patrick Burns. Mr. Kim will be the day-to-day task manager and will lead a team of engineers in the deployment and collection of data logging equipment in this primary data collection effort. Key tasks will include managing the deployment of data loggers and establishing metering plans for facilities. Mr. Kim also will have a key role in the annual TRM revisions and will be responsible for leveraging the outputs of the study to update the assumptions and algorithms for C&I lighting measures in the TRM.

Jesse Smith will serve as the data analysis and statistical lead for the project. He will be responsible for designing a sample that will meet the confidence and precision targets outlined by the Commission and vetting this design with stakeholders prior to the implementation of the study. During Phase I of Act 129, Mr. Smith developed a standardized data format for EDCs to submit program tracking data to the SWE and maintained a single Microsoft Access database of all nonresidential projects completed in the state. The GDS Team's intimate knowledge and access to EDC participation records will allow our team to design a representative statewide sample and reduce our study costs. We will use a SAS® model to input, clean, and analyze the raw data collected by the engineering team. The SAS® software will be used for this project at no additional cost to the Commission.

Further, we will refine an approach originally proposed in a memo to TUS staff and the EDCs on September 24, 2012, which considers the Phase I savings contribution and the variability of values

reported by secondary sources to estimate the relative uncertainty associated with each building type listed in Table 3-4 of the 2013 PA TRM. We will use lighting load shares, lighting power density, and saturations of various lighting technologies from the Phase I Commercial and Industrial End-Use and Saturation Study to refine the list of high-impact facility types in the state. After identifying the building types with the greatest relative uncertainty, we will use a value-of-information approach to allocate sample points to the various building types and focus resources on the building types with the largest uncertainty contribution.

SAMPLE DESIGN

The outputs from this study will be statewide values that can be incorporated in the 2016 PA TRM. Because the intent of the study is to develop statewide HOU, CF, and control factor estimates, we will select a representative sample of nonresidential customers from across each of the seven EDCs. However, the confidence and precision goals of the study will not be established at the EDC level. Instead, we propose to conduct a study that produces statistically significant results for each building type examined.

To estimate the sample size required to achieve the desired levels of precision at the 90% level of confidence, we use the following formulas:

Equation 2: Required Sample Size Calculations

$$n_0 = \left(\frac{z * Cv}{D} \right)^2 \quad n_1 = \left(\frac{n_0}{1 + \frac{n_0}{N}} \right)$$

Where:

- n_0 = The required sample size before adjusting for the size of the population
- Z = A constant based on the desired level of confidence. Equal to 1.645 for 90%
- C_v = Coefficient of variation (standard deviation/mean)
- D = Desired relative precision
- n_1 = The required sample size after adjusting for the size of the population using the finite population correction factor
- N = The population size, or the number of facilities of a given type in the state

The coefficient of variation term is of central importance to this sample design. Based on our team’s research in other jurisdictions, we have found that the operating hours of lighting fixtures within a given building type are somewhat homogenous per jurisdiction, so we propose using a coefficient of variation of 0.4 in the sample design. Further, we propose a total sample size of 500 sites. Our preliminary plan calls for a sample of 45 sites to be sampled for the building types which are identified as the leading contributors to the uncertainty of savings estimates. This design will produce findings that satisfy the statistical requirement of 10% precision at the 90% confidence level for each building type. For facility types that are composed of multiple subcategories, such as “Education,” the 90/10 goal will be exceeded for the building type as a whole and 85/15 confidence and precision will be targeted for each of the subcategories. Table 3-9 shows a possible allocation of sample points to building types that contributed the majority of lighting savings in Phase I of Act 129. We will propose and vet a final sample design with the Program Evaluation Group prior to beginning the study.

Table 3-8: Allocation of Sample Sites by Building Type

Building Type	Sub-Category	Sample Size
Education	Primary Schools	65
	College/University	
Retail Stores	Small	65

	Large	
Industrial Manufacturing	1 Shift	90
	2 Shift	
	3 Shift	
Hospitals	NA	45
Office	NA	45
Warehouse	NA	45
Grocery	NA	45
Public Services	NA	45
Other	Multiple Facility Types	55
Total		500

The remaining 55 sites will be distributed across groups not selected among the high-impact building types. While the findings from these facilities will not be statistically significant on their own, the outputs will provide valuable information about the applicability of values compiled from secondary sources to Pennsylvania businesses.

Traditionally C&I lighting metering studies are conducted with previous participants of utility energy efficiency programs. Recruiting these customers is more efficient because they are familiar with the program and the importance of lighting HOU in energy savings. The expected response rate also is much higher for program participants than nonparticipants. However, we plan to leverage the recruiting efforts for the C&I Baseline Study to deliver a metering study that includes both participants and nonparticipants. We will offer participants in the C&I Baseline Study an additional incentive to have lighting loggers installed during the Phase II Baseline Study site inspection. Using this approach, the sampling frame will include potential program participants as well as previous program participants. We can gain operational efficiencies by using this approach because we will be able to split the travel time and expenses associated with each site visit across the two tasks.

DATA COLLECTION

The GDS Team plans to incent participating customers with a \$75 gift card to bolster recruitment and offset the disruption of having an engineer make two separate trips to the facility. The initial visit will involve gathering data on the types of lighting equipment in the building, the operating schedules of different spaces in the building, and the installation of lighting loggers. We plan to install an average of four data loggers per site, but the actual number of loggers at any given site will be a function of the size of the facility and the number of fixtures with different operating schedules. We will weigh the metered HOU from various spaces within a facility by the relative contribution to the lighting load of the facility. In an office building, we likely will assign bathroom lighting a much lower weight than the working areas and hallways.

We will place a variable number of HOBO® U9-002 light on/off and HOBO® U12-012 light intensity data loggers in various spaces throughout the facility to record the operating hours of the fixtures. We selected this type of instrumentation for the study because the installation is less invasive than metering the electric load of the fixture. The proposed approach also is consistent with an IPMVP Option A: Partially Measured Retrofit Isolation Approach. We can determine reliable estimates of fixtures' wattages using the fixture, lamp, and ballast information gathered by the engineer on site, and we can use the metered operating hours to calculate power consumption without actually metering the load of the fixtures. Our team has more than 600 of these data loggers, which we can devote to this study for a small monthly rental fee.



Data Logger in C&I Lighting Fixture

During the initial site visit, we will ask participants to self-report the operating schedules of the spaces within the building. We will use this information to assess the validity of the data collected and to calculate control factors for fixtures where occupancy sensors are in place.

We propose a monitoring period of 1 to 3 months for each site in the sample. Facilities with constant schedules will receive a shorter metering duration than those with variable schedules. This will allow the team to capture the full range of facility operating characteristics. We will monitor buildings with seasonal schedules, such as schools, for a longer period to understand operating characteristics during both occupied and unoccupied periods. At the close of the metering period, an engineer from the GDS Team will return to the facility to collect the metering equipment.

On-site data collection will be accomplished using an electronic form installed on a tablet computer, which does not require an internet connection. Instead the engineer will sync the tablet to a central Microsoft Access database stored on a server in the GDS Team's offices at the completion of each day of installations once a broadband connection is available. We will review site inspection forms regularly and flag any key fields that are missing or questionable for review by the engineer collecting the data loggers.

OUTPUTS

After we collect data loggers from participating sites, an analyst will verify the raw data and upload the information into an analysis data set along with key parameters gathered during the initial site visit. Operating hours will be extrapolated to a full year based on the occupancy schedule of the building and any holiday variations reported by the site contact. We will calculate average HOU by building type values as well as the level of variation observed within the building type. We will use the observed variation to document the margin of error of the estimate.

Load shape development will be another critical outcome of the proposed study. By collecting fixture wattages in participating facilities, we will be able to develop 8760 load shapes for each of the building types examined in the study. We will use these load shapes to update the Coincidence Factor (CF) values in the PA TRM once the Commission has defined a peak demand window. We will provide the load shapes for each building type to the EDCs for use in their benefit/cost models to promote the accuracy and consistency of TRC ratios for lighting measures across the state. These lighting load shapes, along with HVAC equipment saturation rates collected in the C&I Baseline Study, will be input into eQuest energy simulation models used to update the interactive effect assumptions in the PA TRM. Interactive effects quantify the changes in HVAC consumption that happen when cooler, more efficient lighting fixtures are installed. The accuracy of these assumptions will improve dramatically once our team can incorporate primary Pennsylvania data into the energy simulations.

DELIVERABLE TASK 6: THE TEAM WILL DESIGN AND IMPLEMENT A PHASE II STATEWIDE METERING STUDY TO INFORM TRM ASSUMPTIONS FOR RESIDENTIAL AND C&I LIGHTING MEASURES TO HELP REDUCE UNCERTAINTY ASSOCIATED WITH SAVINGS ESTIMATES FOR THE ACT 129 LIGHTING PROJECTS.

3.7 Task 7: Energy Efficiency Baseline Studies

Energy Efficiency Baseline Study Work Plan

One of the key responsibilities of the SWE team is to conduct updates to the baseline studies that we completed during Phase I to inform the Commission about targets for Phase II. The baseline studies to be conducted during Phase II will serve as needed support for a subsequent Market Potential Analysis and Report to the Commission that will, in turn, provide guidance for a possible Phase III of Act 129 EE&C Programs for Pennsylvania.

In this section, we describe our work plan -- an overview of the tasks we will undertake to complete statewide residential and commercial End-use and Saturation Baseline Study (Statewide Baseline Study) for Pennsylvania for both the residential and non-residential sectors.

Because the baseline studies span the state of Pennsylvania and EDCs, we will collaborate with the EDCs and other stakeholders to establish a common study vision that provides valuable results for current DSM program activities, including updates of the TRM and inputs for energy efficiency potential studies.

General Research Approach

The primary objectives of this Statewide Baseline Study are:

- Select a representative random sample of residential and nonresidential electric customers for participation in the studies;
- Profile electric customer groups at the sector and end-use level;
- Determine the current saturation of energy-using equipment in households and businesses;
- Determine the current saturation of energy-efficient equipment and practices in each customer sector;
- Determine average baseline levels of energy use and energy efficiency for lighting, plug load, space heating, space cooling and water heating by end-use; and
- Determine the percent of energy-using equipment by end-use that is already high-efficiency equipment.

We propose to implement the same general research approach we developed for the Phase I Baseline Study. In Phase I, for each study we developed a sampling and data collection plan, a draft baseline study survey instrument, scripts for recruiting participants into the study, database and analysis methodologies and final report formats. These existing capabilities will increase our efficiency and effectiveness and reduce costs to the Commission significantly. We also have the benefit of having worked with the EDCs to develop stratified random recruiting samples from the complete EDC customer databases. Similar to the Phase I effort, we will establish a joint vision of the parameters for each study (e.g., objectives, coordination and communication protocols; schedule; final report outline; level of granularity; etc.) between the Team, EDC personnel, EDC evaluators, and the TUS staff. We will address any aspects of each EDC's overall customer base that are unique (e.g., specific end-use saturations) or attributes of any of the territories that might be unique.

We propose sample sizes that are sufficient to meet or exceed $\pm 5\%$ precision at the 95% confidence interval at the statewide level for each sector (residential and nonresidential), and $\pm 10\%$ precision at the 90% confidence interval per EDC for each sector. Any additional specific carve-outs will require at least a confidence level of 90% and a margin of error of 20%. If necessary, we will increase sample sizes to ensure statistically reliable results. See our Cost Proposal for more detail and costs on this additional scope of work.

Our team is uniquely positioned to conduct this work, since we conducted and analyzed the Phase I Baseline Study. In addition, we understand the trend impacts that Phase I and II of Act 129 have had on building and equipment characteristics across Pennsylvania (such as saturation levels of efficient equipment). We will use this analysis in the Market Potential Analysis to more accurately assess potential Phase III targets.

We will leverage our Phase I experience to coordinate with the EDCs to develop a sampling plan for each baseline study that minimizes sample bias and is representative of the population. We also will update our existing survey instruments; recruit the on-site sample; train field technicians; perform on-site assessments; and verify, analyze, and report on the final dataset. We describe the tasks for the residential and nonresidential baseline studies below.

Task 1: Baseline Study Planning and Coordination

SAMPLING PLAN—RESIDENTIAL

For the residential sector, we propose a target of no less than $\pm 10\%$ precision at the 90% confidence interval for each EDC. To achieve this, we will need to complete at least 70 on-site visits for each EDC. We recommend that the sample be stratified by a number of important characteristics in order to ensure adequate and statistically reliable representation of important subgroups. These subgroups will include: housing type, annual kWh consumption, rent vs. own, and retired vs. non-retired. We will set quotas to ensure we have reached a representative mix of the population. These quotas are important to minimum bias in the final sample of customers.

In order to recruit the on-site participants, we must accurately produce a recruitment sample representative of each EDC's current population. We will work with the EDCs to develop the random recruitment sample from each EDC's customer database. This recruitment sample will consist of approximately 1,000 records per EDC and will mirror (as closely as possible) each EDC's complete customer databases. Based on our experience in Phase I, a recruitment sample of this magnitude is sufficiently large for us to recruit 70 random on-site participants.

Because not all demographic data are available in each EDC's customer database, we will stratify the recruitment sample only by housing type and electric consumption history. In addition, we will verify that the recruitment sample has a geographic distribution that is similar to the customer database and the distribution of home heating type (where available). As noted above, stratification of additional variables during the recruitment phase will ensure the final sample of 70 on-site surveys per EDC is representative of the entire EDC population.

At the statewide level, we will complete at least 490 on-site visits. Results at the statewide level would meet or exceed a margin of error of $\pm 5\%$ with 95% confidence.

Any additional specific customer group targets or carve-outs required for analysis also should meet at least $\pm 20\%$ precision, with 90% confidence. We can adjust statewide sample sizes to meet any additional group targets or increased confidence/precision requirements.

Again, we will work with the EDCs to develop the random samples of residential customers in each service area. We will use protocols that are similar to those we employed during Phase I to ensure that we meet all company and customer confidentiality requirements. Our cost proposal provides information on the additional cost our Team will charge per site for increasing the proposed sample size beyond 490 on-site visits.

SAMPLING PLAN- NONRESIDENTIAL

We will use a stratified sampling approach based on "highest potential impact" with the following confidence/precision criteria:

- 95/5 for the entire commercial sector at the state-wide level,

- 90/10 for the industrial sector at the statewide level,
- 90/10 for each EDC for the nonresidential s (total of five), and
- 90/20 at the EDC strata level for large-impact subsectors, such as industrial.

As part of our base scope of work, we propose following a sampling approach similar to that which we used in Phase I. Table 3-9 illustrates this distribution of available sample points across the state. This approach will require a minimum of 490 total surveys at the state level with 70 surveys per EDC (53 commercial and 17 industrial). This proposed approach uses the following proposed commercial sectors:

- Institutional (government, nonprofit, etc.)
- Office
- Restaurant
- Retail
- Warehouse
- Miscellaneous
- Industrial

Table 3-9: Sample Premises Distribution across EDC Subsectors

	Retail & Grocery	Restaurant	Warehouse	Institutional	Office	Industrial	Misc.	EDC Total
Duquesne	10	5	5	10	13	17	10	70
Met Ed	10	5	5	10	13	17	10	70
Penn Power	10	5	5	10	13	17	10	70
Penelec	10	5	5	10	13	17	10	70
PECO	10	5	5	10	13	17	10	70
PPL	10	5	5	10	13	17	10	70
WPP	10	5	5	10	13	17	10	70
Subtotals	70	35	35	70	91	119	70	490

As an additional scope of work, our Team is able to add additional sample points to any segment (or add additional segments) that the EDCs, stakeholders or TUS staff deem appropriate. For example, one approach would be to achieve 90/10 for all segments, including the restaurant and warehouse at the state-wide level (an additional 70 site surveys). Or our Team could conduct additional surveys for each EDC to achieve 90/20 at the EDC strata level of the large energy consuming segments such as office, institutional and retail. See Cost Proposal for more detail and costs on this additional scope of work.

REDUCING SAMPLE BIAS AND UNCERTAINTY

Sample bias occurs if a sample is selected incorrectly and does not represent the true population due to non-random reasons. For example, the residential sample may be biased toward an older population, since older people are more apt to be at home to accept and participate in a survey. We will make every effort to minimize such potential bias. As discussed in the sampling plan approaches for the residential and nonresidential sectors, we will ensure that we define the target population properly and that the sample frame, through stratification procedures, matches the population as much as possible.

In addition, we will recruit homeowners and managers for the on-site inspections in order to minimize bias in the sample of homes/buildings selected. Experienced personnel will recruit potential participants and will follow proper call-back protocols. In addition, we will offer homeowners the option of scheduling their on-site visits on weekdays, evenings, or weekends. If we believe that our findings show significant sample bias after we complete our analysis, we will weigh the findings to ensure that they represent the population.

We also will attempt to address other forms of uncertainty throughout the study process. For example, field technicians will receive training to ensure that they follow proper protocols and data entry procedures consistently across all EDCs to limit the possibility that inconsistent collection or measurement methods might cause observed differences.

WEIGHTING

Although we will attempt to minimize sample bias, the final sample selection may require a weight variable to make inferences to the population. We will compare selected demographic residential and nonresidential data collected through the on-site surveys to available data from recent surveys completed by the EDCs and from US Census data. Where differences between the sample and the population as a whole exist, we will develop a weighting variable to correct for any sample bias.

Furthermore, given the equitable 70 site surveys per EDC in the sample frame, we also will apply the appropriate weights to each EDC's findings when rolling up the data to the statewide level. Similar to the approach taken in the Phase I study, we will base these weights on the energy consumption share of each EDC in the state.

SECONDARY RESEARCH

The data collection and mining effort begins with a search of available secondary sources in an effort to streamline primary research efforts and identify gaps – either in the presence or quality of data. We propose reviewing any recent baseline and potential studies that have been completed for regions similar to Pennsylvania, including those completed during Phase I, to:

1. Help inform the focus of the study and provide direction on which residential and nonresidential subsectors have the largest potential energy savings; and,
2. Fill in gaps in data in which budgetary constraints may not allow for high levels of confidence in the myriad commercial subsectors or industrial end-uses.

SURVEY INSTRUMENT DEVELOPMENT

Using an on-site survey instrument and trained staff to review end-use equipment within the home or business will ensure a high level of accuracy. We will modify the survey instruments from Phase I as necessary to be as comprehensive as possible without being overly intrusive to the home or business owner. We will design the survey instrument to capture data similar to the Phase I baseline study effort to allow us to draw comparisons between the two efforts. We will provide a draft survey instrument to EDC personnel, the EDC evaluation teams, and TUS staff for review and comment.

We will develop the residential survey instrument as an electronic survey to be completed on tablet devices by the field technicians. Electronic data collection will facilitate future data entry and help ensure consistent results. The electronic survey instrument will be programmed to restrict data entry within selected expected ranges, which will allow surveyors to confirm the completeness of each survey before they leave the survey site. The GDS Team used this approach successfully for the Phase 1 residential baseline study.

We will continue to use hard copies for the commercial survey instrument. We have found the heterogeneous nature of commercial and industrial facilities requires the flexibility in recording data that only a pencil and paper can provide. A knowledgeable junior engineer will conduct the proper data QA/QC of the completed surveys to maintain consistent data entry across all EDCs.

The residential survey instrument will collect at least the following:

- HVAC equipment characteristics (including type, age, and energy efficiency of existing equipment, type of thermostat and temperature settings, etc.)
- Water heating characteristics (including fuel type, age, and energy efficiency of existing equipment and temperature settings)

- Type, characteristics, and energy efficiency level of major household appliances
- Household size (in square feet), number of rooms, and floor plan
- Building shell characteristics including, but not limited to: insulation type, insulation levels, windows, roof color, and qualitative assessments of proper duct sealing and air infiltration. The on-site surveyors will measure attic and floor insulation levels when easily observable.
- Number of light bulb sockets in and around the home
- Type, quantity, and location of lighting fixtures and bulbs
- Presence of energy efficiency measures (e.g., weather stripping, insulated blinds, duct insulation)
- Condition of HVAC ductwork, duct insulation, and duct sealing
- Type and number of faucets and shower heads
- Type and quantity of consumer electronic equipment
- Household demographics

The non-residential survey instrument is expected to collect similar data across the following end-uses:

- HVAC systems characteristics,
- Ventilation,
- Lighting Systems,
- Plug Load,
- Cooking,
- Refrigeration,
- Process Loads, and
- Water Use.

The survey instruments also might include a short energy decision-making survey to assess customers' awareness of major energy efficiency measures, perceived barriers to installing energy efficiency measures, and their most important DSM measure selection criteria. This market data will be useful to EDC program planners as they develop their Phase III DSM programs.

Task 2: Recruiting and Scheduling

RECRUITING

We will send recruitment letters to a stratified random sample of the population to inform potential participants that an energy survey is to be performed in their area and that a representative of the SWE team may contact them to ask them to participate. We recommend that the first recruitment letter be sent under the name and letterhead of each EDC to provide legitimacy to the recruitment effort, which likely will increase participation.

In order to then identify the homes and businesses where the site visits will take place, the Team will field a telephone recruitment survey to enlist interested and eligible participants. In cases of answering machines or no answers, customers will be called back at least 3 times before moving on to the next name. At least one of these callbacks should be on weekday evenings or on weekends. The Team will provide a call disposition log in the draft and final report for each study, including the number of calls made, refusals, ineligible customers, and other common categories. Overall, the success rate during the Phase I baseline studies was approximately 10% of all homes/businesses contacted.

In order to increase interest in the onsite visit for the Phase II baseline studies, the Team proposes to provide households a \$100 incentive for participation in the onsite visits. Similarly, businesses will receive a \$100 incentive for participation. These incentive levels are an increase over the Phase I baseline studies (\$50 per visit) and should increase the overall recruitment success rate above Phase I levels.

Incentives are also needed in order to reduce bias in the types of homes/businesses and characteristics assessed. The onsite visits will require each participant to take two or more hours out of their day and to allow unfamiliar individuals to examine their home or business. Incentives acknowledge the time and effort that participants give in support of the study.

Recruitment calls will be fielded in English and Spanish, the two most commonly spoken languages at home in Pennsylvania, according to the 2011 American Community Survey (94%). Only 3.9% of the population does not speak English “very well.”

SCHEDULING

After determining eligible homes and businesses for the baseline study, the Team will schedule onsite assessments. Where possible, the scheduler will cluster visits by EDC and in nearby cities and towns to minimize travel time and expenses. Although most visits are expected to occur during weekdays, the Team will perform evening and weekend visits as needed to accommodate the schedules of householders and businesses.

Task 3: Onsite Assessments

The GDS Team will conduct onsite visits in the first half of 2014. The team will visit 490 homes and 490 businesses throughout the state. As noted above, the sample size for each study can be increased at an additional cost.

VISIT PROCEDURES

A trained technician will arrive at the home or business at a time previously scheduled with the survey participant. The technician will have a picture name badge to identify him or her as an employee of the company, introduce him or herself, and ask for the contact person who was identified when the visit was scheduled. Based on previous experience, including the baseline studies conducted during Phase I, we estimate that comprehensive surveys usually take about two hours of “on-site” time for each residential customer, and three hours for each nonresidential customer.

Task 4: Data Preparation, Analysis, and Reporting

DATA PREPARATION

We will review all collected data fields for validity and completeness to ensure data quality across all responses. All data points will be scanned for entry errors as well as outliers. In addition to data entry errors, the Team will also check for internal consistency in recorded responses across fields. Any significant errors will be rechecked and/or confirmed with a follow-up phone call to the participant, where possible.

In addition, the make/model number of numerous equipment types will be collected during the on-site assessments. This recorded data allows for future verification of equipment efficiency and other important characteristics. While not all make/model numbers may be successfully located and verified through online databases, the accuracy regarding the saturation of efficient equipment will be significantly upgraded through this practice.

ANALYSIS

Following the data preparation effort, we will analyze the final dataset for all pre-determined building and end-use characteristics. The total number of observations for each data field will be recorded. Where appropriate, we will present the data as penetration percentages, saturation percentages, or averages. At a minimum, we will analyze data at the EDC, building type, and statewide levels.

We recognize that the findings of the Phase II Baseline Study are expected to be key inputs of the Market Potential Analysis and possible Phase III planning. Having conducted and analyzed the Phase I Baseline Study, we believe we are uniquely positioned to accurately and efficiently review both datasets

and understand the trend impacts that phases I and II of Act 129 have had on building and equipment characteristics across Pennsylvania. We will use this analysis in the Market Potential Analysis to more accurately assess potential Phase III targets.

REPORTING

For each of the sectors (residential and non-residential) the team will produce a draft report organized to address the project objectives and the associated research questions. The report for each sector will provide results at both the statewide and EDC-specific level. All tables will provide both the total number of observations as well as the percentage characteristics. After revising the draft report for each sector based on comments from the EDCs and the TUS staff, the Team will submit a final report for each sector. In addition, the EDCs will receive a database for each sector with information specific to their territory.

Project Schedule

We recognize that the baseline studies are an important input for the Market Potential Analysis and potential Phase III planning purposes. It is critical that the Market Potential Analysis be completed by December 2014. In order to meet this deadline, we must begin planning and coordination for the baseline studies in late 2013, and conduct onsite scheduling and visits in early 2014. The baseline studies would be completed in July 2014, allowing sufficient time to incorporate data derived from these studies into the Market Potential Analysis. We believe this schedule strikes an important balance between providing contemporary baseline data as close to the market potential analysis as possible, while also leaving enough time to properly analyze and incorporate the data into the market potential models.

The following schedule proposes key milestones and completion dates for the residential and non-residential baseline studies.

Task #	Task Description	Estimated Schedule
1	Baseline Study Planning and Coordination	11/2013 – 12/2013
2	Recruiting and Scheduling	1/2014 – 4/2014
3	On-Site Assessments	2/2014 – 5/2014
4	Data Preparation, Analysis, and Reporting	4/2014 – 6/2014

We propose to complete residential and non-residential baseline studies on a similar timeline and track in an effort to streamline and coordinate efforts between the Team and EDC personnel.

DELIVERABLE TASK 7: THE TEAM WILL DESIGN AND COMPLETE ENERGY EFFICIENCY BASELINE STUDIES FOR THE RESIDENTIAL, COMMERCIAL AND INDUSTRIAL SECTORS. ENSURE THE PHASE II BASELINE STUDIES INTEGRATE WITH AND UPDATE THE RESULTS OF THE PHASE I BASELINE STUDIES. THE BASELINE STUDIES ARE NEEDED TO SUPPORT AN UPDATE TO THE MAY 2012 MARKET POTENTIAL ANALYSIS AND REPORT TO THE COMMISSION TO PROVIDE GUIDANCE FOR A PHASE III OF ACT 129 EE&C PROGRAMS FOR PENNSYLVANIA.

3.8 Task 8: Energy Efficiency Potential/Demand Study

This section of our proposal provides our work plan for the required energy efficiency potential study and the optional demand response potential study. Our approach builds on the Pennsylvania potential study that our Team just completed for the Commonwealth in May 2012.

3.8.1 Task 1: Potential Study Kick-off Meeting

Our approach to developing a detailed and thorough project plan for the evaluation of the realistically achievable market potential begins with proper planning. WE propose to hold a special kick-off meeting for this study where we will discuss and listen carefully to State of Pennsylvania and the EDC's needs for this study. We expect to leave this special meeting with a clearly defined understanding of the project's specific objectives and will tailor all future activities to meet those objectives.

The mechanics of conducting energy efficiency potential studies are relatively simple in concept, and the GDS Team has developed industry-standard methods⁸ and tools with the flexibility to report potential savings and program economic indicators (TRC benefit/cost ratios) by customer sector and subsector, vintage, and end use. However, in addition to the application of our tools, we differentiate ourselves by paying particular attention to our customers' needs.

It is in the area of company-specific objectives that we focus particular attention. We understand the Commonwealth of Pennsylvania's perspective on considerations for energy efficiency planning tailored to closely match the specific characteristics of respective EDC service territories. To refine our understanding and provide the foundations for the study, we will complete the following activities and collect the described documents at the kick-off meeting:

- Establish a jointly held vision of study parameters (e.g., objectives, coordination and communication protocols, schedule, final report outline, level of granularity, etc.).
- Identify any pertinent regulatory, corporate, or market sensitivities (or potential developments) that might create significant analytical uncertainties or otherwise affect the study process.
- Issue the following data requests to each EDC:
 - Discuss and collect documentation of annual system load and customer forecasts (both growth and decay), and load profiles.
 - Discuss and collect actual sales and customers billing data at highest available level of resolution.
 - Gather data on and documentation of current and forecasted electric consumption and peak-period demand.
 - Discuss and collect documentation of annual system load profiles.
 - Collect system economic data (e.g., economic discount rates, capital inflation rates, avoided costs, etc.).
 - Review available primary data collected by the implementation contractor.

Information gathered as part of, or soon following, the kick-off meeting will allow the GDS team to develop and refine the scope of work and Study Execution Plan to be followed for the project.

QUALITY ASSURANCE AND CONTROL

Market potential studies are data-intensive endeavors with thousands of data points that must be properly compiled and synthesized from multiple primary and secondary sources. Through its experience in past studies, the GDS Team has implemented a number of processes as a means to minimize the possibility for errors in the data, calculations and reporting. These processes include:

- Screen all secondary data for applicability to Pennsylvania and make adjustments for weather, demographics, etc., as appropriate.
- Benchmark all market data against other regional sources as a means to assess the most reasonable findings.
- The GDS Team's models have several layers of data-validation and checks built into them to ensure that numbers are accurate (e.g. percentages sum to 100% check, color-coded cell inputs/outputs, numbers sum to top-line forecasts checks, etc.).
- Assign experienced staff to oversee and review the findings of junior staff's work to ensure reasonableness.
- Assign an in-house editor to review draft and final reports to ensure proper grammar, table-referencing, consistency in findings, as well as ensure the report is acceptable for non-technical audiences.

⁸ The GDS team follows the general framework for market potential studies as defined in the "Guide for Conducting Energy Efficiency Potential Studies: A Resource for the National Action Plan for Energy Efficiency (NAPEE)", November 2007.

PROJECT SCHEDULE

The GDS Team has prepared a project schedule that will allow us to complete all necessary tasks, milestones, and deliverables on-time in support of presenting our comprehensive final results. The project schedule is shown below in Table 3-11.

Table 3-10: Project Schedule

MILESTONES AND DELIVERABLES	Estimated Date
Statement of Work Meeting	January, 2014
Final Work Plan Delivered	March , 2014
Baseline Inspection Completion	June, 2014
Develop Disaggregated Baseline and Forecast	July, 2014
Draft List of Measures Submitted	June, 2014
Submit Draft Measures with all Assumptions (cost, savings, life, etc.)	August, 2014
Develop Technical & Economic Potential	September, 2014
Determine Achievable/Program Market Potential	October, 2014
Draft Market Potential Report	November, 2014
Final Reports	December, 2014
Monthly Status Reports	Monthly Reports

As indicated in the table above, the GDS Team is estimating a 9 month schedule to complete the tasks as outlined in the RFP. The proposed timeline is subtly different from the timeline listed in the RFP to allow for the added tasks of primary data market research of premise technologies and customer behavior. The final timeline and associated scope, however, will be discussed and finalized with TUS staff.

3.8.2 Market Potential Task 2: Market Research

Our approach to Market Research will include the following subtasks:

CONDUCT PRIMARY MARKET RESEARCH

DETERMINE BASELINE ENERGY USE AND END-USE SATURATION

DISAGGREGATE THE LOAD FORECAST

3.8.2.1 Conduct Primary Market Research

Additional primary research will be needed to supplement and calibrate data collected in the baseline studies. The steps below outline our proposed primary research methodology to collect the necessary data through surveys of representative samples of customers and trade-allies.

Survey of Retailers

Retailers can provide important insight into the market share and saturation of a number of products, including programmable thermostats, water heaters, clothes washers, clothes dryers, and refrigerators. A sample of retailers will be selected, stratified by store type (e.g., home improvement, hardware store, appliance specialty store, etc.), and national chain vs. local independent.

Survey of Trade Allies

Interviews with contractors, dealers, distributors, and other trade allies provides a cost-effective research approach, as business activity tends to be concentrated among relatively few market actors (i.e., fewer interviews can provide detailed insight into market activity). Trade ally interviews can also be leveraged to assess market share and estimates of market saturation for multiple sectors during a single interview.

We will utilize, as best possible, any existing data and/or relationships already established to develop the sample. The sample of trade allies will include both program participants and nonparticipants. Because of the importance of HVAC measures, half of the respondents will be HVAC trade allies, while the remaining interviews will include plumbers, mechanical contractors and wholesalers, building controls/automation vendors, lighting vendors, electrical contractors and wholesalers (motors/ASDs), industrial refrigeration vendors and specialists, and compressed air vendors and specialists.

3.8.2.2 Determine Baseline Energy Use and End-Use Saturation

A critical first step in estimating energy efficiency potential is establishing a realistic energy use baseline and end-use saturation numbers upon which a 10-year “business as usual” forecast can be constructed. The approach described below outlines this process and is followed by a discussion of the approach to defining the existing energy savings baseline for DSM measures.

The GDS Team will utilize a compiled database of information on utility loads and sales forecasts, market data (fuel shares, energy system saturations, and structural characteristics), end-uses (energy use intensities and load shapes), and measure characteristics (technologies, costs, life, and savings) from existing data sources as available, such as the TRM.

Our data collection and mining effort involves a search of available secondary sources that could include:

- Load Shape Libraries. (The GDS Team maintains extensive collections of end use load shapes and DSM measure impact shapes).
- Baseline saturations, fuel shares, efficiency levels, EUI and other datasets collected for regions nearby to the EDC service territories with similar weather characteristics. For example:
 - Data from primary data collected from site inspections from the Phase 1 SWE audit activities..
 - Data from primary data collected from program implementers, particularly for residential sector programs.
 - Primary data collected during the Phase I baseline studies and market potential study for Pennsylvania’s seven largest investor-owned utilities.
- Other national studies. Examples include:
 - Residential Energy Consumption Study (RECS, with household characteristics data tables)
 - Commercial Buildings Energy Consumption Study (CBECS)
 - Latest available Pennsylvania TRM

3.8.2.3 Load Disaggregation and Forecast Study

After the collection of applicable secondary data sources, the next step is to disaggregate the most recent year of completed sales into a baseline year for each EDC. In its study, the SWE team will disaggregate end-use loads and apply them across the study horizon by:

- Determining energy consumption per customer class and segment in baseline year.
- Disaggregating customer class loads into end-use loads.
- Developing load profiles.
- Analyzing and calibrating data.

- Forecasting the 10-year end-use energy consumption.

Determine Energy Consumption per Customer Class and Segment in Baseline Year

The next step in the forecast disaggregation analysis is to determine energy loads for the residential, commercial and industrial customer classes. Separate models will be developed for the residential, commercial and industrial sector for each utility. After that, segmentation per market segment is provided including:

Residential: Single-family, multi-family home, new construction markets.

Commercial: Typically based on major Commercial Buildings Energy Consumption Survey (CBECS) business types. Additional segments can be defined based on customer size if data are available and desired.

Industrial: As determined by actual load consumption shares

End-Use Load Classification

The next step in the forecast disaggregation analysis is to establish the end-use loads within the residential and commercial market segments, and would include loads found in Table 3-11. In the residential sector, the GDS Team will also rely on building simulation modeling with results calibrated to the baseline year to help inform end-use load. The REM/Rate and TREAT models are widely used simulation models that were developed to estimate energy use in residential homes. Model inputs include housing characteristics, appliance ownership, weather data, and average occupancies. These models can then also be used to estimate electric and other fuel savings due to installation of energy efficiency measures.

Table 3-11: Sample of End-Use Loads

Residential	Commercial	Industrial
Space Heating	Space Heating	Space Heating
Water Heating	Water Heating	Water Heating
Lighting & Appliances	Lighting	Lighting
Air Conditioning	Air Conditioning	Processes

Develop Load Profiles

Through its delivery of similar DSM potential studies, the GDS Team has gathered and developed energy load profiles for numerous market territories. We propose an approach to developing energy load profiles which involves calibrating existing load profile data with variables specific to each EDC service territory.

We will adjust the load profile using the closest approximation to each EDC unique composition of customers within its service territory as possible. The GDS Team will carefully evaluate the characteristics of each EDC service territories and amend existing hourly load profiles by adjusting for variables such as weather, building characteristics, regional code requirements, technology saturation, and any additional variables that influence the load shapes of each EDC's customers.

3.8.3 Market Potential Task 3: Energy Efficiency Potential Analysis

The GDS Team has developed industry-standard methods and tools with the flexibility to report energy efficiency potential savings and program economic indicators by customer class and year. What separates the GDS Team from the competition is our unique understanding of the entire life-cycle of DSM programs – from planning and design to implementation and evaluation. Our strength in data organization and software development positions us to provide an industry-leading study for each EDC and the external stakeholders.

DYNAMIC MODELING & PROGRAMMING CAPABILITIES

The GDS Team will leverage our extensive programming knowledge and experience to provide energy efficiency potential results to each EDC by utilizing The GDS Team's in-house developed Microsoft Excel-based modeling tools. Our modeling tools are built on a platform and they provide the ability to run multiple scenarios and re-calculate potential savings based on variable inputs such as sales/load forecasts, discount rates, and actual program savings. Our Excel-based models provide users with the up-most transparency into the assumptions and calculations used by the GDS Team for estimating market potential. Our models have been consistently upgraded and refined over the past several years, with the most recent major upgrades occurring in 2012.

MEASURE LIST RESEARCH

Once the baseline forecast is disaggregated, the next step to assessing market potential is to accurately detail the universe of energy efficiency measures and their savings, costs, and lifetimes. Measures that are currently implemented in each EDC's DSM portfolios, as well as those measures found in the Pennsylvania TRM, will receive careful consideration since these measures already have a historical record and the EDCs have proven processes for implementation. Additionally the GDS Team, through its previous assignments, has compiled one of the most comprehensive sets of energy efficiency measures for Pennsylvania available today. Our detailed national library of energy efficiency measures includes all measures available from the Pennsylvania TRM and existing EDC programs as well as additional measures from the Northwest Power and Conservation Council's Regional Technical Forum (RTF), the California Database for Energy Efficiency Resources (DEER), and the New York State Energy Research and Development Authority (NYSERDA) deemed savings database, as well as other measures the GDS Team has characterized in similar studies and Technical Reference Manuals developed for other states. From these regionally relevant databases measures that are commonly available, based on well-understood technology, and applicable to the buildings and end-uses in each EDC's territories, will be selected for the initial measure list for this study for Pennsylvania. Consideration will also be given to measures that show promise for future viability but have not yet gained a foothold in the market.

Once a draft of the final list of energy efficiency measures has been compiled, it will be sent to the TUS, the EDC's and external stakeholder for review and feedback. We will work closely with TUS staff to ensure that all appropriate measures are included and to develop the final list of measures to be considered in the study.

REVIEW OF POTENTIAL MEASURE BASELINES AND DETERMINING MEASURE IMPACTS

Upon finalization of the energy efficiency measure list data on energy savings, costs, lifetime, and applicability will be collected to determine potential measure impacts. This work is performed through a five step process.

Step 1: Define market classes for application of measures

In line with the disaggregated load forecast, the GDS Team will define the applicability of the appropriate fuel type, sectors, market segments, vintages, and end-uses to each of the measures. These classes are defined as follows:

- **Customer Sectors:** Residential, commercial and industrial.
- **Market Segments:**
 - *Residential:* Single-family, manufactured home, and new construction markets.
 - *Commercial:* Typically based on major business types. Additional segments can be defined based on customer size if data are available and desired.
- **Vintages:** Existing and new.
- **End-Uses:** Space heating, space cooling, lighting, water heating, cooking, processes.

Step 2: Screen sectors, segments, and end-uses for eligibility

The GDS Team will screen market segments and end-uses for applicability of specific energy efficient strategies. For example, certain commercial end-uses, such as cooking loads, may not be appropriate for segments such as offices and warehouses, and may be analyzed only in limited market sectors. Additionally, some sizes of equipment may not be applicable to certain segments, even if the end use is present.

Step 3: Develop base case impacts and costs

For each of the energy efficiency measures on the final list, base case equipment efficiency and practices will be determined. A description of all base case equipment efficiency and practices will be written in a format identical to the Pennsylvania TRM, along with a description of why that particular base case was the best representation. All base case assumptions and data, such as local and federal codes and standards, will be included.

Step 4: Develop energy efficiency measure impacts and costs

A description of all energy efficiency (or “change case”) measure equipment efficiency and practices will be included in the final report. All assumptions relating to measure costs, savings and useful lives will be provided in report appendices.. In addition to the energy impacts for each measure, at the direction of TUS staff, the GDS Team can also consider non-energy quantifiable metrics such as carbon dioxide reduction.

We will obtain costs for each energy efficiency measure from the Pennsylvania Incremental Cost Database recently developed by the GDS Team for Phase I. In addition to the sources noted above, we will use such sources as RSMMeans or calls to local contractors, when appropriate, to collect cost data for measures not included in the Pennsylvania Incremental Cost Database.. Research will also be performed to update the measure life for each energy efficiency measure.

Where applicable, non-energy benefits will also be assessed as part of the study in the context of both incremental costs and savings. For example, certain measures typically have lower operations and maintenance costs, which will reduce the incremental costs of the measures. Other measures, such as clothes washers and pre-rinse spray valves, offer water savings in addition to energy savings.

Step 5: Integrate base case and energy efficiency measure data

The GDS Team will integrate data (measure per-unit costs, savings, and measure life) for all of the resources with baseline building stock data (base-case fuel and end-use saturations, measure applicability factors, and current measure saturations) and baseline energy usage data to produce estimates of the levelized cost-of-conserved-energy (CCE) for each measure.

ESTIMATING ENERGY SAVINGS POTENTIAL AND DETERMINE MARKET POTENTIAL

Drawing on the previous data compilation, organization, and market analysis tasks, the estimation of market potential is conceptually a straightforward exercise.

DEVELOP BASELINE FORECAST

The baseline forecast is created by combining all of the inputs compiled in prior tasks to obtain average consumption estimates by customer segment, construction vintage and end use, and summing these up to the sector level. The disaggregated forecast data provides the foundation. For example, in the residential sector, the general equation for the DSM baseline forecast is:

$$\text{Equation 1: } Forecast_{BL} = \sum_{i,j,t} HH_{i,t} \times EUS_{i,j,t} \times UEC_{i,j,t}$$

Where: $HH_{i,t}$ = the number of households of type i in year t
 $EUS_{i,j,t}$ = the saturation of end use type j in household type i in year t
 $UEC_{i,j,t}$ = the unit energy consumption of end use j in household type i in year t

ESTIMATE TECHNICAL POTENTIAL

The measure-level inputs will be used to estimate technical potential over the planning horizon. This is accomplished by creating an alternate forecast where consumption is reduced by the installation of all technically feasible measures. For technical potential, which represents substitution of all technically feasible measures at the end use level (and following the residential example above), the general equation is:

$$\text{Equation 2: } Forecast_{TP} = \sum_{i,j,t} HH_{i,t} \times EUS_{i,j,t} \times UEC_{i,j,t}$$

Where: $HH_{i,t}$ = the number of households of type i in year t
 $EUS_{i,j,t}$ = the saturation of end use type j in household type i in year t
 $UEC_{i,j',t}$ = the unit energy consumption of end use j' (the most efficient end use technology configuration) in household type i in year t

The technical potential for DSM is simply the difference between **Equation 1** and **Equation 2**. Because measures anticipated to be installed in the absence of utility intervention are included in the baseline forecast in **Equation 1** (and, thus, the technical potential forecast), savings due to already occurring conservation will be removed from the technical potential estimates.

ADDRESSING NATURALLY OCCURRING ENERGY EFFICIENCY

As noted above, one of the first steps in the potential study is to disaggregate utility sales forecasts, as all estimates of potential are ultimately calibrated back to these forecasts. Therefore, getting the forecasts correct is critical. It is also in the sales forecasts where we incorporate naturally occurring adoption, which is the savings estimated to occur as a result of normal market forces. The GDS Team will work with forecasters at each EDC to ensure that the sales forecasts incorporate two known sources of naturally occurring adoption:

- **Codes and standards.** The sales forecasts should be reduced for known code changes. While some code changes have relatively little impact on the overall sales, others – particularly the Energy Independence and Security Act (EISA) and other federal legislation – will have noticeable impacts. In one of our recent studies we worked with the utility to quantify these impacts and adjust the forecast accordingly.
- **Efficiency measure baseline penetration.** In order to properly account for the full amount of DSM potential, we will work with the forecasters to ensure that the forecasts exclude future DSM efforts, but include baseline efficiency penetration.

By properly accounting for these factors the potential study will estimate the net penetration rates, which represent the difference between the anticipated adoption rates of the efficiency measures after intervention and the “business as usual” adoption rates absent efficiency intervention.⁹ This is true even

⁹ As defined in the “Guide for Conducting Energy Efficiency Potential Studies: A Resource for the National Action Plan for Energy Efficiency (NAPEE)”, November 2007.

in the technical and economic scenarios, where the efficiency-case penetration will approach 100 percent, and particularly important in the achievable potential analysis, where we estimate the percentage of eligible measures (and associated savings) that can be expected to occur net of baseline penetration rates (people who would buy the efficient technology in the absence of any program intervention).

Ultimately, the estimates for these baseline penetration rates are derived from a mix of recent research. We will use a combination of data from recent evaluations and the baseline studies that we will be conducting. Estimates of free ridership are important indicators of naturally occurring adoption. Measures with high free ridership will have correspondingly high rates of naturally occurring adoption, while measures with low free ridership represent areas of greater program potential.

Estimate Economic Potential

The next step is to create an alternative forecast of “economic” DSM potential (i.e., considering the most efficient measures that pass economic screening tests, specifically the Total Resource Cost (TRC) as defined by the orders in the State of Pennsylvania. Again following the residential example, the general equation is:

$$\text{Equation 3: } Forecast_{EP} = \sum_{i,j,t} HH_{i,t} \times EUS_{i,j,t} \times UEC_{i,j,t}$$

- Where:
- $HH_{i,t}$ = the number of households of type i in year t
 - $EUS_{i,j,t}$ = the saturation of end use type j in household type i in year t
 - $UEC_{i,j,t}$ = the unit energy consumption of end use j (the most efficient end use technology configuration *that is also economic*) in household type i in year t

Similar to the calculation of technical potential, the economic potential for DSM is the difference between **Equation 1** and **Equation 3**.

Utility-specific data on avoided costs, line losses, discount rates, etc., collected during the kick-off meeting for this study or through data responses, are incorporated to perform a full cost-benefit analysis (TRC) for every sector and measure.

The cost component of the economic screen consists of the incremental measures costs and ignores any programmatic costs (e.g. marketing, analysis, administration) that would be necessary to capture them. This is consistent with the definition of economic potential as defined by the National Action Plan for Energy Efficiency. Programmatic costs would, however, be included in any estimates of EDC acquisition costs associated with achievable and program potential.

Estimate Achievable Potential

The assessment of realistically achievable energy efficiency potential requires estimating, among other parameters, the rate at which cost-effective measures can be adopted over time. Because program implementation scenarios have a direct influence over such market penetration rates, the GDS Team typically incorporates individually developed sets of market penetration curves corresponding to implementation scenarios. These scenarios may be correlated to differing levels of urgency in program implementation, tolerance for rate impacts, macroeconomic conditions, or other situations. The initial kick-off meeting for this study would be the forum for discussing and defining these scenarios.

There are important components in the determination of achievable potential:

- **Customers' willingness to participate.** The likelihood that customers will participate in energy efficiency programs is a function of several factors, most notably incentive level. NPE has performed several studies to attempt to estimate customers' expected behavior at different incentive levels through surveys and secondary research. The GDS Team will also rely on the results of interview questions proposed within the on-site inspections portion of this study to assess customers' willingness to participate in DSM programs. Achievable potential will be estimated for several different incentive-level scenarios to examine the variance in expected savings.
- **Uncertainty.** Filing and planning requirements often necessitate a point-estimate of potential; however, this is not an accurate reflection of the reality of DSM programs. We prefer to think of achievable potential as a range, or probability distribution, where the point-estimate is the most likely outcome. This distribution defines the lower and upper bounds of expected savings, as well as the most likely value.

Estimate Programmatic Potential

Program potential refers to the efficiency potential possible given specific program funding levels and designs. In effect, program potential estimates the subset of achievable potential from a given set of programs and funding. The GDS Team will investigate up to five scenarios of program potential based on different spending and savings goals. The primary scenario will be one that is based upon the program spending cap established by Act 129. Other scenarios will be developed in consultation with TUS staff.

There are important components in the determination of program potential:

Benchmarking. The amount of savings expected to be achievable through DSM programs will be informed by the experience of utilities across the region and nation. Several metrics will be used in this analysis, including percent of sales saved, percent of load growth offset, and spending as a percent of revenue.

The GDS Team suggests developing a second program potential scenario that utilizes a "benchmarking" approach in conjunction with consultant experience. The benchmarking analysis examines the penetration rates of existing energy efficiency programs and portfolios across several regions of the US, looking for relationships between incentive levels with program impacts. Ultimately this benchmarking approach will enable the GDS Team to estimate reasonable market penetration curves for this second scenario, based on empirical results of similar DSM programs, to use when modeling alternative program potential scenarios. Some of the sources for this analysis include:

- The historic performances of each EDC's programs, which will help inform the empirical bounds for achievable potential results.
- Other market potential studies for regions similar to Pennsylvania in terms of program maturity, socio-economics, household/business characteristics, etc.
- FERC Form 861 data which provide portfolio-level results such as that filed in program administrator annual reports.

DATA ANALYSIS OVERVIEW

As mentioned above, the GDS Team will utilize Microsoft Excel-based market potential models to assess energy efficiency potential in each EDC's service territories. We will use separate potential models to disaggregate sales forecasts and generate achievable potential estimations for each EDC's residential, commercial and industrial customer classes (one model for each utility and customer class). Our models enable us to view savings potential at high resolution—by year, vintage (new/turnover/early retirement), energy end use, and customer class for each scenario—then combine these savings to realize overall potential, or any cross section of overall potential. The flexibility of the models will facilitate development of the utilities' Program Planning efforts, enabling us to pinpoint first-year

savings potential in a single rate class across residential and commercial sectors, as an example, or potential for a specific measure in one service territory as compared to the other. The following are some examples of data fields used in potential models:

- **End-Use Applicability:** Percentage of floor stock with a given end-use that is eligible for conversion to a more efficient state. Varies by scenario, customer class, vintage, and end use.
- **Energy-Use Intensity (EUI):** A measure of energy consumed per square foot of floor space, per year. Savings percentages are applied to EUIs in the commercial potential models to approximate unique savings potential by end-use.
- **Expected Useful Life (EUL):** The number of years until 50 percent of installations of a given measure is still providing savings. EUL is the period over which the benefits of a measure are expected to accrue; the net present value of these benefits is used to determine cost-effectiveness. EULs are also used to determine equipment turnover periods.
- **Market Penetration Curve:** The rate of acceptance of efficiency programs in a given scenario. These curves will be developed based on the benchmarking approach described above. Scaling factors can be applied to these curves in order to realize penetration rates by equipment vintage and end-use.

The final deliverable will be provided in both report format, along with the flat Excel files, which will have all the inputs and assumptions, calculations, and output tables and figures.

3.8.4 Task 4: Final Report

The GDS Team will work closely with the TUS staff to develop a draft report with an outline and format that is structured to provide maximum benefit for both system and program planning. The initial outline of our report will follow the Table of Contents of our May 2012 potential study report for Pennsylvania. Prior to submitting a Final Report, we will submit a Draft Final Report for TUS staff review and comments. In addition to the Final Market Potential Report, all of the inputs and outputs of the energy efficiency models will be available in electronic form in Microsoft Excel or comma separate value formats.

We propose that the final market potential study report will be organized in two volumes. The first volume will provide an executive summary of the study findings, an introduction to the study, methodology and the results from the tasks identified in the RFP and this proposal. Included in the report will be an overview of the calculation methodology for technical, economic, achievable, and programmatic potential, including descriptions of the economic tests performed. We will also describe our approach to determining measure information, technology saturations, and market penetration rates. All of the inputs and outputs of the model will be included as an appendix to the report and will be available in electronic form. This will be completed for each company uniquely.

The second volume will contain appendices documenting the data and tools underlying the results, including data assumptions and resources, and measure and technology costs and savings.

3.8.5 Task 5: Regulatory Support

This task includes hosting internal and external workshops to build common understanding of key assumptions, analytical parameters, and results among relevant stakeholders, as determined the TUS staff. These workshops will have clearly outlined agendas, address frequently asked questions and have clearly defined timeframes for comments and questions. Meetings will broadcast via webinar to invited stakeholders.

The GDS Team is also prepared to offer assistance with responses to regulatory inquiries and data requests on an as-needed basis, as well as meetings with stakeholders (per RFP). The GDS Team has provided similar support for the requested expert witness testimony for the Utility Regulatory Commission. We are very familiar with the types of requests that are typically made, as well as the appropriate amount of detail to supply to comply with requests and inquiries.

Our approach to the tasks outlined in the RFP for this project includes detailed data tracking and transparency in how calculations are assembled and executed. We are experienced and comfortable defending challenges or questions about our work. We are committed to supporting the TUS staff throughout the process and will commit the project team's availability as needed. Our Principals on this project have many years of experience providing regulatory support, regulatory assessments, and expert testimony for State Commissions, government agencies, and the federal government.

DELIVERABLES TASK 8: OUR TEAM WILL CONDUCT A STATEWIDE MARKET (ENERGY EFFICIENCY) POTENTIAL STUDY TO DETERMINE THE REMAINING OPPORTUNITIES FOR COST-EFFECTIVE ELECTRIC ENERGY EFFICIENCY SAVINGS IN THE SERVICE TERRITORIES OF THE SEVEN EDCs IN PENNSYLVANIA THAT ARE SUBJECT TO ACT 129. THIS STUDY WILL FOCUS ON KWH AND KW TARGETS TO BE ACHIEVED BETWEEN JUNE 1, 2016 AND MAY 31, 2021. THE TEAM WILL HOST INTERNAL AND EXTERNAL WORKSHOPS TO BUILD COMMON UNDERSTANDING OF KEY ASSUMPTIONS AND RESULTS AMONG RELEVANT STAKEHOLDERS, AS DETERMINED BY THE TUS STAFF.

3.9 Task 9: Meetings and Other Requirements

The GDS Team will perform the following other tasks as needed.

1. **Weekly TUS/SWE Teleconferences:** We will hold weekly teleconferences with TUS staff to discuss audit activity plans for the coming week, the status of quarterly and annual reports, updates needed to the Technical Reference Manual, and any other topics pertaining to work assignments for the coming week. Dick Spellman will be responsible for preparing the agenda for this weekly meeting, and Kaytie Ruditys will continue to prepare the minutes and action items from these teleconferences.
2. **Bi-weekly teleconferences with EDCs:** We will continue to hold bi-weekly teleconferences with each of the EDCs to discuss audit activities and EM&V issues.
3. **Monthly PEG meetings:** We will prepare the agenda for the monthly meetings of the Program Evaluation Group and will prepare minutes of these meetings. These monthly meetings will be conducted in the same format as done during Phase I of Act 129.
4. **Stakeholder meetings as necessary:** Key members of the GDS Team will attend Stakeholder meetings and deliver presentations on the results of baseline studies, market potential studies, and recommendations for program modifications and targets for Phase 3 of Act 129.
5. **Briefings for Commissioners as needed:** As done during Phase I, key members of the Team will brief the Commissioners on key findings and recommendations from audit activities, baseline studies and market potential studies as needed.
6. **Semi-annual evaluation best practices workshops:** As done during Phase I, the Team will conduct semi-annual best practices workshops relating to evaluation methodologies. The Team will be responsible for preparing the workshop agenda and for preparing all presentation materials.
7. **Monthly progress reports:** Dick Spellman and Kaytie Ruditys will prepare monthly progress reports and email them to Darren Gill of the TUS each month, as done during Phase I.
8. **Budget tracking:** On a monthly basis, the SWE Team will compile an Excel worksheet summarizing SWE spending and email it to the TUS staff.
9. **Special Demand Responses studies and analyses as needed:** The Team will prepare detailed analyses and research to respond to ad hoc requests from the TUS relating to demand response issues.
10. **Review of EDC EE&C Plans on an annual basis:** We will review and critique annual filings of EE&C plans made by the EDCs, and will provide comments and recommendations to TUS staff.
11. **Respond to other ad hoc requests from the TUS staff or Commissioners for special analyses or research.** We will make it a priority to respond to such requests on a timely basis.

DELIVERABLES TASK 9: THE TEAM WILL CONDUCT ROUTINE MEETINGS WITH THE TUS STAFF AS WELL AS THE EDCs AND THEIR EVALUATORS. THE TEAM WILL ATTEND OTHER STAKEHOLDER MEETINGS OR COMMISSION BRIEFINGS AS

NECESSARY. THE TEAM WILL ALSO SUBMIT MONTHLY PROGRESS REPORTS AND BUDGET TRACKING TO HELP ENSURE THAT ALL REQUIRED TASKS ARE COMPLETED EFFICIENTLY AND ON TIME. THE TEAM WILL RESPOND TO OTHER AD HOC REQUESTS FOR SPECIAL ANALYSIS OR RESEARCH AS NEEDED.

3.10 Task 10: Testimony

As required in the Commission's RFP on pages 37 to 38, the GDS Team understands that the Statewide Evaluator team is required to stand behind its conclusions and recommendations by testifying and by aiding in the preparation of testimony by Commission staff, if necessary, in any future rate case or other proceeding before the Commission or for proceedings in other venues. We understand that our SWE Team will be required to provide factual support for its conclusions and recommendations in such testimony. Dick Spellman and Patrick Burns of the Phase I SWE Team prepared and filed such testimony on behalf of the Commission staff in the Commission's evidentiary hearings relating to the SWE's recommended kWh and kW savings targets for Phase II of Act 129. Both Mr. Spellman and Mr. Burns have substantial experience testifying before state regulatory commissions on EM&V issues.

We also understand that SWE consultants involved in providing such testimony shall be compensated at 150% of the hourly rates indicated in our proposal. As noted in the Commission's RFP, these costs will be in addition to and billed separately from the base contract amount at 150% of the consultant hourly rates provided in the Contractor's Proposal.

DELIVERABLE TASK 10: THE TEAM WILL BE REQUIRED TO PROVIDE FACTUAL SUPPORT FOR ITS CONCLUSIONS AND RECOMMENDATIONS BY TESTIFYING OR AIDING IN PREPARATION OF TESTIMONY BY COMMISSION STAFF, IF NECESSARY, IN ANY FUTURE RATE CASE OF OTHER PROCEEDING BEFORE THE COMMISSION.

3.11 Task 11: Ongoing Obligations

Data, records, and other materials collected or created by our Team regarding evaluation of the conservation plans will be maintained for a period of no less than 10 years. Given the decreasing cost of data storage capacity and the increasing reliability, security, and accessibility of web-based "cloud" storage, we understand that GDS (the prime contractor) will be responsible for maintaining all data, records, or other materials for at least 10 years. GDS will also notify the Commission and allow access to all materials prior to any destruction or deletion of such materials.

DELIVERABLE TASK 11: THE PRIME CONTRACTOR (GDS) WILL BE RESPONSIBLE FOR MAINTAINING ALL DATA, RECORDS, OR OTHER MATERIALS FOR AT LEAST 10 YEARS, AND WILL NOTIFY THE COMMISSION AND ALLOW ACCESS TO ALL MATERIALS PRIOR TO ANY DESTRUCTION OR DELETION OF SUCH MATERIALS.

3.12 Task Assignments by Consultant

The following tables list the estimated hours by task for each consultant proposed:

3.12 Task Assignments by Consultant

Year 1 Audit

Title	Name	Firm	Hours
President	Dick Spellman	GDS	1062
President	Jane Peters	RIA	280
Principal/ Stockholder	Salil Gogte	Nexant	380
Principal/ Stockholder	Patrick Burns	Nexant	95
Principal/ Stockholder	Scott Albert	GDS	105
Principal/ Stockholder	Rick Hackner	GDS	125
Principal/ Stockholder	Marjorie McCrae	RIA	200
Principal/ Stockholder	Bobbi Tannenbaum	RIA	227
Vice President			
Managing Director	Scott Dimetrosky	Apex	114
Managing Director	Tom Londos	GDS	350
Managing Director	Tim Clark	GDS	330
Managing Director	Bob Fratto	GDS	300
Senior Project Manager			0
Project Manager	Jeffrey Huber	GDS	225
Project Manager	Irwin Kim	Nexant	300
Project Manager	Dulane Morgan	RIA	200
Project Manager	Tyler Hammer	Nexant	300
Project Manager	Jesse Smith	Nexant	886
Project Engineer/ Project Consultant	Caroline Guidry	GDS	440
Project Engineer/ Project Consultant	Pranav Jampani	Nexant	1475
Project Engineer/ Project Consultant	Katie Parkinson	Apex	100
Project Engineer/ Project Consultant	Jason Hinsey	Nexant	1103
Engineer/ Analyst	Andrea Jester	GDS	385
Engineer/ Analyst	Warren Hiron	GDS	100
Engineer/ Analyst	Adam Gardels	RIA	175
Engineer/ Analyst	Anna Kim	RIA	175
Engineer/ Analyst	Susan Lutzenhiser	RIA	250
Engineer/ Analyst	Marnie McPhee	RIA	250
Engineer/ Analyst	Tingting Xue	Nexant	306
Engineer/ Analyst	Katie Ryder	Nexant	375
Associate Engineer/ Associate Analyst	Drew Trafton	GDS	380
Associate Engineer/ Associate Analyst	Casey Nolan	GDS	380
Senior Engineering Assistant	Lisa Wilson	GDS	0
Executive Assistant	Kaytie Ruditys	GDS	514
Engineering Assistant/ Administrative Assistant	Melissa Young	GDS	200
Engineering Assistant/ Administrative Assistant	Marty Alcala	GDS	200

Year 2 Audit

Title	Name	Firm	Hours
President	Dick Spellman	GDS	705
President	Jane Peters	RIA	331
Principal/ Stockholder	Salil Gogte	Nexant	300
Principal/ Stockholder	Patrick Burns	Nexant	30
Principal/ Stockholder	Scott Albert	GDS	50
Principal/ Stockholder	Rick Hackner	GDS	50
Principal/ Stockholder	Marjorie McCrae	RIA	200
Principal/ Stockholder	Bobbi Tannenbaum	RIA	139
Vice President			0
Managing Director	Scott Dimetrosky	Apex	150
Managing Director	Tom Londos	GDS	228
Managing Director	Tim Clark	GDS	250
Managing Director	Bob Fratto	GDS	250
Senior Project Manager			0
Project Manager	Jeffrey Huber	GDS	375
Project Manager	Irwin Kim	Nexant	480
Project Manager	Dulane Morgan	RIA	125
Project Manager	Tyler Hammer	Nexant	300
Project Manager	Jesse Smith	Nexant	831
Project Engineer/ Project Consultant	Caroline Guidry	GDS	450
Project Engineer/ Project Consultant	Pranav Jampani	Nexant	1500
Project Engineer/ Project Consultant	Katie Parkinson	Apex	100
Project Engineer/ Project Consultant	Jason Hinsey	Nexant	800
Engineer/ Analyst	Andrea Jester	GDS	600
Engineer/ Analyst	Warren Hirons	GDS	250
Engineer/ Analyst	Adam Gardels	RIA	175
Engineer/ Analyst	Anna Kim	RIA	175
Engineer/ Analyst	Susan Lutzenhiser	RIA	100
Engineer/ Analyst	Tingting Xue	Nexant	144
Engineer/ Analyst	Marnie McPhee	RIA	300
Engineer/ Analyst	Katie Ryder	Nexant	100
Associate Engineer/ Associate Analyst	Drew Trafton	GDS	365
Associate Engineer/ Associate Analyst	Casey Nolan	GDS	365
Senior Engineering Assistant	Lisa Wilson	GDS	0
Executive Assistant	Kaytie Ruditys	GDS	499
Engineering Assistant/ Administrative Assistant	Melissa Young	GDS	200
Engineering Assistant/ Administrative Assistant	Marty Alcala	GDS	200

Year 3 Audit

Title	Name	Firm	Hours
President	Dick Spellman	GDS	725
President	Jane Peters	RIA	321
Principal/ Stockholder	Salil Gogte	Nexant	325
Principal/ Stockholder	Patrick Burns	Nexant	0
Principal/ Stockholder	Scott Albert	GDS	50
Principal/ Stockholder	Rick Hackner	GDS	75
Principal/ Stockholder	Marjorie McCrae	RIA	200
Principal/ Stockholder	Bobbi Tannenbaum	RIA	139
Vice President			0
Managing Director	Scott Dimetrosky	Apex	100
Managing Director	Tom Londos	GDS	248
Managing Director	Tim Clark	GDS	300
Managing Director	Bob Fratto	GDS	250
Senior Project Manager			0
Project Manager	Jeffrey Huber	GDS	300
Project Manager	Tyler Hammer	Nexant	250
Project Manager	Dulane Morgan	RIA	100
Project Manager	Irwin Kim	Nexant	400
Project Manager	Jesse Smith	Nexant	1081
Project Engineer/ Project Consultant	Caroline Guidry	GDS	550
Project Engineer/ Project Consultant	Pranav Jampani	Nexant	1450
Project Engineer/ Project Consultant	Katie Parkinson	Apex	100
Project Engineer/ Project Consultant	Jason Hinsey	Nexant	885
Engineer/ Analyst	Andrea Jester	GDS	500
Engineer/ Analyst	Warren Hirons	GDS	350
Engineer/ Analyst	Anna Kim	RIA	175
Engineer/ Analyst	Susan Lutzenhiser	RIA	100
Engineer/ Analyst	Adam Gardels	RIA	175
Engineer/ Analyst	Tingting Xue	Nexant	244
Engineer/ Analyst	Marnie McPhee	RIA	340
Engineer/ Analyst	Katie Ryder	Nexant	100
Associate Engineer/ Associate Analyst	Drew Trafton	GDS	390
Associate Engineer/ Associate Analyst	Casey Nolan	GDS	390
Senior Engineering Assistant	Lisa Wilson	GDS	0
Executive Assistant	Kaytie Ruditys	GDS	564
Engineering Assistant/ Administrative Assistant	Melissa Young	GDS	200
Engineering Assistant/ Administrative Assistant	Marty Alcala	GDS	200

Residential Metering Study

Title	Name	Firm	Hours
President	Dick Spellman	GDS	0
President	Jane Peters	RIA	0
Principal/ Stockholder	Salil Gogte	Nexant	0
Principal/ Stockholder	Patrick Burns	Nexant	0
Principal/ Stockholder	Scott Albert	GDS	0
Principal/ Stockholder	John Hutts	GDS	140
Principal/ Stockholder	Marjorie McCrae	RIA	0
Principal/ Stockholder	Bobbi Tannenbaum	RIA	0
Vice President			0
Managing Director	Scott Dimetrosky	Apex	0
Managing Director	Tom Londos	GDS	0
Managing Director	Tim Clark	GDS	0
Managing Director	Bob Fratto	GDS	0
Senior Project Manager			0
Project Manager	Jeffrey Huber	GDS	238
Project Manager	Tyler Hammer	Nexant	0
Project Manager	Irwin Kim	Nexant	0
Project Manager	Jesse Smith	Nexant	0
Project Engineer/ Project Consultant	Caroline Guidry	GDS	300
Project Engineer/ Project Consultant	Pranav Jampani	Nexant	0
Project Engineer/ Project Consultant	Katie Parkinson	Apex	92
Project Engineer/ Project Consultant	Jason Hinsey	Nexant	0
Engineer/ Analyst	Andrea Jester	GDS	100
Engineer/ Analyst	Warren Hiron	GDS	200
Engineer/ Analyst	Adam Gardels	RIA	50
Engineer/ Analyst	Anna Kim	RIA	50
Engineer/ Analyst	Tingting Xue	Nexant	0
Engineer/ Analyst	Marnie McPhee	RIA	0
Engineer/ Analyst	Katie Ryder	Nexant	0
Associate Engineer/ Associate Analyst	Drew Trafton	GDS	120
Associate Engineer/ Associate Analyst	Casey Nolan	GDS	120
Senior Engineering Assistant	Lisa Wilson	GDS	0
Executive Assistant	Kaytie Ruditys	GDS	128
Engineering Assistant/ Administrative Assistant	Melissa Young	GDS	96
Engineering Assistant/ Administrative Assistant	Marty Alcala	GDS	96

C&I Metering Study

Title	Name	Firm	Hours
President	Dick Spellman	GDS	0
President	Jane Peters	RIA	0
Principal/ Stockholder	Salil Gogte	Nexant	0
Principal/ Stockholder	Patrick Burns	Nexant	0
Principal/ Stockholder	Scott Albert	GDS	0
Principal/ Stockholder	Rick Hackner	GDS	0
Principal/ Stockholder	Marjorie McCrae	RIA	0
Principal/ Stockholder	Bobbi Tannenbaum	RIA	0
Vice President			0
Managing Director	Scott Dimetrosky	Apex	90
Managing Director	Tom Londos	GDS	0
Managing Director	Tim Clark	GDS	0
Managing Director	Bob Fratto	GDS	0
Senior Project Manager			0
Project Manager	Jeffrey Huber	GDS	0
Project Manager	Tyler Hammer	Nexant	0
Project Manager	Irwin Kim	Nexant	193
Project Manager	Jesse Smith	Nexant	150
Project Engineer/ Project Consultant	Caroline Guidry	GDS	0
Project Engineer/ Project Consultant	Pranav Jampani	Nexant	360
Project Engineer/ Project Consultant	David Dickensheets	Nexant	600
Project Engineer/ Project Consultant	Katie Parkinson	Apex	0
Project Engineer/ Project Consultant	Jason Hinsey	Nexant	900
Engineer/ Analyst	Andrea Jester	GDS	0
Engineer/ Analyst	Warren Hirons	GDS	163
Engineer/ Analyst	Tingting Xue	Nexant	1050
Engineer/ Analyst	Marnie McPhee	RIA	0
Engineer/ Analyst	Katie Ryder	Nexant	500
Associate Engineer/ Associate Analyst	Drew Trafton	GDS	0
Associate Engineer/ Associate Analyst	Casey Nolan	GDS	0
Senior Engineering Assistant	Lisa Wilson	GDS	0
Executive Assistant	Kaytie Ruditys	GDS	300
Engineering Assistant/ Administrative Assistant	Melissa Young	GDS	225
Engineering Assistant/ Administrative Assistant	Marty Alcala	GDS	225

Commercial Baseline Study

Title	Name	Firm	Hours
President			0
Principal/ Stockholder	Salil Gogte	Nexant	60
Principal/ Stockholder	Patrick Burns	Nexant	131
Vice President			0
Managing Director			0
Senior Project Manager			0
Project Manager	Tyler Hammer	Nexant	500
Project Manager	Irwin Kim	Nexant	80
Project Manager	Jesse Smith	Nexant	43
Project Engineer/ Project Consultant	Jason Hinsey	Nexant	120
Project Engineer/ Project Consultant	William Goodrich	Nexant	80
Project Engineer/ Project Consultant	David Dickensheets	Nexant	120
Project Engineer/ Project Consultant	Michael Fisher	Nexant	80
Project Engineer/ Project Consultant	Misc. Field Engineers	Nexant	868
Engineer/ Analyst	Adam Greenwade	Nexant	196
Engineer/ Analyst	Katie Ryder	Nexant	120
Engineer/ Analyst	Andrew Dionne	Nexant	120
Engineer/ Analyst	Misc. Field Engineers	Nexant	590
Associate Engineer/ Associate Analyst	Laura Ruff	Nexant	272
Associate Engineer/ Associate Analyst	Tingting Xue	Nexant	150
Associate Engineer/ Associate Analyst	Misc. Field Engineers	Nexant	815
Senior Engineering Assistant			0
Executive Assistant	Gayle Towner	Nexant	500
Executive Assistant	Audrey Vestel	Nexant	331
Engineering Assistant/ Administrative Assistant			0

Residential Baseline Study

Name	Firm	Hours
Dick Spellman	GDS	56
John Hutts	GDS	140
		0
Tim Clark	GDS	60
		0
Jeffrey Huber	GDS	500
Misc. Field Engineers	GDS	330
Warren Hirons	GDS	178
Andrea Jester	GDS	178
Misc. Field Engineers	GDS	534
Drew Trafton	GDS	118
Casey Nolan	GDS	118
Misc. Field Engineers	GDS	354
Misc. Telephone Recruiters	GDS	400
Kaytie Ruditys	GDS	160
Marty Alcala	GDS	310
Melissa Young	GDS	310

Commercial Potential Study

Title	Name	Firm	Hours
President	Scott Dimetrosky	Apex	180
Principal/ Stockholder	Patrick Burns	Nexant	240
Vice President			0
Managing Director			0
Senior Project Manager			0
Project Manager	Tyler Hammer	Nexant	844
Project Engineer/ Project Consultant	Adam Greenwade	Nexant	892
Engineer/ Analyst			
Associate Engineer/ Associate Analyst			0
Senior Engineering Assistant			0
Executive Assistant			0
Engineering Assistant/ Administrative Assistant			0

Residential Potential Study

Title	Name	Firm	Hours
President	Dick Spellman	GDS	200
Principal/ Stockholder			0
Vice President			0
Managing Director			0
Senior Project Manager			0
Project Manager	Jeffrey Huber	GDS	876
Project Engineer/ Project Consultant			0
Engineer/ Analyst	Warren Hirons	GDS	166
Engineer/ Analyst	Andrea Jester	GDS	166
Associate Engineer/ Associate Analyst			0
Senior Engineering Assistant			0
Executive Assistant			0
Engineering Assistant/ Administrative Assistant	Marty Alcala	GDS	174
Engineering Assistant/ Administrative Assistant	Melissa Young	GDS	174

DR Potential Study

Name	Firm	Hours
		0
Patrick Burns	Nexant	250
		0
		0
		0
Jeffrey Huber	GDS	250
Michael Fisher	Nexant	163
Adam Greenwade	Nexant	588
Warren Hirons	GDS	450
Drew Tafton	GDS	250
Casey Nolan	GDS	250
		0
		0
		0

3.13 Known Existing Commitments of the Key Personnel on the GDS Team for 2013 to 2016

Known Existing Commitments of the Key Personnel on the GDS Team for 2013 to 2016							
Key Personnel on the GDS Team	Firm	Title	Clients With Whom Consultant Has Existing Hours Commitments	Annual Labor Hour Commitments for Existing Projects			
				2013	2014	2015	2016
Dick Spellman	GDS	President	Pennsylvania PUC Phase 1 SWE Evaluation Team, Georgia Public Service Commission, North Carolina Utilities Commission, Hoosier Energy, District of Columbia Department of the Environment	1000	500	500	500
John Hutts	GDS	Principal	East Texas Electric Cooperative Sharyland Utilities Santee Cooper Georgia Public Service Commission Pennsylvania PUC Phase 1 SWE	1000	500	500	500
Tom Londos	GDS	Managing Director	Pennsylvania PUC Phase 1 SWE Evaluation Team, Maryland Energy Administration, DC Sustainable Efficiency Utility	500	500	500	500
Jeffrey Huber	GDS	Project Manager	Pennsylvania PUC Phase 1 SWE Evaluation Team, Hoosier Energy, District Department of the Environment, Connecticut Office of Consumer Counsel, NYSERDA	650	450	250	0
Andrea Jester	GDS	Analyst	Pennsylvania PUC Phase 1 SWE Evaluation Team, Georgia Public Service Commission	1000	0	0	0

Kaytie Ruditys	GDS	Executive Assistant	Pennsylvania PUC Phase 1 SWE Evaluation Team, Connecticut Office of Consumer Counsel	200	0	0	0
Salil Gogte	Nexant	Principal	Pennsylvania PUC Phase 1 SWE Evaluation Team, Wisconsin Focus on Energy Evaluation	500	500	500	0
Irwin Kim	Nexant	Project Manager	Pennsylvania PUC Phase 1 SWE Evaluation Team, Wisconsin Focus on Energy Evaluation	750	750	750	0
Jesse Smith	Nexant	Senior Project Analyst	Pennsylvania PUC Phase 1 SWE Evaluation Team, CPS Energy, South Carolina Electric and Gas	500	300	300	0
Pranav Jampani	Nexant	Project Engineer	Pennsylvania PUC Phase 1 SWE Evaluation Team	250	0	0	0
Patrick Burns	Nexant	Principal	Pennsylvania PUC Phase 1 SWE Evaluation Team, Ontario Power Authority, Wisconsin Focus on Energy Evaluation, Public Service Electric and Gas	600	400	400	400
Tyler Hammer	Nexant	Senior Project Analyst	Pacificorp, Mississippi Power	360	0	0	0
Katie Ryder	Nexant	Analyst	Lawrence Berkeley National Laboratory, Public Service Electric and Gas	1000	200	0	0
Jane Peters	Research Into Action	President and Owner	NYSERDA, US Department of Energy/Lawrence Berkeley National Laboratory, Southern California Edison	750	750	450	450
Ryan Bliss	Research Into Action	Project Director	Northwest Energy Efficiency Alliance, US Department of Energy/Lawrence Berkeley National Laboratory, Ontario Power Authority, Ameren Missouri	900	750	450	0

Marjorie McRae	Research Into Action	Principal	Bonneville Power Administration, Energy Trust of Oregon, Massachusetts Department of Energy Resources, NorthWest Energy Efficiency Alliance, NYSERDA	600	600	450	300
Bobbi Tannenbaum	Research Into Action	Principal	NYSERDA, MidAmerican Energy, Ameren Missouri	600	600	450	300
Dulane Moran	Research Into Action	Project Director	US Department of Energy/Lawrence Berkeley National Laboratory, Pacific Gas & Electric and Southern California Edison, NYSERDA, Ontario Power Authority, Illinois Energy Association, San Diego Gas & Electric	750	300	150	0
Adam Gardels	Research Into Action	Senior Project Analyst	Energy Trust of Oregon, Northwest Energy Efficiency Alliance	675	150	150	150
Anna Kim	Research Into Action	Senior Project Analyst	Massachusetts Department of Energy Resources, NYSERDA	450	300	300	300
Susan Lutzenhiser	Research Into Action	Senior Project Analyst	NYSERDA	300	0	0	0
Marnie McPhee	Research Into Action	Communications Specialist	Technical Editing and Communications	600	600	0	0
Note: Known project ending dates for specific projects are reflected in the labor hours estimates provided for each year for each consultant.							

3.0-A OPTIONAL DEMAND RESPONSE MARKET POTENTIAL STUDY

The policy goal of achieving a set demand reduction target can be achieved with two different types of programs – energy efficiency and demand response (DR). While energy efficiency programs have proven to be cost effective in the Commonwealth of Pennsylvania and are slated to continue in the next DSM cycle, there are no current plans to run demand response programs in 2013 while the Commission and stakeholders study the cost effectiveness of such programs. The GDS Team can contribute to that analysis by conducting a Demand Response Potential Study that will build off the EDC, sector, and measure-level results of the proposed Energy Efficiency Potential Study. Our unique understanding of the regulatory/stakeholder landscape and customer population in Pennsylvania would allow us to produce the high-quality study necessary to accurately quantify potential and produce actionable DR targets.

This study would not only quantify the magnitude of the potential impact, but the cost of acquisition for such resources as well. The cost of acquisition analysis from a DR Potential study, combined with the analogous results from the Energy Efficiency Potential Study, would allow the Commission to consider the most cost-effective balance of DR and energy efficiency in reaching a demand reduction goal.

As part of this optional study, the GDS Team proposes the following tasks:

1. Assess Technical Potential
2. Determine Economic Potential
3. Determine Achievable Potential
 - a. Conduct Curtailment Service Provider (CSP) Research
 - b. Conduct Participant Research
4. Conduct a Distributed Energy Study

As noted in the cost section of our separate cost proposal, demand response study Tasks 1 and 2 above are priced as one option and reflect the scope of a limited potential study for the Commission. Tasks 3 and 4 are each priced separately and demonstrate the flexibility of the GDS Team in providing additional detail and custom solutions for the Commission. The budget of each task (only in our separate cost proposal) includes the incremental effort for project management and stakeholder meetings.

Task 1: Assess Technical Potential

Step 1: Use Energy Efficiency Potential Model to Understand Baseline Consumption

For the Energy Efficiency Potential Study, we will disaggregate each EDC's sales into customer segments and end-uses, and forecast future load growth. We also will use the load profiles developed during this study to evaluate and explicate peak demand consumption, which will be necessary to characterize the potential for demand response.

We will use end-use level peak demand as a baseline in the Demand Response Potential Study. As discussed in Step 2 and Step 3 below, different program types can affect different end-uses, and different customer segments may have different capacities for load reduction.

Step 2: Research Potential Program Offerings

The GDS Team will look at two different types of demand response programs when assessing technical potential – dispatchable and non-dispatchable. Dispatchable DR refers to load reductions that the end-user agrees to make in response to direction from someone other than the end-user itself (e.g. residential air conditioner reduces load automatically in response to a signal from the utility company). Non-dispatchable DR refers to programs in which end-users decide whether and when to reduce consumption in response to and based on a dynamic pricing structure that exposes the end-user to higher electricity prices during high, or peak, demand periods. Time-of-use, critical peak pricing, and real-time pricing schemes fall under the non-dispatchable category.

Table 3-1A shows the types of programs the GDS Team may investigate.

Table 3-1A: DR Program Types

Non-Dispatchable	Dispatchable
Critical Peak Pricing: Rates that include a pre-specified, extra-high rate that is triggered by the utility and is in effect for a limited number of hours	Direct Load Control: Customers receive incentive payments for allowing the utility a degree of control over equipment, such as air-conditioners
Time-of-Use Rates: Rates with fixed price blocks that differ by time of day	Demand Bidding/Buyback: Customers offer bids to curtail load when wholesale prices are high
Real-Time Pricing: Rates that vary at some regular interval (usually hourly) in response to wholesale market prices	Interruptible/Curtailable: Customers receive a discounted rate for agreeing to reduce load upon request

The GDS Team will gather data on participation rates and load reductions by customer segment and end-use for each of these programs.

Step 3: Screen sectors, segments, and end-uses for eligibility

The GDS Team will screen customer segments and end-uses for applicability to specific DR programs. For example, demand bidding programs typically require that participants have a peak demand of greater than 250kW. Also, certain end-uses, such as cooking loads, may not be available for demand response.

Step 4: Develop Impacts and Costs by Program Type and End-Use

In theory, it is possible to reduce all consumption included in a DR program during an event. However, it is neither practically feasible nor reasonable for a customer to do so. Therefore, after adjusting the base demand to include only eligible customers and loads, estimates must be developed that describe the load that is practically available to be curtailed. For some programs, such as the residential air conditioning program, this rate approaches 100%, as all central air conditioners' consumption can practically be reduced (although for a limited duration and a limited number of times). However, a manufacturing facility generally cannot shut down all of their pumps or motors, but might be able to reduce their cooling load.

We will use savings rates from industry sources to quantify potential savings. When possible, the GDS Team will use sources relevant to the Pennsylvania environment, such as the PJM report on air conditioner impact in direct load control programs¹⁰. The GDS Team also will attempt to leverage any available data from EDCs on DR programs they have implemented.

This step will also include an effort to understand the costs of implementing and running the different types of DR programs. Again, we will leverage data from past EDC programs wherever possible, and supplement this data with evaluation reports from DR programs in other jurisdictions.

Step 5: Calculate Potential

The data from each of the previous steps will be integrated into a spreadsheet-based model of technical DR potential. All technically feasible demand reductions will be incorporated to provide a measure of the theoretical maximum DR potential. Results will be presented by EDC and program type.

¹⁰ *Deemed Savings Estimates for Legacy Air Conditioning and Water Heating Direct Load Control Programs in PJM Region*. PJM Load Analysis Subcommittee. Prepared by RLW Analytics. February 2007.

ADDRESSING EXISTING DEMAND RESPONSE FROM CSPS

The GDS Team recognizes there is a non-trivial amount of demand response already occurring in Pennsylvania outside of any EDC programs. This DR is generally acquired through CSPs and the PJM economic load response program. The GDS Team will account for this DR in its potential study. This effort could draw upon published data by PJM and the current Commission effort to understand the overlap between EDC DR programs and CSP DR.

Task 2: Determine Economic Potential

We will assess economic potential for DR in much the same way as we propose for the Energy Efficiency Potential Study. All programs included in technical potential will be screened for cost-effectiveness by comparing the programs' anticipated benefits and costs, specifically by using the TRC test and associated rules in place at the time of analysis. Our analysis will incorporate utility-specific data on avoided costs, line losses, discount rates, etc., collected during the kick-off meeting.

The assessment of economic potential for non-dispatchable DR will consider the existing and planned roll-out of advanced metering infrastructure (AMI) by each EDC. AMI is inextricably linked to price-responsive DR because of the need for shorter metering intervals and two-way communication, which are two capabilities that traditional metering technology does not have. For those EDCs that have concrete plans to install, or already have installed AMI, the costs associated with that deployment are "sunk," and thus the likelihood of non-dispatchable DR passing an economic threshold test are high. Those EDCs with no AMI and no plans to install AMI may have to spend significant capital to deliver non-dispatchable DR, and thus are less likely to pass economic screens.

Task 3: Determine Achievable Potential

As with the Energy Efficiency Potential Study, achievable potential reflects the portion of economic potential that can practically be attained in a real-world scenario. This stage of the analysis incorporates market penetration (or "adoption") curves for programs that simulate the rate at which load reductions can be attained over time. Typically, a potential study will benchmark the results to the experiences of other utilities' programs to ensure that they reflect a realistic savings level. Carrying results from one jurisdiction to another may mask differences in customer segmentation, load profiles, customer preferences, and economic conditions. To supplement this data, the GDS Team proposes to conduct interviews with potential DR participants to better inform adoption curves, end-use applicability, and forecasted impacts across segments and EDCs.

The likelihood that customers will participate in a DR program is a function of several factors, but a major component is the compensation they will receive for the inconvenience or revenue lost as a result of reducing load. Participant surveys will allow the GDS Team to understand how participation rates may change in response to varying incentive levels and/or a change in the frequency of load reduction events (top 100 hours requirements). Participant surveys will also allow the GDS Team to understand how the interplay of CSP DR efforts may affect participation in future EDC programs.

The sample design for participant interviews likely would include stratification by customer segment and EDC so that the GDS Team would have reliable information to adjust adoption curves across programs, segments, and EDCs.

Task 4: Distributed Energy Study

In addition to DR, there are other forms of "distributed energy" resources that can contribute to load reduction, both permanently and on a demand response basis. Potential research opportunities include combined heat and power (CHP) systems for commercial and industrial facilities, biogas recovery for anaerobic digesters in livestock and wastewater facilities, and microturbine use at natural gas drilling sites to produce electricity from waste gas that is normally flared. Similar to the DR and energy

efficiency potential studies, the results of this study would provide the Commission with the potential impact and cost of acquisition for distributed resources.

The results of the energy efficiency potential study could again dovetail with this study, especially with regard to CHP potential. For example, the Team previously conducted a CHP potential analysis for a client which required the segmentation of electricity sales by commercial/industrial segment. From there, applicability and CHP sizing decisions can be replicated at the segment level depending on the typical electrical and thermal loads present at that type of facility.

PROJECT SCHEDULE

The DR potential study would be timed to run concurrently with the energy efficiency potential study, with final results being delivered in December, 2014. The GDS Team believes a DR potential study report concurrent with the energy efficiency potential study will greatly aid the commission staff's ability to segment ACT 129 funds as necessary. Additionally, it is imagined that the stakeholder meeting will be held concurrently for GDS Team and stakeholder efficiencies. As described in *Step 1* of the technical potential section, work on the DR study would need to wait until the end-use disaggregation and forecasting work for the energy efficiency potential study was completed.

4.0 EXPERIENCE AND CAPABILITIES (II-4)

GDS has assembled a highly experienced and nationally recognized project team to undertake this Act 125 Statewide Evaluator project for the Pennsylvania Public Utility Commission (Commission). GDS is the prime contractor for this project and will be responsible for the overall management of this project. Subcontractors to GDS are: Nexant Planning and Evaluation, LLC (NPE), Research Into Action, Inc., and Apex Analytics.

This GDS Team has extensive experience with program evaluation, measurement and verification, including a solid background evaluating program energy and peak demand savings and the cost-effectiveness of energy efficiency measures/programs and demand response programs. Our team's specific experience is summarized below, and includes of the primary contact for similar projects.

4.1 Overview of Evaluation Experience and Capabilities of GDS Associates, Inc.

GDS is a multi-service consulting and engineering firm formed in 1986 and now employs a staff of more than 170 in five locations across the U.S. Our consultants are recognized leaders in their respective fields, dedicated to their clients, innovative in their approach to meeting unique challenges, and known for consistently being available when needed. Our broad range of expertise focuses on clients associated with, or affected by, electric, gas, water and wastewater utilities. In addition, we offer information technology, market research, and statistical services to a diverse client base.



Our Mission

Help our clients succeed by anticipating and understanding their needs and by efficiently delivering quality services with confidence and integrity.

The following are brief descriptions of all the services that GDS provides.

ENERGY EFFICIENCY AND DEMAND SIDE MANAGEMENT SERVICES

Our staff of highly qualified program design and analysis specialists assists clients with the complexities of multi-faceted energy efficiency planning, program implementation and evaluation. GDS has completed numerous energy efficiency and demand response potential studies, administered programs in multiple states and conducted program evaluations for many utility and government clients.

STATISTICS AND MARKET RESEARCH SERVICES

GDS supplies wide-ranging statistical and market research services to electric and gas utilities and other clients. Our services stretch from proven survey design that captures demographic profiles of consumers and potential customers, to data mining and analysis of utility load information.

INFORMATION TECHNOLOGY SERVICES

A complete understanding of client business problems and needs is critical to the implementation of successful IT systems. GDS specializes in understanding these issues and combines this knowledge with select technologies to create cost-effective IT solutions.

RENEWABLE ENERGY RESOURCES, DISTRIBUTED GENERATION, AND CHP SERVICES

GDS provides expertise in addressing the complex economic, engineering, scientific, and governmental issues associated with renewable and other distributed generation resources that impact utilities, government agencies, developers, and their customers.

INTEGRATED RESOURCE PLANNING, ENERGY ASSURANCE PLANNING SERVICES

Securing adequate and reliable energy resources is crucial to thriving in a more competitive electrical market. GDS has helped guide its clients through uncharted territory by providing power supply portfolio, integrated resource planning, transmission planning and reliability assessments, load forecasting, financial, wholesale and retail rate-making and competitive analysis services.

GENERATION SERVICES

Greater competition has made effective control of power generation costs increasingly important. Over a span of more than 15 years, GDS has helped numerous power plant co-owners and non-utility generators reduce costs and achieve improved performance by identifying inefficiencies in power plant construction, operation and maintenance practices, and providing practical solutions.

ENVIRONMENTAL MANAGEMENT SERVICES (GREENLINE ENVIRONMENTAL)

GreenLine Environmental, a GDS Company, provides environmental services to utilities, municipalities, developers, industry, and the military. These services include right-of-way vegetation management, GPS and GIS mapping and inventory, environmental assessments, and urban forestry consulting.

REGULATORY AND RESTRUCTURING SERVICES

GDS provides comprehensive regulatory and restructuring services to generators, transmitters, distributors, and large users of energy. Numerous state and federal restructuring initiatives have made regulatory planning and strategy development essential. To assist our clients with this task, GDS brings decades of expert regulatory experience in key areas such as rate design and litigation, contract negotiation, and transmission access.

DEREGULATION AND RETAIL ENERGY PROCUREMENT SERVICES

GDS provides a wide range of services to help clients plan for and benefit from participation in deregulated energy markets. These include, retail aggregation and energy procurement, merchant plant services, stranded cost analysis, and electric restructuring policy analysis.

UTILITY PRIVATIZATION SERVICES

GDS has successfully assisted clients throughout the country in their efforts to acquire the utility electric, gas, and water distribution systems.

FINANCIAL ANALYSIS AND RATE SERVICES

The recent pace of regulatory change and uncertainty is unrivaled in the utility industry and requires equally unparalleled flexibility in ratemaking and regulatory strategies. GDS has been at the forefront of industry restructuring policy, offering broad expertise in regulatory accounting, economics, finance, and ratemaking.

ELECTRIC DISTRIBUTION SYSTEM PLANNING AND DESIGN SERVICES

(HI-LINE ENGINEERING) Hi-Line Engineering, a GDS company, offers electric distribution system planning, mapping, staking and design services to the electric utility industry throughout the United States. We provide high-quality, personal service to rural electric cooperatives, investor-owned utilities, municipalities, and the U.S. military. GDS has managed the design and construction of thousands of miles of electric distribution lines across the US.

WATER AND WASTEWATER UTILITY CONSULTING SERVICES

GDS provides expert assistance to water and wastewater utility management and users of water resources by addressing the complex engineering, accounting, economic, management, operational, regulatory, and policy issues that impact the water industry. GDS serves a variety of clients including municipalities, investor-owned utilities, water districts, non-profit customer-owned systems, and government agencies.

NATURAL GAS CONSULTING SERVICES

GDS provides creative solutions to help our clients meet challenges arising in both regulated and competitive environments within the evolving natural gas utility industry. Our team of highly qualified professionals works to address complex economic, engineering, policy, and regulatory issues with clients including consumer groups, publicly owned utilities and regulatory authorities.

GDS E&MV Project Experience

Our evaluation experts understand the quantitative and qualitative issues associated with the design, implementation and evaluation of successful energy efficiency plans and programs. We use our technical expertise to minimize financial risks and maximize the benefits from energy efficiency programs and policies for our clients. GDS has provided program evaluation consulting services to public utility commissions in Pennsylvania, California, Georgia, Florida, Maine, Mississippi, New Hampshire, North Carolina, Rhode Island, Vermont and the Maryland Energy Administration. Our program evaluation services include:

- Development of energy efficiency and demand response potential studies;
- Development of program evaluation plans and budgets;
- Impact evaluations;
- Process evaluations;
- Technical Reference Manual Development
- Program logic model development;
- Cost-effectiveness model development (energy efficiency, renewables/distributed generation);
- Measure-, program-, and portfolio-level benefit cost analysis;
- Development of data tracking and reporting systems for program evaluations;
- Formal program evaluations filings with regulatory commissions; and,
- Expert testimony.

Current Statewide Evaluator

Since 2009, GDS has been serving as the prime contractor for the Statewide Evaluation of **Pennsylvania's Act 129** energy efficiency programs being implemented by seven investor-owned utilities in Pennsylvania. As the Statewide Evaluator (SWE), the GDS Team is providing a review of utility process and impact evaluations and verifying the accuracy of kWh and kW savings reported by seven electric distribution companies (EDC) in the State. The GDS Team is also providing an assessment of the methodologies being used by each EDC, and a review of cost-effectiveness calculations, along with providing quarterly process updates as well as biannual improvement workshops with the EDCs. The annual reports produced provide the Commission with recommendations for Energy Efficiency & Conservation (EE&C) plan and program improvements.

SINCE 2009, GDS HAS BEEN SERVING AS THE PRIME CONTRACTOR FOR THE STATEWIDE EVALUATION OF PENNSYLVANIA'S ACT 129 ENERGY EFFICIENCY PROGRAMS.

The GDS Team has provided a public web-accessible database and reporting system for the Commission's website so that the general public may be kept abreast of the impacts of the EE&C by program and sector. As the SWE, the GDS Team also produced an accurate assessment of the future potential for energy savings through a Market Assessment Study. While all of these tasks are related, they each have distinct goals:

- Impact evaluation reviews seek to quantify the energy, demand, and possible non-energy impacts that have resulted from demand-side management (DSM) program operations.
- Process evaluations seek to describe how well those programs operate and to characterize their efficiency and effectiveness.
- Market Characterization and Assessment seeks to determine the attitude and awareness of market actors, measure market indicators and identify barriers to market penetration.

Continuity of Personnel and Workflow

Table 4-1 highlights the vast experience of the GDS Team including education, qualification and certifications. All of the GDS and Nexant personnel have experience working on SWE Phase I, exemplifying our earlier statement that ‘we can hit the ground running!’ with no loss momentum, delay in transition and at a reduction in cost to the Commission.

Table 4-1: Education, Qualifications, Certifications and Work Experience of Consultants on the GDS Associates Team

Consultant Name	Title	Years of Energy Efficiency Experience	Education	Professional Certifications	Serves on the Phase I Statewide Evaluator Team	Impact Evaluations	Process Evaluations	Onsite Verification of KWH Savings and Equipment Installation	Development of Technical Reference Manuals	Development of Evaluation Frameworks	Conducting Audits of Impact and Process Evaluations	Energy Efficiency Baseline Studies	Energy Efficiency and Demand Response Potential Studies
GDS													
Dick Spellman	President	35	BA, MBA	CMVP	Yes	x	x	x	x	x	x	x	x
Rich Hackner	Principal, Midwest Region Manager	30+	BS, MSME	PE	No	x	x	x	x		x		x
Scott Albert	Principal, Northeast Region Manager	30+	BS, MBA	CCP	No	x	x	x	x	x	x	x	x
Joe Danes	Principal	18	BS, MSME	PE, CMVP	Yes								
Tim Clark	Managing Director	27	BS, MBA	CEM	Yes	x	x	x	x	x	x	x	x
Tom Londos	Managing Director	30+	BS		Yes								
Bob Fratto	Managing Director	30+	BSIE, MBA	CEM	No								
Jeffrey Huber	Project Manager	7	BS, MA	CEM	Yes			x	x		x	x	x
Caroline Guidry	Project Engineer	4	BS, MSME	CMVP	Yes	x	x	x	x	x	x	x	x
Warren Hirons	Engineer	3	BS Engineering BS Economics	EMIT, EIT	Yes		x		x	x	x		x
Andrea Jester	Analyst	3	BS		Yes						x		
Brock Keasler	Programmer/Analyst	2	BS		Yes	x	x		x		x	x	x
Kaytie Rudytis	Executive Assistant	5	BS		Yes							x	x
Melissa Young	Engineering Asst/Co-op Student	1	Co-op Mechanical Engineering Student		Yes							x	x
Marty Alcala	Engineering Asst/Co-op Student	1	Co-op Mechanical Engineering Student		Yes							x	x
Nexant													
Salil Gogte	Principal	7	BE, MS	LEED AP	Yes	x	x			x	x		x
Irwin Kim	Project Manager	5	BS	PE, CMVP, LEED AP	Yes	x		x	x	x	x		
Jesse Smith	Senior Project Analyst	3+	BS, MS	Base SAS Programming and Six Sigma Green Belt Certifications	Yes	x		x			x		x
Pranav Jampani	Project Engineer	4	BE, MS		Yes	x		x	x		x		
Patrick Burns	Principal	15+	BS	PE, CEM, LEED AP	Yes	x		x		x		x	x
Tyler Hammer	Senior Project Analyst	6+	BS, MBA		Yes	x			x		x	x	
Katie Ryder	Project Analyst	4	BS, MS		Yes		x				x		x
Research Into Action													
Jane S. Peters	President and Owner	32	AB, PhD		No		x		x	x	x	x	x
Ryan Bliss	Project Director	5	BA, MA		No		x			x	x	x	x
Marjorie McRae	Principal	32	BA, MA, PhD		No		x		x	x	x	x	x
Bobbi Tannenbaum	Principal	30	BS, MS	Certificate in Energy Analysis and Policy	No	x	x		x	x		x	x
Dulane Moran	Project Director	10	BA, MPA		No		x			x	x	x	x
Adam Gardels	Senior Project Analyst	2	BS, MA		No		x				x	x	x
Anna Kim	Senior Project Analyst	4	BA, MS, MES		No	x			x		x	x	x
Susan Lutzenhiser	Senior Project Analyst	25	BA, MA		No		x				x	x	x
Marnie McPhee	Communications Specialist	30+	BA		No		x						

GDS' RELEVANT RECENT PROJECTS

Client Name	Project Name & Project Date	Project Description	Contact
Impact and Process Evaluations			
<p>Pennsylvania Public Utility Commission</p>	<p>Act 129 Statewide Evaluator 2009 to 2014</p>	<p>This evaluation includes an analysis of each plan from both a process and impact standpoint, program impacts (demand and energy savings), and cost-effectiveness according to the Total Resource Cost Test (TRC). The GDS team provides quarterly process updates as well as biannual improvement workshops with the EDCs. The annual reports produced provide the Commission with recommendations for EE&C plan and program improvements.</p>	<p>Greg Shawley Manager Pennsylvania Public Utility Commission 400 North St. Harrisburg, PA 17120 gshawley@state.pa.us 717-787-5369</p>
<p>Maryland Energy Administration</p>	<p>Evaluation of Energy Efficiency programs funded by MEA 2010 to 2013</p>	<p>The Maryland Energy Administration retained GDS for the period 2010 to 2013 to conduct ongoing impact evaluations of each Maryland Energy Administration energy efficiency program from both a process and impact standpoint.</p>	<p>Dennis Hartline Manager Maryland Energy Administration 60 West Street, Suite 300 Annapolis, MD 21401 dhartline@energy.state.md.us 410-260-2602</p>
<p>District of Columbia District Department of the Environment</p>	<p>Professional Services for the Evaluation, Measurement, & Verification of Energy Efficiency and Renewable Energy Programs 2012 to 2014</p>	<p>For The District of Columbia Sustainable Energy Utility (DCSEU), GDS developed an M&V Framework. The objective of the M&V Framework (also referred to as the "Evaluation Framework") is to establish a District-wide framework for the DC SEU's programs that describes the M&V (ex-ante savings) principles, metrics, approaches, reporting requirements, schedules, and the roles and responsibilities of DDOE and the DC SEU. The Evaluation Framework is based on industry "best practice" for collecting and tracking program and project data, establishing key assumptions, calculating savings and other benchmarks, using analytical tools and models, and reporting of results. The contents of the framework are:</p> <ul style="list-style-type: none"> • DC SEU Portfolio Overview • System for Calculating Ex-Ante Savings • Net Impact Evaluations • Cost-Effectiveness • Bidding Energy Savings into PJM • Data Tracking and Reporting Guidelines • Overview of Evaluation, Measurement and Verification Plan • Planning, Evaluation and Reporting Schedule 	<p>Veronique Marier Office of Contracting and Procurement District Department of the Environment 441 - 4th Street, N.W. Suite 700 South Washington, D.C. 20001 veronique.marier@dc.gov (202) 671-2741</p>

Client Name	Project Name & Project Date	Project Description	Contact
MidAmerican Energy	MidAmerican Energy Efficiency Evaluation 2012	GDS Associates, as a subcontractor to Tetra Tech, provided evaluation services to MidAmerican Energy. GDS was responsible for all residential program impact analyses, and the agriculture program impacts and residential and nonresidential demand response program evaluations. Additionally, GDS reviewed MidAmerican Energy's cost effectiveness calculator for calculation accuracy and regulatory compliance. The evaluations were differentiated by MidAmerican Energy's Illinois and Iowa service territories.	Charles Rea Manager, Regulatory Strategic Analysis MidAmerican Energy Company One River Center Place/106 East Second Street Davenport, IA 52801 CBRea@midamerican.com 563-333-8868
Vermont Department of Public Service	Evaluation of Residential Retrofit Programs of Efficiency Vermont 2012	GDS was hired as lead contractor of a larger team to perform a multifaceted evaluation of Vermont's residential (existing single-family homes) energy efficiency retrofit programs. In addition to an impact evaluation component to assess both thermal (regulated and unregulated fuels) and electric energy savings, this project includes important process evaluation and market assessment activities. Through a combined effort under this single project, two separate programs will be evaluated: The Vermont Gas System's Home Retrofit (HR) Program, and Efficiency Vermont/Burlington Electric Department's (EVT/BED's) Home Performance with ENERGY STAR® (HPwES) program	Brian Cotterill Vermont Department of Public Service 112 State Street, Draw 20 Montpelier, VT 05620 802-828-3212
Northeast Energy Efficiency Partnerships (NEEP)	NEEP Building Operator Certification Program 2002	GDS was subcontracted as part of an evaluation team led by Research Into Action to perform a process, market, and impact evaluation of NEEP's Building Operator Certification (BOC) program. Key elements of GDS' role in this evaluation included: database and document review; survey instrument design; sample selection; and savings impact analysis	Dr. Jane Peters President Research Into Action PO Box 12312 Portland, OR 97212 jane.peters@researchintoaction.com 503-287-9136
Impact Evaluations			
Efficiency Vermont (EVT) and Burlington Electric Department (BED)	Energy Efficiency Measurement and Verification 2012 to 2013	GDS is under contract (as a subcontractor to West Hill Energy) for a two-year project to conduct electric demand metering analysis to assess impacts for forward capacity market participation. The goal is to verify that EVT and BED winter and summer kW reductions meet the New England ISO standards established for the Forward Capacity Market (FCM). This project involves pre and post inspection sampling for 80 energy efficiency projects.	Kathryn Parlin Vice President West Hill Energy and Computing 23 Williamstown Rd. Chelsea, Vermont 05038 kathryn@westhillenergy.com 802-685-3340

Client Name	Project Name & Project Date	Project Description	Contact
<p>Washington, DC, District Department of the Environment</p>	<p>Evaluation of Energy Efficiency and Renewable Energy Programs 2012 to 2013</p>	<p>GDS Associates is a subcontractor to Tetra Tech to develop and implement an EM&V framework for impact evaluations of Washington, DC energy efficiency and renewable energy programs. Our proposed approach includes developing the Framework for Annual Savings M&V and determining that the EM&V Plan is designed to ensure that the District Department of the Environment (DDOE) and DC SEU program staff receive the information they need at the individual program level and across the entire program portfolio. Our strategic evaluation also looks at the organizational structure developed to deliver the programs, how each program fits in the total portfolio, and how the programs may interact with other energy efficiency programs that target the same markets.</p>	<p>Veronique Marier Office of Contracting and Procurement District Department of Energy 441 - 4th Street, N.W. Suite 700 South Washington, D.C. 20001 veronique.marier@dc.gov (202) 671-2741</p>
<p>Austin Energy (Texas)</p>	<p>Impact Evaluations of Residential And Commercial Programs 2011 to 2012</p>	<p>Austin Energy retained GDS in the summer of 2011 to conduct comprehensive impact evaluations for several of its energy efficiency and demand response programs. GDS completed impact evaluations of the Home Performance with Energy Star (HPwES), Multi-Family, Weatherization Assistance Program (WAP), and commercial and industrial demand response programs.</p>	<p>Scott Jarman Austin Energy 721 Barton Springs Road Suite 258 Town Lake Center Building Austin, TX 78704 scott.jarman@austinenergy.com (512) 482-5307</p>
<p>New York State Energy Research and Development Authority (NYSERDA)</p>	<p>Impact Evaluations 2009 to 2010</p>	<p>GDS was hired (as a subcontractor to Megdal & Associates) by the New York State Energy Research and Development Authority (NYSERDA) to perform an impact evaluation of its 2007-2008 residential new construction program. Key elements of this evaluation included: database assessment, engineering review, statistical billing analysis impact evaluation, customer surveys, site visits, and assessment of impact issues. Results are being used to modify initial energy savings estimates for NYSEDA's future energy efficiency programs. As part of this contract, GDS was responsible for performing surveys of market actors (e.g., builders, nonparticipating builders, homeowners of ENERGY STAR Homes) as well as conducting on-site inspections of work performed as part of the program.</p>	<p>Jennifer Meissner NYSERDA 17 Columbia Circle Albany, NY 12203 jae@nyserda.ny.gov 518-862-1090</p>

Client Name	Project Name & Project Date	Project Description	Contact
Vermont Department of Public Service	Verification of Energy Savings Reported by Efficiency Vermont to ISO-New England 2008 to 2010	GDS was hired by the Vermont Department of Public Service (as a subcontractor to West Hill Energy) to assist with measurement and verification of the demand savings as required by the ISO-NE Forward Capacity Market. GDS was responsible for verifying Efficiency Vermont's (EVT) energy savings through an ongoing review of energy efficiency projects. GDS focused on verifying the energy and demand savings associated with custom commercial projects. This involved writing an M&V plan; installing HVAC, refrigeration, and lighting system data-loggers; a thorough review of program files and analytical tools used to estimate savings; and discussions with EVT program staff to address outstanding issues and fill in missing information.	Kathryn Parlin Vice President West Hill Energy and Computing 23 Williamstown Rd. Chelsea, VT 05038 kathryn@westhillenergy.com 802-685-3340
New York State Energy Research and Development Authority (NYSERDA)	Large Impact Savers Program 2008	GDS conducted evaluation and verification work of Georgia-Pacific and Rockland County Sewer Technical Assistance reports and any resulting projects.	Victoria Engel-Fowles NYSERDA 17 Columbia Circle Albany, NY 12203-6399 vse@nyserda.ny.gov (518) 862-1090 x3207
West Hill Energy and Computing, Inc.	Energy Savings Verification and Engineering Review Service 2004 to 2008	As a subcontractor to West Hill Energy, GDS assisted the Vermont Department of Public Service with the verification of EVT savings and the ongoing review of prescriptive and non-prescriptive custom commercial projects. This involved a thorough review of the program files and analytical tools used to estimate savings, as well as discussions with EVT program staff to address outstanding issues and fill in missing information.	Kathryn Parlin Vice President West Hill Energy and Computing 23 Williamstown Rd Chelsea, VT 05038 Kathryn@westhillenergy.com (802) 685-3340
New York State Energy Research and Development Authority (NYSERDA)	Energy Smart Program B/C Analysis 2007 to 2009	GDS provided impact evaluation services as part of a broader contract with NYSERDA. GDS was hired to assist with cost-effectiveness analyses on all quantifiable energy efficiency and renewable resource programs being delivered through their New York Energy Smart portfolio of programs.	Victoria Engel-Fowles NYSERDA 17 Columbia Circle Albany, NY 12203-6399 vse@nyserda.ny.gov (518) 862-1090 x3207
Public Service of New Hampshire	Impact Evaluation 2005	GDS was hired to conduct an impact evaluation of the NH Electric Utilities' Home Energy Assistance Program that serves income-eligible residential customers throughout New Hampshire. GDS' role involved a billing analysis of all program participants, and a comprehensive engineering review of energy savings estimates and associated methodologies and software. GDS also conducted on-site assessments of a sampling of participants.	Tom Belair Public Service of New Hampshire PO Box 330 Manchester, NH 03105-0330 belair@psnh.com 603-634-2720

Client Name	Project Name & Project Date	Project Description	Contact
KeySpan Energy Delivery	Benefit/Cost Analysis of KeySpan Energy Delivery Low Income Energy Efficiency Program 2004	GDS was retained by KeySpan Energy Delivery to complete a detailed engineering analysis of the electric and natural gas energy savings in KeySpan Energy Delivery's residential low-income energy efficiency program.	Bruce Johnson Manager KeySpan Energy Delivery 52 Second Avenue Waltham, MA 02451 781-466-5318
KeySpan Energy Delivery	Impact Analysis of KeySpan Residential Weatherization Program 2003	GDS was retained to complete a statistical billing analysis of the electric and natural gas energy savings accomplished by KeySpan Energy Delivery's residential weatherization and insulation program	Bruce Johnson Manager KeySpan Energy Delivery 52 Second Avenue Waltham, MA 02451 781-466-5318
Long Island Power Authority (LIPA)	Impact Evaluation of LIPA's Clean Energy Initiative REAP Program – Low Income Program Evaluation 2001 to 2003	GDS was retained (as a subcontractor to Megdal & Associates) to complete a statistical billing analysis of the energy savings in LIPA's residential low-income energy efficiency program. GDS prepared all of the data for inclusion in the analysis and conducted all regressions necessary to draw conclusions.	Dr. Lori Megdal Lewis Owner Megdal & Associates 198 High Street Acton, MA 01720 megdal@bellatlantic.net 978 461-3978
Northeast Utilities	Impact Evaluation of Municipal Buildings Program 2002	GDS was hired by Northeast Utilities to perform an impact evaluation of its 2000 Municipal Buildings program. Key elements of this evaluation included: sample design; on-site monitoring and verification of installed measures; verification of tracking system accuracy; engineering review of savings algorithms; impact evaluation; customer surveys; and assessment of impact issues.	Deborah Sas Market Planning Analyst Northeast Utilities PO Box 270 Hartford, CT 06141 sasde@nu.com 860-832-4951
NSTAR	Residential High Use Energy Efficiency Program 1999	GDS was hired (as a subcontractor to Megdal & Associates) to perform an impact evaluation of NSTAR's 1999 Residential High Use energy efficiency program. Key elements of this impact evaluation included: database assessment, engineering review, statistical billing analysis impact evaluation, customer surveys, site visits, and assessment of impact process issues.	Dr. Lori Megdal Lewis Owner Megdal & Associates 198 High St. Acton, MA 01720 megdal@bellatlantic.net 978 461-3978

Client Name	Project Name & Project Date	Project Description	Contact
East Texas Electric Cooperative (ETEC)	Impact Evaluation 1997 to 1998	GDS completed a detailed impact evaluation of the peak demand savings of the residential air conditioning and electric water heating cycling program of the ETEC. GDS performed all task on this evaluation, including development of the research approach, design of survey instruments, development of sampling plans, end-use metering, data analysis and report writing.	John Butts East Texas Electric Cooperative P.O. Box 631623 Nacogdoches, TX 75963 johnb@gtpower.com 936-560-9532
Process Evaluations and Market Assessments			
New York State Energy Research and Development Authority (NYSERDA)	Process Evaluations And Market Assessments 2012 to 2014	GDS is providing process evaluation and market assessment and characterization services for the Systems Benefit Charge (SBC) New York Energy Smart Program, the Energy Efficiency Portfolio Standard (EEPS), Regional Greenhouse Gas Initiative (RGGI), Green Jobs Green New York (GJGNY), Statutory Research and Development, and other program portfolios [possibly including the five-year technology and market development (T&MD) portfolio recently approved by the Public Service Commission].	Victoria Engel-Fowles NYSERDA 17 Columbia Circle Albany, NY 12203-6399 vse@nyserda.ny.gov (518) 862-1090 x3207
Bonneville Power Administration	Process Evaluations on Now-Wires Solutions Initiative 2007	GDS was retained by BPA to conduct an assessment of their Non-Wires Solutions initiative development process and the state of the initiative. GDS reviewed program materials and reports, designed an interview guide and conducted in-depth interviews with key BPA staff. Our analysis identified program strengths, weaknesses and potential improvements in key program areas, including design, implementation, planning, cost impact, and allocation of resources.	Jean Oates Public Utility Specialist Bonneville Power Administration Office of Energy Resources PO Box 3621-KLJB-1 Portland, OR 97208-3621 jaoates@bpa.gov 503-230-5861
New England State Program Working Group	Common Measurement and Verification Standards Development for Energy Efficiency Measures/Programs for the ISO-NE Forward Capacity Market 2006 to 2007	GDS was a lead contractor hired to assist the New England State Program Working Group to develop consistent and/or common regional M&V protocols for energy efficiency resources to be used as input to the development of M&V Standards for the ISO-NE Forward Capacity Market Measurement and Verification Manual. Key tasks included: development of common M&V methods, development of common values/consistent approaches for measuring peak demand reduction values, and development of default measure life values for select residential and commercial/industrial energy efficiency measures.	Julie Michals Northeast Energy Efficiency Partnerships, Inc. 91 Hartwell Ave. Lexington, MA 02421 203-244-5125

Client Name	Project Name & Project Date	Project Description	Contact
MPUC's Efficiency Maine	Residential Lighting Program 2004 to 2007	GDS was part of a team that designed and implemented the MPUC's Efficiency Maine Residential Lighting Program. GDS conducted a random sample onsite survey of 100 homes to collect data on the number and types of light bulb sockets and light bulbs in order to determine the saturation of high efficiency lighting in the residential sector in Maine.	Dick Bacon 242 State Street Augusta, ME 04333 207-287-3831
Connecticut Energy Conservation Management Board (ECMB)	Energy Efficiency Maximum Achievable Potential Study 2003 to 2004	GDS completed on-site surveys and data collection, including installing time-of-use lighting loggers and analyzing metered data to assess electric energy savings during a full year as well as summer and winter demand savings coincident with the New England ISO peak load period. The utility members of the Connecticut Energy Conservation Management Board that sponsored this study include: United Illuminating Company (UI) and Connecticut Power and Light (CL&P), Cape Light Compact, NSTAR, National Grid, Unitil, and Efficiency Vermont.	Jeff Schlegel Consultant to the ECMB Street/PO Box Tucson, AZ 520-797-4392
Efficiency Maine	Residential New Construction 2007 to 2008	In 2008, GDS completed a detailed market assessment and baseline study for Efficiency Maine of the residential new construction market. In 2007, GDS completed a detailed market assessment and baseline study for the Maine residential lighting market for Efficiency Maine.	Elizabeth Crabtree Program Director Efficiency Maine 151 Capitol St Augusta, ME 04333 Elizabeth.crabtree@efficiencymaine.com 207-213-4156
Vermont Department of Public Service (DPS)	Commercial and Industrial Energy Efficiency Programs 2000 to 2003	A detailed market characterization and baseline assessment report was developed as a key deliverable for this project and included recommendations (and baseline values) for a number of key indicators for tracking continued program success.	Brian Cotterill 112 State Street, Draw 20 Montpelier, VT 05620 802-828-3212
Boston Edison Company	Residential Clothes Washers and Commercial/Industrial/Institutional Premium Efficient Motor Installations 1998 to 1999	GDS was hired by Boston Edison Company to estimate the future market penetration and market effects of energy-efficient residential clothes washers and commercial/industrial/institutional premium efficient motor installations using a Delphi survey technique.	Robert Cuomo Team Leader, Policy, Planning and Evaluation Boston Edison Company 151 University Ave Westwood, MA 02090 781-441-8594

Client Name	Project Name & Project Date	Project Description	Contact
Boston Gas Company	Market Transformation Programs 1997 to 2000	In the fall of 1997, GDS was hired by Boston Gas Company to develop market assessment plans for the Company's new market transformation programs, to develop an overall evaluation plan for these programs, and rigorous indicators of market effects.	Bruce Johnson Manager Boston Gas Company 52 Second Avenue Waltham, MA 02451 781-466-5318
Logic Model Development			
NYSERDA	Logic Model Development and Market Assessment 2007 to 2009	GDS was retained by NYSERDA to assist their in-house program evaluation staff in the following areas: (1) characterizing markets, (2) developing market studies to attribute effects to NYSERDA's programs, (3) collecting market information as it affects customer response to programs, (4) tracking market progress indicators and (5) developing logic models and design matrices.	Brent Barkett Summit Blue Consulting 720-564-1130
Keyspan	Logic Model Development 2005	GDS was retained to develop program logic models for a portfolio of proposed residential and commercial gas energy efficiency programs. Work included: identification of key program elements (inputs; activities; anticipated outputs; short, intermediate and long-term outcomes; and potential external influences) based on existing KeySpan programs being implemented in MA and NH. Following Program Design and Implementation staff review, logic model diagrams were developed and vetted. Finally, key measurement indicators were identified for potential prioritization and use in future evaluation activities to help assess progress being made toward achievement of key program outcomes and goals.	Marygrace Cerce/ Subid Wagley Program Manager KeySpan 52 Second Avenue Waltham, MA 02451 781-466-5318
Fitchburg Gas and Electric Light Company	Small C&I and Low-Income energy efficiency programs 2003	Key project deliverables for process work included: performance and completion of secondary program and database research, draft and final interview guides for in-depth interviews with program design and implementation staff, summary of program design including results from in-depth interviews, and a flow diagram showing program logic and key delivery mechanisms.	Deborah Jarvis Unitil Service Corp. 6 Liberty Lane West Hampton, NH 03842 603-773-6455

Client Name	Project Name & Project Date	Project Description	Contact
Technical Assistance and Regulatory Support for Evaluation, Measurement and Verification			
North Carolina Utilities Commission	Technical and Regulatory Support for Evaluation, Measurement and Verification 2011 to 2013	The North Carolina Utilities Commission retained GDS to provide technical and regulatory support for EM&V oversight of the EM&V studies produced by Duke Energy and Progress Energy. GDS is responsible for reviewing and critiquing all of the evaluation plans and evaluation studies produced by these two investor-owned utilities.	Robert Gruber 430 North Salisbury Street Raleigh, NC
Austin Energy	EM&V Services for the City of Austin, Texas Municipal Utility 2011 to 2012	Texas Municipal Utility Austin Energy retained GDS Associates to provide technical demand-side management (DSM) consulting services. In an effort to maximize Austin Energy's resources in delivering the energy efficiency, DSM, renewable energy, smart grid, demand response, and the associated carbon reduction and other environmental benefits, Austin Energy's staff from time-to-time required specific consulting services. The services provided by GDS assisted Austin Energy to plan, evaluate, justify, and propose programs and strategies to achieve its goals.	Terry Nicholson Senior Buyer Austin Energy Municipal Building, 124 W 8th Street Austin, TX 7870 Terry.Nicholson@austinenenergy.com (512) 322-6586
Georgia Public Service Commission	Technical and Regulatory Support for Evaluation, Measurement and Verification 2010 to 2012	The Georgia Public Service Commission retained GDS to provide technical and regulatory EM&V support for the review and critique of program evaluation plans, quarterly progress reports and program impact and process evaluations produced by Georgia Power Company between 2010 and 2012. GDS is responsible for reviewing and critiquing all of the evaluation plans and evaluation studies produced by Georgia Power Company.	Jamie Barber Georgia Public Service Commission 244 Washington Street Atlanta, Georgia jbarber@psc.state.ga.us 404-656-0994
Missouri Department of Natural Resources	Technical and Regulatory Support for Evaluation, Measurement and Verification 2010 to 2013	The Missouri Department of Natural Resources retained GDS to provide technical and regulatory support for EM&V oversight of the integrated resource plans and EM&V studies produced by investor-owned utilities in Missouri.	Adam Bickford Planner III , Division of Energy Missouri Department of Natural Resources PO Box 176 Jefferson City, Missouri 65102 adam.bickford@dnr.mo.gov 573-526-4795

Client Name	Project Name & Project Date	Project Description	Contact
Florida Public Service Commission	Technical and Regulatory Support for Evaluation, Measurement and Verification, Setting Energy Efficiency Savings Goals, etc. 2008 to 2009	The Florida Public Service Commission retained GDS to review, assess, and critique the technical, economic, and achievable potential studies performed by Itron for the seven Florida electric utilities regulated by the Florida Energy Efficiency and Conservation Act of the Florida legislature. GDS did a detailed review of these seven studies, as well as a combined statewide technical potential study, and prepared comprehensive recommendations on the energy efficiency cost-effectiveness tests that are consistent with the revised FEECA statute and that the Commission should have used in this proceeding to establish new energy conservation goals for the FEECA utilities.	JoAnn Chase Florida Public Service Commission 2540 Shumard Oak Boulevard Tallahassee, FL 32399 jchase@psc.state.fl.us 850-413-6978
National Grid	Technical Assistance Services 2006 to 2007	GDS provided technical assistance to support the implementation and evaluation of energy efficiency projects. Services included: field measurement, review and independent verification of energy efficiency measure recommendations and associated savings estimates for multiple commercial and industrial facility projects being implemented throughout National Grid's service territory.	David Jacobson National Grid 55 Bearfoot Road Northborough, MA 01532 508-421-7282
New Hampshire Business Resource Center	New Hampshire Business Resource Center – Industrial Energy Audits 2007 to 2009	GDS provided technical assistance for its business clients to carry out comprehensive energy audits, provided recommendations for energy conservation opportunities, evaluated existing technologies, provided consultation and professional evaluations of emerging technologies for renewable and alternative energy sources and bio-energy products, and assisted with the development of USDA energy efficiency grant applications.	Christopher Way christopher.way@dred.state.nh.us (603) 271-2591
NYSERDA	Energy \$mart 2001 to 2003	GDS was responsible for providing data collection, analysis, and report writing services to NYSERDA in support of their overall evaluation efforts for the first three years of the New York Energy \$mart SM program effort.	Jennifer Meissner NYSERDA 17 Columbia Circle Albany, NY 12203 jae@nyserdanyny.gov 518-862-1090
Development of Technical Reference Manuals			
Maine Public Utilities Commission	Efficiency Maine Residential and Business Programs 2007 to 2011	GDS developed and updated the Technical Reference Manual for Efficiency Maine's energy efficiency programs and updated the .	Denis Bergeron Maine Public Utilities Commission 101 Second St. Hallowell, ME 04347 207-287-3831

Client Name	Project Name & Project Date	Project Description	Contact
Ameren Illinois	Energy Efficiency program 2008	GDS developed the TRM for Ameren Illinois' Energy Efficiency programs	Cheryl Miller Ameren Illinois 300 Liberty St. Peoria, IL 61602 309-677-5244
Pennsylvania Public Utility Commission	Development of Technical Reference Manual for PA Act 129 Energy Efficiency Programs 2009 to 2012	GDS and its subcontractors assisted the Technical Utility Services' staff of the Pennsylvania Public Utility Commission with the development of this Technical Reference Manual from 2009 to 2012.	Greg Shawley Manager Pennsylvania Public Utility Commission 400 North St. Harrisburg, PA 17120 gshawley@state.pa.us 717-787-5369
Other			
Wisconsin Focus on Energy	Business Program 2001 to 2013	GDS has been designing and implementing statewide energy efficiency programs for the commercial, production agriculture, and industrial (biofuels) sectors in Wisconsin since 1999 for the Focus on Energy Program. Since 2001, GDS has provided the Wisconsin Focus on Energy Business Program with technical services to businesses and production agriculture facilities in Wisconsin relating to the economic feasibility and energy savings of energy efficiency measures.	Preston Schutt Business Programs Manager Wisconsin Focus on Energy P.O. Box 7854 Madison, WI 53707 608-266-1462
Ameren Illinois	Design and Implementation of Ameren Illinois ActOnEnergy Business Program 2008 to Present	GDS Associates is part of a team that has been designing and implementing state-wide energy efficiency programs for the commercial, agriculture, and industrial sectors in Ameren Illinois' service territory. GDS is providing technical services to business facilities in Illinois relating to the economic feasibility and energy savings of energy efficiency measures. GDS provides program design, on-the-ground program implementation, data tracking, call center, and administrative support for the various programs.	Cheryl Miller Ameren Illinois 300 Liberty St. Peoria, Illinois 61602 309-677-5244
ISO-New England	ISO-NE Forward Capacity Market Qualification Package Review Support 2007	GDS conducted a review of Demand Resource qualification packages for completeness and compliance with the Market Rules and the ISO-New England Manuals for ISO-New England.	Kathryn Parlin Vice President West Hill Energy and Computing 23 Williamstown Rd Chelsea, VT 05038 kathryn@westhillenergy.com 802-685-3340

Client Name	Project Name & Project Date	Project Description	Contact
PSNH	Commercial & Industrial Support Services as part of PSNH's energy efficiency programs 2004 to 2006	GDS was hired by PSNH to assist in delivering targeted engineering services to commercial and industrial customers in conjunction with PSNH's energy efficiency programs. The range of technical assistance includes conducting scoping studies, focused feasibility studies, comprehensive facility services, and whole building assessments.	Paul Lentine 603-634-2523
Massachusetts JMC	ENERGY STAR Home Program 2005	The Massachusetts JMC retained GDS in 2005 to conduct 90 on-site inspections of newly constructed homes in Massachusetts for the purposes of collecting energy efficiency characteristics of new homes. This information was used to adjust the definition of the user defined reference home, which was instrumental to the delivery of the Massachusetts ENERGY STAR Home Program.	Bill Blake National Grid 55 Bearfoot Road Northborough, MA 01532 508-421-7255
British Columbia Hydro	Assessment of British Columbia Hydro Ten-Year Energy Efficiency Plan 2002	GDS conducted a comprehensive assessment of the appropriateness and reasonableness of the proposed program plans, processes, and procedures included in the BC Hydro DSM Ten-Year Plan. GDS reviewed program implementation and evaluation plans, marketing strategies, benefit/cost analyses, monitoring and verification protocols, staffing plans, program budgets, and financial and energy savings reporting systems, and made recommendations on items needing improvement.	Gurjit Parmar BC Hydro 333 Dunsmuir Street Vancouver, B.C. V6B 5R3 604-623-3792
Service of New Hampshire, Granite State Electric Company, and the ECS	Assessment of commercial construction practices 1999 to 2000	GDS was hired to conduct a baseline study on commercial construction practices to assist in determining whether New Hampshire's commercial energy code needed to be updated.	Brad Parkhurst Marketing Projects Coordinator Need organization name Box 330, 1000 Elm Street Manchester, NH 03105 603-634-2789
Massachusetts Electric Company and eight other electric utilities	Analysis of residential new construction market 1998 to 1999	In 1998-1999, GDS was retained by the Massachusetts Electric Company and eight other electric utilities to develop market assessment and baseline characteristics for the residential new construction market in southern New England.	Dorothy Conant, Coordinator Northboro, MA 01532 508-303-7297

GDS has provided energy efficiency, renewable energy, market research, integrated resource planning, regulatory support and related IT services to the following clients:

- ❖ *Adams Columbia Electric Cooperative*
- ❖ *Allegheny Electric Cooperative*
- ❖ Alliance to Save Energy
- ❖ Alliant Corporate Services
- ❖ Alexander Babbage
- ❖ *Arkansas Electric Cooperative Corporation*
- ❖ Aspen Systems Corporation
- ❖ August Partners
- ❖ Austin Energy
- ❖ Bare Associates International
- ❖ Bay State Gas Company
- ❖ Bemidji Area Indian Health Services
- ❖ Berkshire Gas Company
- ❖ *Big Rivers Electric Cooperative*
- ❖ Biomass Gas and Electric
- ❖ British Columbia Hydro (BC Hydro)
- ❖ Blackstone Valley Electric Company
- ❖ Boston Gas Company (now KeySpan Energy Delivery)
- ❖ Bonneville Power Administration (BPA)
- ❖ Boston Edison (now NSTAR)
- ❖ *Brazos Electric Cooperative*
- ❖ Burlington Electric
- ❖ Cadmus Group
- ❖ Cambridge Electric Light (now NSTAR)
- ❖ *Central Electric Power Cooperative*
- ❖ Central Maine Power Company
- ❖ City of Champaign, IL
- ❖ City of Gainesville, FL
- ❖ City of Grand Island, NE
- ❖ City of Green Bay, WI
- ❖ City of Houston, Texas
- ❖ City of Jefferson, WI
- ❖ City of Lafayette, Louisiana
- ❖ *Cobb Electric Membership Cooperative*
- ❖ Colonial Gas Company
- ❖ Commonwealth Electric (now NSTAR)
- ❖ Commonwealth of Virginia, Dept of Mines, Minerals & Energy
- ❖ COM/Gas (now NSTAR)
- ❖ Concord Electric Company
- ❖ Connecticut Conference of Municipalities
- ❖ Connecticut Energy Advisory Board (CEAB)
- ❖ Connecticut Energy Conservation Management Board (ECMB)
- ❖ Connecticut Light and Power Company
- ❖ Connecticut Office of Consumer Counsel
- ❖ Connecticut Natural Gas Company
- ❖ Consolidated Edison of NY
- ❖ Consortium for Energy Efficiency
- ❖ *Dairyland Power Cooperative*
- ❖ District of Columbia, District Department of the Environment
- ❖ District of Columbia Sustainable Efficiency Utility
- ❖ *East Texas Electric Cooperative*
- ❖ Eastern Edison
- ❖ Efficiency Maine
- ❖ Efficiency Vermont
- ❖ Energy Center of Wisconsin
- ❖ Energy Conservation Management Board
- ❖ Electric Council of New England
- ❖ Enbridge Consumers Gas (Canada)
- ❖ Energy North
- ❖ Energy Options
- ❖ Exeter and Hampton Electric Company
- ❖ Fall River Gas Company
- ❖ Fitchburg Gas and Electric Company
- ❖ Florida Public Service Commission
- ❖ FOCUS on Energy (WI)
- ❖ Gainesville, Florida Regional Utilities (GRU)
- ❖ GasNetworks (Massachusetts)
- ❖ Georgia Environmental Facilities Authority
- ❖ Georgia Public Service Commission
- ❖ Granite State Electric Company
- ❖ Green Mountain Power Company
- ❖ Green River Area Development District
- ❖ GreenCo Solutions
- ❖ Hawaii Department of Business, Economic Development and Tourism
- ❖ H.E. Butt Grocery Store Chain
- ❖ Holy Cross Energy
- ❖ Hoosier Energy
- ❖ ISO-New England
- ❖ KeySpan Energy Delivery
- ❖ La Capra Associates

- ❖ LaVallee Brensinger Architects
- ❖ LINPAK Materials Handling
- ❖ Long Island Power Authority
- ❖ Maine Public Service Company
- ❖ Maine Public Utilities Commission
- ❖ Marblehead Municipal Light Department
- ❖ National Grid
- ❖ Massachusetts Health and Educational Facilities Association
- ❖ Massachusetts Joint Management Committee
- ❖ Megdal and Associates
- ❖ Milwaukee School of Engineering
- ❖ The Minnesota Project
- ❖ Maryland Energy Administration
- ❖ Nantucket Electric Company
- ❖ Narragansett Electric Company
- ❖ National Grid, USA
- ❖ NSTAR
- ❖ New England Gas Company
- ❖ New England State Program Working Group
- ❖ Newport Electric
- ❖ *New Hampshire Electric Cooperative*
- ❖ New Hampshire Governors' Office of Energy and Community Service
- ❖ New Hampshire Office of Energy & Planning
- ❖ New Hampshire Public Utilities Commission
- ❖ *North Carolina Electric Membership Cooperative*
- ❖ North Carolina Utilities Commission
- ❖ Northeast Energy Efficiency Partnership (NEEP)
- ❖ *Northeast Texas Electric Cooperative*
- ❖ Northeast Utilities Service Company (NUSCO)
- ❖ Northern States Power
- ❖ Northern Utilities
- ❖ Nova Scotia Power
- ❖ NYSERDA
- ❖ *Oconto Electric Cooperative*
- ❖ Oneida Tribe of Indians of Wisconsin
- ❖ Pennsylvania Public Utilities Commission
- ❖ Piedmont
- ❖ PowerSouth
- ❖ Public Service Company of New Hampshire
- ❖ Public Service of New Mexico
- ❖ Questar Gas Company
- ❖ Reading Municipal Light Department
- ❖ Research Into Action
- ❖ Rhode Island Public Utilities Commission
- ❖ *Sam Houston Electric Cooperative*
- ❖ Sam Rayburn G&T Electric Cooperative
- ❖ Santee Cooper
- ❖ Sharyland Utilities
- ❖ SJH and Co.
- ❖ Southern Alliance for Clean Energy
- ❖ Southern Connecticut Gas Company
- ❖ Southern Mississippi Electric Power Association
- ❖ Shel Feldman Management Consulting
- ❖ State of Virginia Energy Office
- ❖ State of Wisconsin, Department of Administration
- ❖ Tauton Municipal Lighting Plant
- ❖ TecMarket Works
- ❖ *Tennessee Valley Authority (TVA)*
- ❖ *Tex-La Electric Cooperative*
- ❖ Utah Energy Office
- ❖ Union Gas (Canada)
- ❖ United Illuminating
- ❖ Unutil
- ❖ US Department of the Environment
- ❖ US Department of Veteran Affairs
- ❖ US Environmental Protection Agency
- ❖ Vermont Department of Public Service
- ❖ WE Energies (Wisconsin)
- ❖ West Hill Energy and Computing
- ❖ Western Massachusetts Electric Company
- ❖ Wisconsin Focus on Energy
- ❖ Wisconsin Public Power, Inc.
- ❖ Wisconsin Public Service Commission
- ❖ Xcel Energy

4.2 Overview of Experience and Capabilities of Nexant Planning & Evaluation

NEXANT PLANNING & EVALUATION, LLC (NPE) is a wholly owned subsidiary of Nexant Inc., a Delaware corporation formed in 2000 to provide energy efficiency and demand-side management (DSM) program planning, design, development, implementation and evaluation consulting services.

NPE delivers a comprehensive range of planning and evaluation services to utilities and governing agencies for the residential, commercial, industrial, institutional, and government market segments. NPE is an industry leader in the field of utility energy efficiency program measurement and verification (M&V) practices, having authored or assisted in the development of many of the industry's leading references, including the FEMP M&V Guidelines, the International Performance Measurement and Verification Protocols (IPMVP), and ASHRAE Guideline 14-2002 – "Measurement of Energy and Demand Savings."

With a dedicated, experienced staff of more than 30 in-house energy professionals, NPE possesses extensive real-world experience implementing M&V practices to quantify program savings impacts, conducting complex portfolio evaluation studies, determining the accuracy of program-reported savings, and evaluating lost revenue and cost-effectiveness analyses for numerous investor-owned utilities throughout the United States and Canada. NPE staff have successfully designed, managed, and completed more than 100 evaluations of energy efficiency programs for electric and gas utilities over the last decade. These qualifications allow NPE to approach our work from multiple perspectives, ensuring that our findings are not only accurate, but provide information to utilities and their stakeholders with an eye toward its use in future DSM program administration and evaluation efforts.

NPE has evaluated programs totaling hundreds of millions of dollars in funding and involving thousands of individual energy efficiency projects. Our core services include:

- Integrated Resource Planning
- End Use Metering and Monitoring
- Program Process and Impact Evaluations
- Outcome Evaluations
- Market and Potential Studies
- Market Characterization Studies
- Net-to-Gross Analysis
- End-Use Saturation Studies
- Benchmarking
- Regulatory and Policy Planning
- Detailed Project Technical Review and Due Diligence
- Expert Testimony
- EM&V Training
- Facility Energy Assessments and Audits
- End-Use/Load Profile Studies and Research



NPE at a Glance

Professional staff with over a decade of DSM planning and evaluation experience

Fully staffed service centers in Philadelphia, PA, Boulder, CO and Atlanta, GA.

Completed large portfolio evaluations and market studies in over 10 states

NPE Principals are members of the IPMVP technical committee

Developed Statewide Evaluation Frameworks,

ABOUT NEXANT

NPE's parent company, Nexant Inc., is a provider of intelligent grid software and clean energy solutions — pioneering, developing, and advancing electric power grid and alternative energy technologies and services.

Nexant's exclusive focus on energy, combined with their well-respected and experienced professionals, proven technology, and proprietary industry information, has earned them distinctive brand recognition and a reputation as a top energy solutions company.

Nexant's innovative software solutions manage energy efficiency, demand side management, demand response, and distributed generation. They enable smart grid rates and customer-facing products and services and improve the physical and financial operational efficiency of the power grid. They also support market operations by addressing critical deregulation and security issues.

To date, Nexant's team of industry professionals has completed more than 3,000 client assignments in over 100 countries, and their software applications and platforms are actively in service in more than 120 control centers at utilities worldwide. Their clients include Fortune 500 companies, utilities, transmission and distribution system operators, petroleum and chemical majors, financial institutions, government agencies, and development banks.

Nexant is headquartered in San Francisco, California, and operates from 31 corporate, representative, and project offices located throughout the United States, Europe, the Middle East, Africa, and Asia.

NEXANT’S RELEVANT RECENT PROJECTS

Client Name	Project Name & Project Date	Project Description	Contact
Evaluations			
Pennsylvania Public Utility Commission	PA ACT 129 Statewide Evaluator - Evaluation of Pennsylvania Electric Distribution Companies' Energy Efficiency and Conservation Programs 2009 to Present	<p>Nexant is conducting impact evaluations of the Energy Efficiency and Conservation (EE&C) Programs of the large Pennsylvania Electric Distribution Companies (EDC) as a subcontractor to GDS Associates, Inc. Under the direction of the Commission, an evaluation process has been established that monitors and verifies data collection, quality assurance, the results of each EDC plan, and the program as a whole, in accordance with the Total Resource Cost Test (TRC). Nexant and GDS have conducted an evaluation of each EDC plan and the entire energy efficiency and conservation program as a whole. The evaluation includes an analysis of each plan from both a process and impact standpoint, program impacts (demand and energy savings), and cost-effectiveness according to the TRC.</p> <p>The team has created an Audit Plan to guide the utility EM&V contractors in the development of data collection sampling and protocols; clarified and updated the current Technical Resource Manual; developed QA/QC procedures to be followed in the field; and as statewide evaluator, developed in the Audit Plan a menu of approaches, depending on type of program and total impact of the program for achieving savings, for verifying impact and process activities performed by the utility EM&V contractors. An in-depth analysis and review of the current Technical Resource Manual for the State of Pennsylvania is also being conducted. Nexant is working on a collaborative basis through technical working groups to provide clarity and updates to various measures. Additional measures that are currently not in the TRM are being identified to develop guidelines for EM&V that can be followed as these measures are integrated under various programs.</p>	Mr. Greg Shawley Pennsylvania Public utility Commission 400 North Street 2nd Floor, M West Harrisburg , PA 17120 gshawley@pa.gov (717) 787-5369
Ontario Power Authority	Cross Cutting Evaluation of Business Incentive Programs for the Ontario Power Authority 2009 to Present	<p>Nexant’s team completed the impact and process evaluations for the Ontario Power Authority’s (OPA) large commercial and institutional business incentive initiative for program years 2008-2010. Nexant’s primary responsibilities included: 1) auditing selected projects, 2) verifying energy and demand savings, 3) estimating net savings, 4) developing measure-level 8760 load shape analyses, and 5) reviewing prescriptive input assumptions. To perform these tasks, we established appropriate strata and drew a random sample of representative projects. We reviewed application documents and conducted site inspections to obtain information about the representative projects. We used engineering calculations and the information obtained onsite to develop</p>	Mr. Phil Bosco Ontario Power Authority 120 Adelaide Street West, Suite 1600 Toronto, ON M5H 1T1 phil.bosco@powerauthority.on.ca (416) 969-6095

Client Name	Project Name & Project Date	Project Description	Contact
		<p>program realization rates that adjusted the OPA’s reported savings. We reviewed current M&V methods and processes used in OPA programs. The goal of this task was to study M&V procedures to identify gaps and make recommendations for improvement. To conduct the process evaluation, we teamed with Research Into Action, a highly regarded leader in process evaluation and market research. Our team interviewed program staff and other third-party evaluators to understand the current M&V practices used in individual programs. We then compared the feedback to the observations from the impact evaluation of project samples. Recommendations were then refined by comparing program methods with the best practices of other jurisdictions.</p> <p>Nexant is leading the team, which includes Research Into Action, that is completing the impact and process evaluation and cost-effective analysis of OPA’s business incentive programs for program years 2011-2012. These initiatives include the Retrofit, Audit Funding, and Existing Building Commissioning Incentive initiatives. -Continuing this work has allowed the evaluation to build off the previous evaluation work in a more seamless and cost-effective manner.</p>	
<p>Ontario Power Authority</p>	<p>Evaluation of the Small Business Lighting Program</p> <p>2010 to Present</p>	<p>Nexant’s team conducted an impact and process evaluation for the Ontario Power Authority’s (OPA) Small Commercial Direct Install initiative for program years 2009-2010. Nexant’s primary responsibility was to verify the net energy (kWh) and demand (kW) impacts and assess the cost effectiveness of the program. To conduct the process evaluation, we teamed with Research Into Action, a highly regarded leader in process evaluation and market research. Our team designed a survey to assess free-ridership and spillover for each facility. We used this information to develop program realization rates and net-to-gross ratios that adjusted the OPA’s reported savings. Nexant also was tasked with updating the OPA’s prescriptive savings assumptions for each measure based on our site visits and secondary market research. Our evaluation team integrated process-related data collection into several of the onsite impact evaluation tasks to avoid over-burdening OPA’s commercial customers.</p> <p>Nexant is serving on a team, led by Research Into Action, that is completing the impact and process evaluation and cost effectiveness analysis of the OPA’s Small Business Lighting Program initiative, the next iteration of the Small Commercial Direct Install initiative, for program years 2011-2012. This evaluation will greatly benefit from the team’s combined knowledge and experience of nd will allow an enhanced level of reporting that would not be possible for the same budget.</p>	<p>Mr. Phil Bosco Ontario Power Authority 120 Adelaide Street West, Suite 1600 Toronto, ON M5H 1T1 phil.bosco@powerauthority.on.ca (416) 969-6095</p>

Client Name	Project Name & Project Date	Project Description	Contact
<p>Ontario Power Authority</p>	<p>Evaluation of the 2011-2012 Consumer Program 2012 to Present</p>	<p>Nexant is part of a team, led by Rresearch Into Action, that is conducting process and impact evaluations of Ontario Power Authority's (OPA) Consumer Program portfolio for the 2011 and 2012 program years. The portfolio consists of four programs: HVAC Incentives, Midstream Incentives (pool pumps and TVs and set-top boxes), Appliance Retirement/Appliance Exchange, and the Instant Coupon Booklet / Bi-Annual Retailer Events. This evaluation involves close coordination of data collection, analysis, and reporting in order to address program-specific and cross-program marketing effects. Nexant is responsible for completing the cost-effectiveness analyses for all four initiatives and the impact evaluations for the HVAC, Appliance and Midstream initiatives. Our impact evaluation approach for these three initiatives involves a variety of techniques that demonstrate Nexant's breadth of expertise.</p> <p>The HVAC impact evaluation includes verification site visits with spot measurements, as necessary, for furnaces and 2011 central air conditioners. For 2012 central air conditioner projects, a metering approach is being used to more accurately update the prescriptive assumptions used to calculate savings for these measures.</p> <p>The impact evaluation of the Appliance Initiative follows a calculated analysis approach based on parameter performance. This approach uses a combination of site measurement and verification with a statistical model based on an analysis of the current program tracking data and telephone surveys of sampled participants. The on-site measurement and verification activities require close coordination with OPA's decommissioning agent and program participants in order to obtain equipment characteristics (top freezer, side-by-side, etc.), operating conditions (primary vs. secondary, indoor vs. outdoor, etc.), and energy use patterns. This task is being cost-effectively accomplished by integrating evaluation recruitment into the existing program processes. Nexant will also update the Unit-Energy-Consumption (UECs) estimates, part-use factors, and NTG ratios used in previous OPA evaluations.</p> <p>The two elements of the Midstream Initiative (pool pumps and TVs and set-top boxes) require taking two different approaches to estimating energy and demand savings. We proposed an M&V approach for Pool Pumps and a modeling approach for TVs and Set-Top Boxes.</p>	<p>Mr. Phil Bosco Ontario Power Authority 120 Adelaide Street West, Suite 1600 Toronto, ON M5H 1T1 phil.bosco@powerauthority.on.ca (416) 969-6095</p>

Client Name	Project Name & Project Date	Project Description	Contact
<p>Delaware Department of Natural Resources and Environmental Control</p>	<p>EM&V of Delaware Energy Efficiency and Demand Response Programs 2011 to Present</p>	<p>Nexant recently completed a project for the Delaware Department of Natural Resources and Environmental Control (DNREC) where they developed an EM&V Framework and a Delaware-specific TRM, as well as provided EM&V for Delaware’s Sustainable Energy Utility’s (SEU) state-wide energy efficiency programs. Nexant helped facilitate the stakeholder process for developing the EM&V Framework and played a central role to educate DNREC and inform the Framework on PJM Capacity Market participation. Nexant led the efforts to adapt the Mid-Atlantic TRM to a Delaware-specific TRM through review of commercial measures and commercial baseline assumptions relevant to Delaware. Both the Framework and TRM will inform future program EM&V throughout the state. Nexant also conducted program evaluations of ARRA-funded residential and non-residential state-wide programs administered by Delaware’s SEU. Specifically, Nexant conducted an impact and process evaluation of the commercial prescriptive and custom rebate programs which focused largely on lighting and HVAC measures. Nexant also evaluated the new residential “green” construction program to assess the energy impacts, isolating market effects to understand common building practices. In addition to EM&V efforts, Nexant implemented baseline studies for both the residential and the commercial & industrial sectors. The project involved a considerable amount of stakeholder engagement and regulatory scrutiny from the Delaware Public Service Commission (PSC). A key aspect of Nexant’s role was to manage the interface between DNREC, outside interveners, PJM, the utilities, the SEU, and the Delaware PSC.</p>	<p>Ms. Bahareh van Boekhold Delaware Department of Natural Resources and Environmental Control 1203 College Park Drive, Suite 101 Dover, DE 19904 Bahareh.vanBoekhold@state.de.us (302) 735-3495</p>
<p>Wisconsin Public Service Commission</p>	<p>Impact Evaluation of Focus On Energy Portfolio 2011 to Present</p>	<p>Nexant is conducting a multi-year impact evaluation for the Wisconsin Focus on Energy portfolio of energy efficiency programs. The project includes an evaluation of three portfolios of programs: Mass Markets (MM) programs, Targeted Markets (TM) programs, and legacy programs. The MM portfolio contains seven generally residential measure-based programs while the TM portfolio contains six generally non-residential end-user-based programs, including programs for commercial, industrial, and agricultural customers. The evaluation coincided with Focus on Energy’s transition from the previous program administrator to the current program administrator, resulting in the need to evaluate legacy programs prior to the rollout of new programs. Nexant’s responsibilities include developing Strategic Evaluation Plans for each portfolio, developing Program Specific Evaluation Plans for each program, developing a special evaluation plan for the legacy programs, performing engineering analysis and review, conducting on-site data collection inspections, deploying logging and</p>	<p>Mr. M. Sami Khawaja, Ph.D. The Cadmus Group 720 SW Washington St., Suite 400 Portland, OR 97205 Sami.Khawaja@cadmusgroup.com (503) 503-467-7122</p>

Client Name	Project Name & Project Date	Project Description	Contact
		<p>monitoring devices, conducting database review, performing measure research, and performing other data analysis. Cross-cutting activities and analysis are being performed to enable reporting at both the measure and program levels. In addition to impact evaluation activities, Nexant also is conducting a multi-year baseline study in both the residential and nonresidential sectors to assess the standard market practices in Wisconsin and ascertain the level of free-ridership in a jurisdiction where programs have been running for many years. Nexant also is leading measure-specific metering studies for nonresidential measures and developing the nonresidential section of the Wisconsin TRM.</p>	
<p>Georgia Power Company</p>	<p>Evaluation of 2011 Certified DSM Programs 2011 to 2012</p>	<p>Nexant and its subcontractors, The Cadmus Group, and SRBI, recently concluded a process and impact evaluation of Georgia Power Company's seven certified Demand Side Management programs, including: residential water heating, residential home energy improvement, residential high efficiency new homes, residential lighting and appliance, residential refrigerator recycling, commercial prescriptive and commercial custom programs for the 2011 program year. The evaluation project included the formation of key program questions, planning, stakeholder interviews, customer surveys, on-site inspections, measurement of key measure parameters and cost-effectiveness analysis. Evaluation key questions, plans, and cost-effectiveness procedures were developed considering input from stakeholder groups, including the Georgia Public Service Commission. Each program was evaluated independently, with results reported at measure, program and portfolio levels. Target precision and confidence intervals for process and impact surveys were established for each unique program to balance sample rigor with program impacts and budgets. Measurement and verification approaches were customized to each specific energy efficiency measure, considering expected uncertainty and impact magnitude. A statewide metering study was conducted in the homes of participants of the residential lighting and appliance program to develop estimates of the average hours of use and coincidence factor for compact fluorescent bulbs installed through the program's various delivery channels.</p>	<p>Mr. Dean Harless Georgia Power Company 241 Ralph McGill Blvd., NE Atlanta, GA 30308-337 ldharles@southernco.com (404) 506-1468</p>

Client Name	Project Name & Project Date	Project Description	Contact
Lawrence Berkeley National Laboratory	Evaluation of US Department of Energy's Better Buildings Program 2012 to 2014	In 2011, Nexant, as a subcontractor to Research Into Action, began a four-year evaluation for the Lawrence Berkeley National Laboratory of the U.S. Department of Energy's Better Buildings Program. The program invests American Recovery and Reinvestment Act (ARRA) funds to: 1) initiate projects that achieve energy savings in sectors where this has proved difficult, 2) demonstrate a sustainable business model for providing cost-effective energy upgrades for a large percentage of the residential, commercial, and/or public buildings in a specific community, and 3) identify and spread the most effective approaches supporting the development of a robust retrofit industry in the U.S. More than 40 grantees provide diverse programs throughout the U.S. Our team is developing and will employ a quasi-experimental design to assess how well the overall Better Buildings program has achieved its objectives. Evaluation activities include process and market effects assessments and energy impact evaluations, including M&V and billing analysis. Nexant is leading the impact evaluation and M&V analysis and will conduct approximately 800 project reviews across the 41 BBNP Grantees. Our team's goal is to quantify the energy savings resulting from the program activities, to fully understand the various program activities, explain the theory and logic of how they address the Better Buildings objectives, and identify which programs and program elements were most successful and which can be successfully replicated.	Mr. Edward Vine Lawrence Berkeley National Laboratory 1 Cyclotron Road MS 90R2002 Berkeley, CA 94720 ELVine@lbl.gov (510) 486-6047
New York State Energy Research and Development Authority	Measurement & Verification Evaluation of New York Energy \$Mart Program 2003 to 2007 <i>(Extended for the Con Edison Gas Efficiency Program Through 2009)</i>	Nexant was the measurement and verification (M&V) evaluation contractor for New York Energy Research and Development Authority's (NYSERDA) New York Energy \$mart portfolio of 43 energy efficiency, market transformation and research programs, all funded through the State's system benefit charge. Our primary responsibility under this multi-year contract was to independently verify the gross energy (kWh) and demand (kW) impacts that result from the operation of the Program. Using our broad engineering experience with energy using systems found in commercial, residential, and industrial sectors, we reviewed project files to check that accepted savings calculation methodologies are used and correctly applied. Our basic approach was to draw a random sample of representative projects and to calculate program realization rates that adjust NYSEDA's reported savings to match actual conditions found in the field. For each project in our sample we inspected installations to ensure that energy efficient equipment that has received incentive money from NYSEDA was operating as designed. On site activities included interviews with facility managers, witnessing equipment operation, collecting systems information, and taking spot measurements of power, temperature, flow, or other parameters. Based on our findings we determined the verified project savings and applied the results to the sponsoring program. Nexant's	Ms. Judeen Byrne NYSEDA 17 Columbia Circle Albany, New York 12203-6399 jlb@nyserda.ny.gov (518) 862-1090, Ext. 3514

Client Name	Project Name & Project Date	Project Description	Contact
		M&V evaluation results were used to quantify benefits that were credited to the operation of the New York Energy Smart Program.	
Planning Studies and Market Assessments			
Pennsylvania Public Utility Commission	Commercial & Industrial Baseline Study 2011 to 2012	Nexant performed a commercial & industrial baseline study for the Pennsylvania Public Utility Commission for the seven electric distribution companies (EDCs) in Pennsylvania. Nexant developed a customized sampling plan and survey instrument to meet the objectives of the Technical Working Group, and provided key inputs in the Market Potential Study. The baseline study included primary market research with more than 24 field engineers conducting 418 commercial & industrial site visits during a four-month time period. Primary data was collected for six of the seven EDCs with data collected from a prior study on PECO Energy Company also incorporated. The combined data were analyzed and an End Use and Saturation Summary Report presented data at both a state-wide and EDC-specific level. The report included saturation and efficiency levels along with a market segmentation exercise that provided electricity consumption by sector, business segment and end use.	Mr. Greg Shawley Pennsylvania Public Utility Commission 400 North Street 2nd Floor, M West Harrisburg, PA 17120 gshawley@pa.gov (717) 787-5369
Pennsylvania Public Utility Commission	Commercial & Industrial Market Potential Study 2011 to -2012	As a subcontractor to Cadmus, Nexant conducted a state-wide DSM energy efficiency market potential study for the Pennsylvania Public Utility Commission for the seven electric distribution companies (EDCs) located in Pennsylvania to help inform the planning and implementation of Phase II of Pennsylvania's Act 129 energy efficiency goals for 2018. The potential study included the determination of technical, economic, achievable and program potential for the commercial & industrial sectors. Nexant conducted all the research to determine savings, costs, and estimate useful lives values for hundreds of commercial & industrial energy efficiency measures. Nexant also developed 14 customized MS Excel-based models to estimate savings potential for each EDC and each sector, and then rolled up the EDC-specific findings into statewide potential. Findings were summarized in a report with recommended savings targets based on Nexant's analysis. In coordination with Cadmus, senior Nexant staff also provided regulatory support to PUC staff to advise them during the stakeholder engagement process as targets were considered. Ultimately, the findings were used by the Commission to help inform updated targets for the implementation of Phase II of Pennsylvania's Act 129.	Mr. Greg Shawley Pennsylvania Public Utility Commission 400 North Street, 2nd Floor, M West Harrisburg, PA 17120 gshawley@pa.gov (717) 787-5369

Client Name	Project Name & Project Date	Project Description	Contact
Iowa Utility Association	Assessment of State-Wide Energy and Capacity Savings Potential 2007, and 2011 to Present	In 2007 and again in 2011-present, Nexant served on a team of consultants, led by Cadmus, that is completing a technical and market assessment of Iowa's statewide energy and capacity savings potential for the Iowa Utility Association. The study provided estimates of technical potentials for electric energy efficiency and peak capacity reduction, natural gas energy efficiency, and selected renewable resources for all major end-uses in all customer sectors (including low-income, residential, and nonresidential). Nexant's main responsibility was to conduct primary market research of the non-residential segment to collect data on end-use customer characteristics and energy efficiency measures including current equipment saturation levels at various efficiency levels and other key inputs for the technical assessment. To complete the data development, Nexant developed and conducted trade ally (approximately 50) and end-use customer (approximately 200) phone surveys, completed on-site inspections (approximately 40), reviewed secondary data reports and assessments, and provided general and technical project oversight.	Mr. Hossein Haeri The Cadmus Group 720 SW Washington, Suite 400 Portland, OR 97205 Hossein.Haeri@cadmusgroup.com (503) 467-7140
Delaware Department of Natural Resources & Environmental Control	Commercial & Industrial Baseline Study 2011 to Present	NPE is leading the state-wide effort to conduct a commercial and industrial (C&I) end-use and baseline study for the Delaware Department of Natural Resources and Environmental Control. The study involved 140 on-site visits to residential, commercial, and industrial facilities to perform baseline field surveys of existing lighting, HVAC, and building envelope characteristics; the re-design of the NPE C&I survey instrument to better match the needs of Delaware and future clients; and the development of a sampling plan of C&I customers to develop the most accurate methods to determine a statewide baseline condition.	Ms. Bahareh van Boekhold Delaware Department of Natural Resources and Environmental Control 1203 College Park Drive, Suite 101 Dover, DE 19904 Bahareh.vanBoekhold@state.de.us (302) 735-3495

Client Name	Project Name & Project Date	Project Description	Contact
PacifiCorp	Comprehensive DSM Market Potential Assessment 2006 to 2007, 2010, and 2012 to Present	Nexant was and is currently a contributing member of the team selected by PacifiCorp to complete a comprehensive assessment of achievable energy efficiency, demand response, and renewable resources across their six-state service territory. Nexant specifically supported research into achievable market penetration rates, incentive structures, incremental measure costs, program administration costs, and end-use-specific energy intensities to construct multiple scenario analyses. These efforts relied on data collected through Nexant project experience, as well as data compiled through federal and state agencies, to provide a comprehensive evaluation of DSM portfolio performance.	Mr. Hossein Haeri The Cadmus Group 720 SW Washington, Suite 400 Portland, OR 97205 Hossein.Haeri@cadmusgroup.com (503) 467-7140
Georgia Power Company	DSM Technical Potential Study and Integrated Resource Planning Technical Support 2005 to 2007, 2008 to 2010, and 2011 to 2012	To support the demand side analysis for Georgia Power's 2007 and 2010 Integrated Resource Plans (IRP), Nexant compiled and analyzed an extensive list of potential DSM measures and program offerings for Georgia Power's commercial, industrial, and residential customers. Nexant staff worked closely with Georgia Power's staff to identify locally applicable technologies, measure energy performance, and gather accurate cost data. Subsequent policy and program analyses were conducted to establish detailed energy efficiency program frameworks, annual energy and demand savings estimates, and annual budgets for a portfolio of residential, commercial, and industrial programs. Upon establishing the program structures, Nexant prepared preliminary program plans outlining the overall procedures, eligible measures, preliminary incentive levels, and goals of each proposed program. Nexant also conducted a DSM technical potential study in support of Georgia Power's 2007 IRP filing consisting of a detailed assessment of the potential for energy efficiency and demand response programs in Georgia Power's service territory. Nexant worked closely with Georgia Power's staff to identify locally applicable technologies, measure energy performance, gather accurate measure cost data, and characterize Georgia Power's electricity load. These inputs were used to estimate achievable energy efficiency potential and related impacts, which were broken out into technically feasible, economically viable, and realistically achievable DSM potential impacts for the residential, commercial, and industrial market sectors.	Mr. Dean Harless Georgia Power Company 241 Ralph McGill Blvd., NE Atlanta, GA 30308-337 ldharles@southernco.com (404) 506-1468

Client Name	Project Name & Project Date	Project Description	Contact
Northwestern Energy	Distributed Energy Resource Study 2011	Nexant conducted a study to assess the potential for distributed energy resources in Northwestern Energy's service territory, which included two resource groups – demand response and distributed generation. Demand response potential was calculated by using data collected during the 2009 end-use study and industry data on demand response participation. Programs included in the analysis were direct load control, irrigation load reduction, curtailable load (mandatory reduction), and demand bidding (event-by-event voluntary participation). Distributed generation potential was estimated by using the existing customer base and forecasted growth rates by commercial/industrial sector to determine the facility types and load profiles most applicable for combined heat and power (CHP) and anaerobic digesters. For CHP, Nexant first segregated customers by business type into over 30 categories and filtered the list to include only those customers with peak loads suitable for CHP systems. Then, thermal factors were applied on a sector basis to reflect the electric versus heat sizing decisions that must be made by customers. Finally, applicability factors were used to reflect logistical and economic barriers that CHP must overcome. Anaerobic digester potential was estimated for wastewater facilities using EPA databases for wastewater flow rates and the associated potential for biogas recovery.	Mr. William (Bill) Thomas NorthWestern Energy 40 East Broadway Street Butte, MT 59701 Bill.thomas@northwestern.com (406) 497-2669
Tri-State Generation and Transmission Association	Market Electric Potential Assessment 2009 to 2010	Nexant, along with its subcontractor The Cadmus Group, performed a Market Electric Potential Assessment for Tri-State Generation and Transmission Association's (Tri-State) service areas in Colorado, Nebraska, New Mexico, and Wyoming. The assessment goal was to determine the technical, economic, and achievable potential for energy efficiency and demand response in the residential, commercial, irrigation and Industrial customer sectors over the 15 years from 2010 to 2025. Nexant engaged with Tri-State's 44 rural electric cooperative distributors, including 12 in New Mexico, to understand end-use market characteristics and current DSM program challenges and barriers. The assessment segmented Tri-State's territory into eight regions, including North and South New Mexico, to provide higher resolution and accuracy for energy efficiency measure data. Demand response potential was estimated on the basis of customer segment and program type, including direct load control, irrigation load reduction, curtailable load (mandatory reduction), and demand bidding (event-by-event voluntary participation).	Mr. Lowell Stave Tri=State Generation and Transmission Association 1100 West 116th Avenue Westminster, CO 80234 lstave@tristategt.org (303) 452-6111

Client Name	Project Name & Project Date	Project Description	Contact
Northwestern Energy	End-Use and Market Potential Study 2009	Nexant, along with its subcontractor The Cadmus Group, completed an end-use and market potential study for NorthWestern Energy’s Montana electric service territory. The study involved two tasks. The first, completed by Nexant, was to perform an end-use and load profile study and determine the energy efficiency measures to be addressed in the estimation of market potential. This task included over 200 site visits to residential and commercial customers within NorthWestern Energy’s service territory. The second task, led by Cadmus, was to compare the costs and savings of energy-efficient measures relative to standard equipment and practices to determine what electric energy efficiency is technically feasible, economically feasible, and achievable in NorthWestern Energy’s electric supply market for a range of avoided costs.	Mr. William (Bill) Thomas NorthWestern Energy 40 East Broadway Street Butte, MT 59701 Bill.thomas@northwestern.com (406) 497-2669

4.3 Overview of Experience and Capabilities of Research Into Action, Inc.

Research Into Action has been a leading provider of energy efficiency, demand response, renewable energy, and resource conservation program and portfolio evaluation and market research services since 1996. We helped pioneer and continue to champion process evaluation as an effective tool to understand the motivations that underlie individuals' and organizations' energy-related actions. We conduct process evaluations of program portfolios and single programs, both as stand-alone evaluations and as part of comprehensive process, impact, economic, and market studies. We are based in Portland, Oregon, and have additional offices in New York City, Washington, DC, and Madison, Wisconsin.



Our clients include program administrators with utilities, energy-related governmental agencies, and nongovernmental organizations throughout the United States and Canada. They rely on us for independent, insightful, and useful information as they develop, implement, evaluate, and evolve their programs and services. We have active energy program evaluation projects or recently completed projects in: California, Colorado, Idaho, Illinois, Iowa, Massachusetts, Michigan, Montana, New York State, Oklahoma, Oregon, Vermont, and Washington State; four nationwide projects; six regional projects in the Northwest region; three regional projects in the Northeast region; and projects in British Columbia and Ontario.

Of greatest relevance to this project, we are leading the following process evaluations: 1) NYSERDA's 40+ energy efficiency and renewable energy program portfolio, 2) the 40+ ARRA-funded Better Buildings for the US Department of Energy, 3) NorthWestern Energy's 30+ energy efficiency program portfolio, and 4) Ameren Missouri's nonresidential program portfolio.

Research Into Action has provided significant leadership in the energy program evaluation and market research industry since our inception. For instance, Dr. Jane S. Peters, President, is treasurer of the International Energy Program Evaluation Conference (IEPEC), and was a member of the teams that wrote the 2006 Evaluation Protocols and 2001 Framework for Planning and Assessing Publicly Funded Energy Efficiency for the California Public Utilities Commission. In addition, Dr. Peters and Dr. Marjorie McRae, Principal, have led Evaluation, Measurement, and Verification training programs for the Association of Energy Services Professionals for several years, and Bobbi Tannenbaum, Principal, has taught evaluation-related courses for the International Energy Program Evaluation Conferences and the International Energy Agency. They and the other key staff we include in this proposal have published and presented widely in the field. Among her many publications, Dr. Peters co-authored the white paper *Reconsidering What We Measure; Awareness, Knowledge, Attitudes, and Behavior* (2012) for Southern California Edison, and wrote the white paper *Process Evaluation Insights on Program Implementation* (2009) for the California Institute for Energy and Environment, as well as two books on energy program evaluation for the Electric Power Research Institute (EPRI). Dr. McRae wrote *DSM Evaluation: Six Steps for Assessing Program Effects*, a guide to process and impact evaluation and market research published by EPRI, as well as numerous studies for a variety of clients throughout the U.S.

Research Into Action is honored that *Oregon Business* magazine recognized us as one of the **ten greenest companies to work for in Oregon** in 2010, 2011, and 2012, and one of the **best companies to work for in Oregon** in 2011, and that the Initiative for a Competitive Inner City recognized us as one of the "**Inner City 100**" – the fastest-growing firms located in America's inner cities – in 2011 and 2012.

Research Into Action is a Women-owned Business Enterprise as certified by the State of Pennsylvania Department of General Service/Bureau of Small Business Opportunities (certificate 400314-2012-11-S expires 11/30/13) and the Women's Business Enterprise National Council (WBENC) (certificate 2005116258 expires 8/31/2013). We have included copies of these certificates in the Small Diverse Business Volume.

RESEARCH INTO ACTION’S RELEVANT RECENT PROJECTS

Client Name	Project Name & Project Date	Project Description	Contact
Program Evaluation			
<p>Bonneville Power Administration</p>	<p>Various Projects 1997 to Present</p>	<p>The Bonneville Power Administration (BPA)_is a federal power marketing agency that serves more than 120 utilities throughout the Pacific Northwest. We have conducted more than 24 projects for BPA since 1997. Our most recent projects for BPA are: the update of BPA’s Measurement and Verification (M&V) Protocols (2009-2010); Residential and Commercial Lighting Program Assessment (2009-2010); Residential Performance Tested Comfort Systems (PTCS) and HVAC Research (2010); Evaluation Strategy for Custom Projects and M&V (2010-2011); process evaluation of the Energy Smart Industrial Program (2011-2012); and the Analysis of the Residential Building Stock Assessment Database (2012-2013). We also compiled data on measure costs and energy savings for a list of target measures to inform the Northwest Power and Conservation Council’s Sixth Power Plan.</p> <p>Our assessment of BPA’s residential and commercial lighting programs is particularly relevant to this proposal. For the commercial sector, we conducted a process evaluation to determine: 1) if the Trade Ally Network (TAN) were operating as designed, 2) if the TAN were providing value to utility customers, 3) the strengths and weaknesses of the TAN, and 4) how to improve the TAN to increase energy savings. We interviewed 30 trade allies and other TAN stakeholders. For the residential programs, we: 1) reviewed national best practices for direct-mail and direct-installation programs, 2) reviewed BPA customer utilities' direct-mail and direct-installation approaches, 3) determined the maximum number of bulbs BPA should allow its customer utilities to direct-mail, and 4) identified if there were a difference in self-reported installation among utilities that direct-mailed different numbers or varieties of bulbs. We conducted phone interviews with 200 residential customers to assess their satisfaction with and installation of direct-mailed bulbs. For both projects, our methodology included a review of program literature and best practice information, and surveys of approximately 30 utility program staff.</p>	<p>Lauren Gage Evaluation and Market Research Lead Bonneville Power Administration PO Box 3621 Portland, OR 97208-3621 lsmgage@bpa.gov (503) 230-4961</p>

Client Name	Project Name & Project Date	Project Description	Contact
California Statewide	Process Evaluation of Upstream Lighting and Market Transformation Programs and Residential/Non-Residential Needs Characterization 2011 to 2013	In 2011, Research Into Action began a three-year process evaluation of Pacific Gas & Electric's and Southern California Edison's upstream lighting and market transformation programs. This work was part of a combined process evaluation and nonresidential needs characterization performed by a team led by Evergreen Economics. The process evaluation included interviews with program managers and nonresidential trade allies and nonresidential customer research. The project was particularly timely because the California lighting programs were in a state of major transition from large-scale resource acquisition of cost-effective energy savings to market transformation programs focused on new technologies. This project provided insights to help California meet its aggressive energy efficiency strategic plan for lighting: a 60 to 80 percent reduction in lighting energy consumption through delivery of advanced lighting to all buildings.	Caroline Chen Sr. Business Consultant Program Evaluation StatWizards LLC (Member of SCE M&E Team) 100 Tunapuna Lane Coronado, CA 92118 ccchen@san.rr.com (619) 423-1512
California Statewide	Process Evaluations of the Statewide Home Energy Efficiency Rebate (HEER) and Statewide Business and Consumer Electronics Programs 2011 to 2012	In 2011-2012, Research Into Action led the evaluation of the Statewide Home Energy Efficiency Rebate (HEER) and Statewide Business and Consumer Electronics (BCE) programs for Southern California Edison and Pacific Gas & Electric. The project included a process evaluation of the HEER program, a market characterization for end-use appliances included in the HEER program, an assessment of program opportunities for miscellaneous plug loads, and a general population survey of residential customers' attitudes, knowledge, awareness, and behavior (AKAB). The combination of these four study areas provided a comprehensive look at the program designs working in this market, as well as potential future program designs. This research was timely because the role of utility programs in residential markets was shifting dramatically, and this project informed the development of the 2014-2016 programs.	Caroline Chen Sr. Business Consultant Program Evaluation StatWizards LLC (Member of SCE M&E Team) 100 Tunapuna Lane Coronado, CA 92118 ccchen@san.rr.com (619) 423-1512
California Statewide	2009-2011 California Statewide Low Income Energy Efficiency Program Process Evaluation: Pacific Gas & Electric 2010 to 2011	Research Into Action led a mixed-methods process evaluation of the Low Income Energy Efficiency (LIEE) Program for the four California investor-owned utilities: Pacific Gas & Electric (PG&E), Southern California Edison, San Diego Gas and Electric (SDG&E), and Southern California Gas. Our evaluation sought to identify which program processes were and were not working, and how to achieve or exceed goals and objectives for the program most effectively. We explored administration, communication and coordination, delivery and implementation, and customer response. Our approach involved: 1) interviews with key contacts at the four utilities and contracted implementation, outreach, and marketing organizations; 2) surveys of participants who participated through standard LIEE program activities and targeted recruitment activities; 3) focus groups with PG&E and SDG&E staff; 4)	Mary O'Drain Policy & Strategic Planning Group Pacific Gas & Electric MC H14G, P.O. Box 770000 San Francisco, CA 94177-0001 MJOB@pge.com (415) 973-2317

Client Name	Project Name & Project Date	Project Description	Contact
		ride-along observations of field crews in each of the four utility territories, including two days with audit/education crews, two days with inspection crews, and one day with implementation crews; and 5) interviews with the marketing, outreach, and implementation organizations contracted to the utilities. We presented our evaluation design and findings at public workshops.	
Energy Trust of Oregon	Various Projects 2002 to Present	The Energy Trust of Oregon is a nonprofit organization that invests systems benefit charges paid by ratepayers of Oregon electric and gas investor-owned utilities into energy efficiency and renewable energy projects that benefit those ratepayers. Since its inception, we have conducted more than 30 projects for Energy Trust, including 17 process evaluations, market research, organizational research, and special investigations. Currently, we are evaluating the Production Efficiency industrial program and Existing Buildings (commercial and small industrial) program.	Philipp Degens, PhD Evaluation Manager Energy Trust of Oregon 421 SW Oak Street #300 Portland, OR 97204 phil.degens@energytrust.org (503) 493-8888, ext. 220
New York State Energy Research and Development Authority (NYSERDA)	New York Energy Smart Process Assessment and Evaluation 2003 to 2014	Research Into Action has led comprehensive process evaluations of New York State Energy Research and Development Authority's residential, business and institutional, and research and development (R&D) programs since 2003. In addition, as the evaluation oversight contractor from 2007 to 2011, we ensured the integration of process, market, and impact evaluations. Our third contract, which began in May 2012, covers all process and market evaluation and market characterization work. For our evaluation work, we begin each year by prioritizing the programs and developing an action plan. The action plan covers all of the projects for the year, which we and our subcontractors subsequently complete. Our current action plan includes process and/or market studies for the Multifamily Performance, Commercial Audit FlexTech, New Commercial Construction, Home Performance with ENERGY STAR, and ENERGY STAR Products programs; and program theory and logic models for 12 programs. In 2012, we also are evaluating NYSERDA's Behavior Research Field Pilots and assisting NYSERDA in the development of a strategy for integrating more behavioral intervention strategies across their portfolio.	Patricia Gonzales, PhD Project Manager, Energy Analysis NYSERDA 17 Columbia Circle Albany, NY 12203-6399 pmg@nyserda.org (866) 697-3732 ext. 3338 pmg@nyserda.org

Client Name	Project Name & Project Date	Project Description	Contact
Northeast Energy Efficiency Partnerships	Energy Savings Verification and Engineering Review Service 2010 to 2012	In 2010-2012, we served as a subcontractor to NMR Group for two projects for the Northeast Energy Efficiency Partnerships (NEEP). The first, a Scoping Paper on Net Savings helped NEEP understand the reasons for measuring net savings, how to improve the consistency and quality of EM&V practices with respect to defining and estimating energy efficiency program net savings, and identify the needs of some related stakeholders vis-à-vis net savings. We participated in the review of available literature on measuring net impacts, conducted in-depth interviews with key practitioners and theorists, and prepared sections of the final report. For the second project, we identified definitions for adjusted gross savings, net savings, and other indicators used to measure progress toward achievement of the goals for commercial and industrial programs. The project identified the extent to which the policy goals and measurement parameters were aligned and made recommendations for common definitions and future research.	Elizabeth Titus Research and Evaluation Manager Northeast Energy Efficiency Partnerships 91 Hartwell Ave. Lexington, MA 02421 etitus@neep.org (781) 860-9177, ext. 11
Northwest Energy Efficiency Alliance	Various Projects 2001 to Present	The Northwest Energy Efficiency Alliance (NEEA) drives efforts to transform the energy efficiency market in the Northwest. NEEA works in collaboration with BPA, Energy Trust of Oregon, and over 100 utilities on behalf of more than 12 million energy consumers. We have conducted more than 38 projects for NEEA since its inception, including 18 program process evaluations. In particular, we have led five Market Progress Evaluation Reports (MPER) of NEEA's BetterBricks commercial-sector initiative and seven MPERs of the Building Operator Certification (BOC) initiative. . In 2011, we evaluated the kW Crackdown commercial office energy savings competition, Residential Economizer Pilot Program, and Residential Ductless Heat Pump pilot and program. Currently, we are leading the evaluations of NEEA's BOC Expansion (2012-2015), 80 Plus (power strips) (2013), Consumer Electronics (2012-2013), Refrigerator System Operator Program (2012-2013) and Food Processing initiatives (2012-2013).	Christopher Frye Senior Manager, Market Research & Evaluation Northwest Energy Efficiency Alliance 421 SW Sixth Avenue, Suite 600 Portland, OR 97204 cfrye@neea.org 503-688-5441
Ontario Power Authority	Various Process and Impact Evaluations 2008 to Present	Research Into Action has conducted six process evaluations for the Ontario Power Authority (OPA) since 2008. Currently, we are evaluating the Business Incentive Programs (2011-2013), 2011-2012 Small Business Lighting Incentive Program (2012-2013), and Consumer Program (2012-2013). Prior work included: the cross-cutting evaluation of OPA's 2009-2010 Large Commercial and Industrial Retrofit Incentive Initiatives (2010-2011), evaluation of the Chilled Water Plant Ongoing Commissioning – Phase 1 (2008-2010), and Small Commercial Direct Install Program (2010-2011). We highlight the most	Phil Bosco Evaluation Manager Ontario Power Authority 120 Adelaide Street W., Suite 1600 Toronto, Ontario M5H 1T1 Canada phil.bosco@powerauthority.on.ca (416) 969-6095

Client Name	Project Name & Project Date	Project Description	Contact
		<p>relevant of these below.</p> <p>2011-2013: As a subcontractor to Nexant we are leading the process evaluation of OPA's Cross-cutting Business Incentive initiatives: saveONenergy Retrofit, Audit Funding, and Existing Building Commissioning. These initiatives are implemented by more than 70 local distribution companies (LDCs or utilities) in Ontario. 2012-2013: We are leading a two-year process and impact evaluation to provide forward-looking information about OPA's 2011-2012 Small Business Lighting Incentive Initiative. Our team identified the strengths of the existing program approach while completing systematic research into the wants and needs of participating LDCs and the trade allies necessary to deliver this direct-install lighting program, as well as new measures or equipment that can provide additional savings opportunities for the small commercial sector.</p> <p>2010-2011: We led the team (which included Nexant) that conducted cross-cutting impact and process evaluations of OPA's 2009-2010 Large Commercial and Industrial Retrofit Incentive initiatives. For the impact audit, our team: 1) audited selected projects, 2) verified energy and demand savings, 3) estimated net savings, 4) developed measure-level 8760 load shape analyses, and 5) reviewed prescriptive input assumptions. We carried out a TRC cost-effectiveness analysis and calculated levelized costs per kW and kWh. For the process evaluation, we surveyed program participants, partial participants, nonparticipants, evaluation contractors, and trade allies. Finally, we assessed job-creation effects for LDCs and contractors.</p> <p>2010-2011: As a subcontractor to Nexant, we led the process evaluation and provided support for the impact evaluation of OPA's Small Commercial Direct Install Program. To avoid over-burdening OPA's commercial customers, the evaluation team integrated process-related data collection into several of the onsite impact evaluation tasks. Based on interviews with program representatives, we sent email surveys to participating LDCs to help us diagram and document the key choices and important differences in how the LDCs implemented the program. We also interviewed 20 LDCs. In addition, we conducted telephone surveys with 135 participants in the 2010 program and with partial participants and assessors/contractors, and an online survey of nonparticipants.</p> <p>2010: We led the team that conducted cross-cutting impact and process evaluations of OPA's 2009-2010 Large Commercial and Industrial Retrofit Incentive initiatives. For the impact audit, our team: 1) audited selected projects, 2) verified energy and demand savings, 3) estimated net savings, 4) developed measure-level 8760 load shape analyses, and 5) reviewed</p>	

Client Name	Project Name & Project Date	Project Description	Contact
		<p>prescriptive input assumptions. We carried out a TRC cost-effectiveness analysis, based on verified net kW and kWh savings and measure life values, and calculated levelized costs per kW and kWh. For the process evaluation, we surveyed program participants and nonparticipants in the general market. We also interviewed evaluation contractors and trade allies. Finally, we assessed job-creation effects for local distribution companies and contractors.</p> <p>2009: As a subcontractor to QuEst, we conducted a process evaluation as part of an assessment of OPA's pilot Ongoing Commissioning Chilled Water Plant Program to determine market response to the program and OPA's ability to deliver electric energy and demand savings through a full-scale program. We reviewed market research and best practices studies; conducted in-depth interviews with program staff and participating end-users; tested program design, theory and delivery; estimated free-ridership; and identified education and training needed by market actors.</p>	
<p>US Department of Energy/Lawrence Berkeley National Laboratory</p>	<p>Better Buildings Program Assessment 2012 to 2014</p>	<p>In 2011, Research Into Action began a four-year evaluation for the Lawrence Berkeley National Laboratory of the U.S. Department of Energy's Better Buildings Program. The program invests American Recovery and Reinvestment Act (ARRA) funds to: 1) initiate projects that achieve energy savings in sectors where this has proved difficult; 2) demonstrate a sustainable business model for providing cost-effective energy upgrades for a large percentage of the residential, commercial, and/or public buildings in a specific community; and 3) identify and spread the most effective approaches supporting the development of a robust retrofit industry in the U.S. More than 40 grantees provide diverse programs throughout the U.S. Our large team has developed and is employing a quasi-experimental design to assess how well the overall Better Buildings program achieved its objectives. Evaluation activities include process and market effects assessments and energy impact evaluations, including M&V and billing analysis. We seek to fully understand the various program activities, explain the theory and logic of how they address the Better Buildings objectives, and identify which programs and program elements were most successful and which can be successfully replicated.</p>	<p>Edward Vine, Ph.D. Staff Scientist Lawrence Berkeley National Laboratory, Energy Analysis Program 1 Cyclotron Road, Building 90-2000 Berkeley, CA 94720 elvine@lbl.com (510) 486-6047</p>

Client Name	Project Name & Project Date	Project Description	Contact
MidAmerican Energy	Energy Efficiency Monitoring and Evaluation Services of the Nonresidential Portfolio 2011 to 2012, 2006	We are leading the process evaluations of MidAmerican Energy's nonresidential programs and education crossover program as part of a comprehensive analysis of MidAmerican's entire energy efficiency portfolio. We conducted interviews and surveys with four primary groups of individuals: program and contractor staff, midstream and upstream market actors including vendors and contractors, program participants, and nonparticipating customers. To obtain cost efficiencies, we integrated impact-related activities into our work, such as assessing the in-service rates, and gathering data to inform engineering estimate parameters. In 2006, we also conducted process evaluations of the six energy efficiency and load management programs MidAmerican Energy offered its nonresidential customers in Iowa in 2004-2005: Nonresidential Equipment, Nonresidential Custom, Small Commercial Energy Audit, Nonresidential Energy Analysis, Efficiency Bid, Commercial New Construction, and Nonresidential Load Management.	Chuck Rea Manager, Regulatory Strategic Analysis MidAmerican Energy One River Center Place, 106 E. Second St. Davenport, IA 52801 CBRea@midamerican.com (563) 333-8868
NorthWestern Energy	Demand Side Management Program Evaluation Services 2011 to 2012, 2007	As a subcontractor to SBW, we are conducting the process evaluation portion of a comprehensive analysis of the commercial, industrial, agricultural, and residential electric and natural gas DSM programs NorthWestern Energy (NWE) delivers in its Montana service territory. We are evaluating each of NWE's more than 30 programs, including audits, incentives, training, energy efficiency, and renewable energy (photovoltaic and wind). Our work involves in-depth interviews with program staff, implementation contractors, and supporting engineering firms, and surveys of participating and nonparticipating customers and participating trade allies. We also are developing estimates of free-ridership, spillover, and leakage. The current project follows on similar process evaluations of NWE's DSM energy efficiency programs we conducted in 2007. For that work, we conducted the process evaluation portion of a combined process, impact, and economic evaluation of NWE's 12 electric and gas nonresidential and residential energy efficiency and renewable energy programs for 2004, 2005, and 2006. The evaluation supported NWE's DSM and Universal System Benefits efforts by providing estimates of free-ridership and spillover values as well as insights into program processes. In 2007, we provided testimony about that project to the Montana Public Service Commission. Our testimony helped NWE meet its regulatory requirements.	William Thomas Regulator Support Services Manager NorthWestern Energy 40 E. Broadway Butte, MT 59701 william.thomas@northwestern.com (406) 497-2111

Client Name	Project Name & Project Date	Project Description	Contact
Best Practices Research			
<p>California Public Utilities Commission</p>	<p>National Energy Efficiency Best Practices Study</p> <p>2003 to 2007</p>	<p>Research Into Action was a key member of the team that produced the National Energy Efficiency Best Practices Study between 2003 and 2007 for the California Public Utilities Commission (CPUC). The studies sought to identify best practices for 18 different energy-efficiency program types. The team developed and implemented a method to identify and communicate excellent programmatic practices in order to enhance the design of energy-efficiency programs in California. For the best practices research, Research Into Action assisted with the identification and selection of over 100 programs for screening and in-depth interviews, and then conducted the screening and interviews for six to ten programs in four program areas: residential lighting, comprehensive residential single-family weatherization, multifamily weatherization, and education and training services for trade allies. We developed the profiles and wrote a discussion of the best practices for program components for each of the four program areas. We identified additional programs for review, recommended a final set of programs for benchmarking, collected data for each program selected, summarized findings, and prepared draft and final reports for each assigned area.</p>	<p>Rafael Friedmann Team Lead, Portfolio, Optimization and Metrics – Measurement and Evaluation Department Pacific Gas & Electric Company 245 Market Street San Francisco, CA 94105 rafi@pge.com (415) 972-5799</p>
<p>Puget Sound Energy</p>	<p>Benchmarking and Best Practices</p> <p>2008 to 2009</p>	<p>In an effort to increase the impact of its investments in energy efficiency, Puget Sound Energy (PSE) contracted with Research Into Action to gather data on the budgets, goals, and accomplishments of West Coast utilities with strong energy conservation programs. After carefully reconciling data gathered from publicly available sources as well as contacts at five utilities, Research Into Action outlined a set of best practices that allowed PSE to better manage its energy efficiency programs.</p>	<p>Laura Feinstein Senior Evaluation Analyst Puget Sound Energy 10885 NE 4th Street/PO Box 97034 Bellevue, WA 98009-9734 laura.feinstein@pse.com (425) 462-3053</p>
<p>Tennessee Valley Authority</p>	<p>5-Year Plan for Energy Efficiency/Demand Response/Distributed Generation</p> <p>2011 to 2012</p>	<p>As part of a team led by EMI, we provided comparative research and best practice analysis to support the development of the Tennessee Valley Authority's (TVA) 5-Year Plan for Energy Efficiency/Demand Response/Distributed Generation. Our analysis allowed the planning team to consider the experiences of other program administrators when developing the components of TVA's program portfolio. Research Into Action helped pioneer the development and use of logic models to provide clear, accurate, and useful descriptions of how a program actually works. We create logic models for many of the programs we evaluate, and have trained our clients to develop and use these tools to improve their programs' performance.</p>	<p>Robert M. Balzar Vice President Energy Efficiency and Demand Response Tennessee Valley Authority PO Box 292409, OCP 2K Nashville, TN 37229-2409 rmbalzar@tva.com (615) 232-6620</p>

Client Name	Project Name & Project Date	Project Description	Contact
Logic Model Development			
NYSERDA	Program Analysis and Logic Modeling 2009, 2007	Research Into Action led the development of logic models and program theory and analyses for 16 New York Energy Smart programs serving businesses and institutions. Our team met with staff for each program, developed a graphical logic model of the program theory, and then analyzed the program in the context of findings for similar programs and in comparison to theories of change in social science. In 2002, we also developed and conducted an interactive two-day workshop to train NYSERDA evaluation staff to develop useful draft logic models for two of the NYSERDA Energy Smart programs.	Patricia Gonzales, PhD Project Manager, Energy Analysis New York State Energy Research and Development Authority 17 Columbia Circle Albany, NY 12203-6399 (866) 697-3732 ext. 3338 pmg@nyserda.org
Southern California Edison	SCE Partnership Logic Models 2008 to 2009	In 2008 and 2009, Research Into Action worked with Southern California Edison (SCE) to develop logic models and elaborate program theory and process flows for two of its partnership programs. One program focused on building energy-saving partnerships with local governments, and the other on building partnerships with large institutions. We reviewed program documentation and met with program staff to create models and theory statements to help SCE develop its program processes and flow documentation.	Richard Pulliam Electrical Engineer, Measurement & Evaluation Group Southern California Edison 1515 Walnut Grove Avenue Mail Stop - GO5, 3rd Floor Rosemead, CA 91770 richard.pulliam@sce.com (626) 302-0635

4.5 Overview of Experience and Capabilities of Apex Analytics

Apex Analytics was formed in 2011 by Mr. Scott Dimetrosky with the goal of providing the highest quality planning and evaluation studies for energy efficiency, load management, and market transformation programs. Mr. Dimetrosky, during his 20 year career, has led dozens of planning and evaluation studies addressing all market sectors—large and small commercial, industrial, agricultural, residential, and low income. Mr. Dimetrosky and Katie Parkinson of Apex Analytics are currently leading the evaluation of residential lighting and appliance recycling programs for Progress Energy Corporation and Ontario Power Authority. In addition, Mr. Dimetrosky is managing evaluation efforts on behalf of a number of utilities in the Midwest and in New England, plus serves as a member of the independent evaluation teams in Arkansas and Missouri, and thus is quite familiar with EM&V reporting and regulatory needs.

Representative Projects

CLIENT:	NICOR GAS
Project Name & Date(s)	Independent Evaluation Oversight and Review (2011-Present)
Contact name and title:	James Jerozal, DSM Manager
Phone:	(630) 878-7975
E-mail:	JJeroza@agresources.com
Project Description:	Apex Analytics is currently serving as the evaluation manager for Nicor Gas, managing the evaluations of the 2011-2012 energy efficiency programs. Nicor Gas currently offers 14 programs that serve all sectors, with budgets expected to exceed \$50 million. Mr. Dimetrosky provides independent EM&V oversight and quality assurance for all programs, working closely with the EM&V contractor. In addition to reviewing the work plans, data collection instruments, analysis, and reporting, Mr. Dimetrosky also coordinates communication and reporting with the Stakeholder Advisory Group (SAG) as well as the Illinois Commerce Commission (ICC).
CLIENT:	NATIONAL GRID AND NSTAR
Project Name & Date(s)	Independent Evaluation Oversight and Review (2012-Present)
Contact name and title:	Ms. Kimberly Crossman, CEM, Program Strategy Massachusetts Evaluation & Policy, National Grid
Phone:	(781) 907-1562
E-mail:	kimberly.crossman@us.ngrid.com
Project Description:	Mr. Dimetrosky is currently providing strategic and quality insurance oversight for the evaluations of the 2011 and 2012 National Grid and NSTAR residential retrofit and energy efficient lighting programs. Mr. Dimetrosky provides independent review of the EM&V consultant work plans, data collection instruments, analysis, and reporting, ensuring that all evaluation activities utilize best practices and provide defensible results. Mr. Dimetrosky has also prepared analysis and memos, based on the 2011-2012 evaluation findings, for the Massachusetts Public Utilities Commission as part of the 2013-2015 program filing.
CLIENT:	ARKANSAS PUBLIC SERVICE COMMISSION
Project Name & Date(s)	Independent Evaluation Monitor Team, (2011-Present)
Contact Name And Title:	Mr. Kim Davis, Director, Financial Analysis
Phone:	(501) 682-572
E-mail:	kdavis@psc.state.ar.us

Project Description: Apex Analytics, as a subcontractor to the Johnson Consulting Group, is serving in the role of Independent Evaluation Monitor (IEM) for the Arkansas Public Service Commission (AR PSC). The IEM team provides oversight and quality insurance across three separate evaluation contractors working on behalf of six investor owned utilities. Mr. Dimetrosky reviews all deliverables from the evaluation contractors to ensure that they meet best practices and the requirements of the AR PSC. In addition, Mr. Dimetrosky led the development of the behavioral program evaluation protocols as part of the development of the 2012 Technical Reference Manual.

CLIENT: **CALIFORNIA 2006-2008 RESIDENTIAL RETROFIT EVALUATION REPORT**

Contact Name and Title: Mikhail Haramati, Energy Division, California Public Utility Commission

Phone: (510) 285-7216

Email: Mharamati@gmail.com

Project Description: Mr. Dimetrosky led the 2006-2008 California Residential Retrofit Evaluation effort. The \$15 million evaluation effort was one of the largest evaluations ever conducted, encompassing High Impact Measures (HIMs) from 15 separate programs. The evaluations were targeted to reflect the highest research priorities, including providing adjustments to the gross savings claimed by the utilities, the net savings after accounting for free-ridership, and information essential to valuing the savings, such as the annual load shapes of the savings. The research effort included over 18,000 telephone surveys, 4,200 site visits, 2,000 metered sites, and 18 focus groups. Interim and final results were presented to a broad group of stakeholders, including investor owned utilities, environmental groups, and consumer advocacy groups.

5.0 QUALIFICATIONS OF KEY PERSONNEL (II-5)

This section of our proposal identifies all team members, including the Principal or Lead contact, who will be responsible for ensuring that the project is timely and of good quality. This section also provides a clear description of the roles and responsibilities of each key person in completing the work plan.

The GDS Team consultants assigned to this project are listed below and bios for each consultant are also provided. Resumes of the team’s consultants assigned to this project are provided in Appendix A. Resumes describe relevant responsibilities from other projects that will help the bid evaluation team evaluate our qualifications and experience.

TEAM PERSONNEL		TITLE	ROLES & RESPONSIBILITIES
GDS ASSOCIATES, INC.			
Dick Spellman, CMVP	President		Responsible for overall project management, delegation of work assignments, regular progress reports to the TUS staff and Commissioners, developing agendas and leading weekly meetings with TUS staff and bi-weekly meetings with EDC’s, review of key project deliverables, development and presentation of testimony and ensuring work tasks and deliverables are completed within the approved budget
Rich Hackner, PE	Principal		Will provide technical engineering support relating to annual updates to the TRM and the development of new guidance memos
Scott Albert	Principal		Will serve as a senior technical advisor on the development of the updated Audit Plan and evaluation framework
Joe Danes, PE	Principal		Will provide technical engineering support relating to annual updates to the TRM and the development of new guidance memos
John Hutts	Principal		John Hutts, GDS Principal will be the lead for the residential lighting metering study. He will also be responsible for developing the sampling plan for the residential lighting metering study and the residential baseline study. He will also review all sampling plans for the EDC impact evaluations of residential energy efficiency programs.
Tim Clark, CEM	Managing Director		Responsible for assisting with residential baseline, market potential and metering studies
Tom Londos	Managing Director		Deputy Project Director for Administration. Responsible for ensuring that GDS Team complies with all administrative and deliverable requirements. Also responsible for overall planning and analyses relating to DR programs
Robert Fratto, CEM	Managing Director		Will assist with development of engineering algorithms

		and data collection relating to annual updates of the TRM
Jeffrey Huber, CEM, CMVP	Project Manager	Responsible for leading residential oversight activities and leading the residential baseline, market potential studies.
Caroline Guidry, CMVP	Project Engineer	Will assist with SWE audit activities for residential programs
Warren Hirons	Engineer	Will assist with the residential baseline, market potential and metering studies
Andrea Jester	Analyst	Responsible for leading the development of SWE quarterly and annual reports to the PA PUC. Also will lead all audit activities for the residential lighting, efficient products, and appliance recycling programs.
Brock Keasler	IT Engineer	Responsible for all information technology related tasks, updating of the public website, and maintenance of the project SharePoint site
Kaytie Rudytis	Executive Asst.	Responsible for taking minutes of major meetings, sending out and tracking of data requests and responses, maintaining accounting record of SWE spending on a monthly basis, and other administrative tasks
Melissa Young	Engineering Asst.	Data collection and analysis
Marty Alcala	Engineering Asst.	Data collection and analysis
NEXANT PLANNING AND EVALUATION, LLC		
Salil Gogte, PE, LEED AP	Principal	Deputy Project Manager in charge of the development and refinement of the SWE Audit Plan and evaluation framework. Responsible for leading the development of SWE positions on technical sampling, engineering and analytical related EM&V issues.
Irwin Kim	Project Mgr.	Responsible for leading the development of all annual updates to the TRM
Jesse Smith	Sr. Project Mgr.	Responsible for commercial sector audit tasks and providing assistance on the commercial baseline, market potential and metering studies
Pranav Jampani	Project Engineer	Responsible for commercial sector audit tasks and providing assistance on the commercial baseline, market potential and metering studies
Patrick Burns	Principal	Responsible for leading the commercial sector baseline, market potential and metering studies
Tyler Hammer	Sr. Project Analyst	Will assist with the commercial sector baseline, market potential and metering studies
Katie Ryder	Project Analyst	Will assist with the commercial sector baseline, market potential and metering studies

RESEARCH INTO ACTION, INC.		
Jane S. Peters, PhD	President	Process evaluation audit activities
Ryan Bliss	Project Director	Process evaluation audit activities
Marjorie McRae	Principal	Process evaluation audit activities
Bobbi Tannenbaum	Principal	Process evaluation audit activities
Dulane Moran	Project Director	Process evaluation audit activities
Adam Gardels	Sr. Project Analyst	Process evaluation audit activities
Anna Kim	Sr. Project Analyst	Process evaluation audit activities
Susan Lutzenhiser	Senior Project Analyst	Process evaluation audit activities
Marnie McPhee	Comm. Specialist	Editing of all major SWE reports
APEX ANALYTICS		
Scott Dimetrosky	President	Technical engineering support
Kaytie Parkinson	Associate	Technical engineering support

5.1 Bios of Key Personnel

GDS ASSOCIATES, INC. (GDS)

RICHARD SPELLMAN, CMVP PRESIDENT OF GDS ASSOCIATES

Dick Spellman has more than 35 years of strategic planning, economic analysis, market research, renewable energy and energy efficiency program design, implementation and evaluation experience in the energy industry. Dick has managed several large-scale energy efficiency and demand response program design, implementation and evaluation projects for GDS clients. He has served as the overall Project Manager of the Pennsylvania Statewide Evaluator (SWE) team since 2009 and designed the work plans for energy efficiency baseline and market potential studies completed for Pennsylvania in 2012. Dick received his certification as a Certified Measurement and Verification Professional in 2012.

He has completed more than 40 energy efficiency and demand response potential studies as well as numerous impact and process evaluations. He has testified on the results of energy efficiency plans, market potential and baseline studies and evaluations before numerous state regulatory commissions. Before joining GDS in 1993, he was the Manager of Marketing and Product Development at Central Maine Power Company, and he held several management positions during his 16 years at CMP. He served as the chairman of the New England Power Pool DSM Planning Committee in 1991 and 1992, and he served as a Board Member of the Association of Energy Services Professionals (AESP) from 2005 through 2010.

Dick has a BA degree with distinction in Math/Economics from Dartmouth College (graduated cum laude and with distinction) and a Masters degree in Business from the Thomas College Graduate School of Business. He is graduate of the University of Michigan Graduate School of Business Administration Management II Program, the Electric Council of New England Skills of Utility Management Program, and he is member of the Association of Energy Services Professionals and the Association of Energy Engineers (AEE). He completed the AEE Certified Measurement and Verification Professional (CMVP) training in October 2012.

RICH HACKNER

PRINCIPAL

Mr. Hackner, P.E. is a Principal and Midwest Region Manager for GDS Associates, Inc. He is the Sector Manager for the Agriculture and Rural Business Team of the Wisconsin Focus on Energy Program (Focus). He is also past leader for the Focus Industrial Program's Food and Dairy Cluster Initiative. He is also working on the new Focus Biofuels cluster initiative. Rich works closely with many organizations, businesses and government agencies to develop collaborative efforts that support agriculture and rural business interests in Wisconsin. He is also Chairperson of the Rural Energy Management Council (REMC), an advisory council sponsored by the Wisconsin Department of Agriculture, Trade and Consumer Protection, since its inception in 1999. His previous work experience includes 10 years as Associate Director and Senior Program Manager for the Energy Center of Wisconsin. During his term at the Center he initiated a number of bio-based and agriculture-related initiatives including: biopulping, transgenic alfalfa, combined heat and power systems, fuel cell research and demonstrations, among others. He has initiated development of numerous collaborative efforts between a broad range of constituents including: Universities, trade associations, electric and gas utilities, industrial concerns, and Federal, Regional, State and Local government agencies. Rich has a Bachelors and Master's Degree in Mechanical Engineering from the University of Wisconsin-Madison and is a Registered Professional Engineer in the State of Wisconsin.

SCOTT ALBERT
PRINCIPAL

Mr. Albert is a Principal and Northeast Region Manager for GDS Associates and has more than 30 years of experience in the energy industry including approximately 10 years each with GDS Associates, Boston Edison, and Public Service Company of NH. Since joining GDS in 1999, Scott has helped with the design, delivery and evaluation of more than \$500 million of electric and fossil-based energy efficiency, renewable and distributed generation projects for utilities and residential, municipal, commercial and industrial customers across the country. His growing staff includes a solid mix of professional engineers, energy auditors and specialty-certified experts who have conducted numerous projects including: smart grid pilot programs in Massachusetts and New Hampshire, building energy code compliance and roadmap development projects for the NH Office of Energy and Planning and Utah State Energy Office, extensive program evaluation and market assessment support for NY State Energy Research and Development Authority, and an ongoing portfolio of large commercial/industrial facilities audits and residential new and existing ENERGY STAR® home efficiency support. In addition to his substantial energy efficiency and demand response experience, Scott has been involved in overseeing the technical, contractual, operational and regulatory activities associated with over 100 renewably-fueled, non-utility owned hydroelectric, biomass, municipal solid waste, landfill gas, wind, solar and animal waste-fueled facilities. Activities in this area included: design support and coordination of standard grid interconnection policies and procedures; short and long-term power purchase contract policy development, negotiations and implementation; net metering and retail wheeling issues identification and resolution; project development tracking; dependable capacity and annual energy determinations; operations monitoring; and regulatory filings and reporting. Scott earned his Masters Degree in Business Administration from New Hampshire College (now Southern NH University) and has a BS in Civil/Environmental Engineering from Northeastern University.

JOSEPH DANES, P.E., CMVP
PRINCIPAL

Mr. Danes has successfully managed numerous energy studies for the Department of Veterans Affairs, as well as for the U.S. Department of Transportation and the Indian Health Services. He has worked as an Energy Advisor with Wisconsin's Focus on Energy Program since 2001 and as a consultant for Xcel Energy's Conservation Wise program for Minnesota since 2004, providing energy audits and recommendations to commercial, industrial, and government customers. Mr. Danes has thirteen years

of experience in the energy efficiency industry, including evaluation of combined heat and power, solar hot water heat, and wind generation for Department of Veterans Affairs medical centers throughout the United States.

Mr. Danes has personally conducted commercial and industrial facility surveys, prepared recommendation reports, and assisted customers in implementing recommended measures. Mr. Danes has also performed a number of industrial process and facility surveys for companies ranging from printers and plastics manufacturers to metal fabricators and foundries, as well as detailed engineering studies on end uses such as compressed air systems. Work has included analysis and recommendations for HVAC systems, HVAC and process related motors and drives, compressed air systems, and refrigeration systems.

Mr. Danes holds an M.S. in Mechanical Engineering (HVAC and Building Energy Systems) from the University of Wisconsin-Madison, and a B.S. in Mechanical Engineering from the University of Illinois in Urbana-Champaign. He is a registered Professional Engineer in the State of Wisconsin, a Certified Measurement and Verification Professional, and a member of ASHRAE.

John Hutts
Principal

Mr. Hutts is a Principal of GDS Associates and has been a member of the firm since its inception in 1986. He has more than 30 years of consulting experience and specializes in statistics and quantitative analysis. Specific applications include load forecasting, load research, sample design, and customer surveys. In the electric utility industry, Mr. Hutts has provided load forecasting services for clients in 20 states and 3 Canadian provinces. The services have included day-ahead hourly forecasts, 12-24 monthly forecasts for budgets and financial planning, and 15-20 year forecasts for long-term resource planning. Mr. Hutts has also provided forecast evaluation services for various state agencies. Mr. Hutts has managed numerous consumer survey projects designed to obtain information that was not otherwise available for load forecasting and energy efficiency studies. His expertise includes questionnaire design, sample design and selection, data tabulation and analysis, and benchmarking. Mr. Hutts has provided testimony before public service commissions in four states and has conducted load forecasting and customer surveying training classes. In addition to his work in the utility industry, Mr. Hutts has provided consulting and research for clients in the areas of banking, retailing, commercial real estate, hotels, manufacturing, professional sports, college athletics, and education. John holds an MBA from Georgia State University and a Bachelor of Business Administration from the University of Texas at Austin with a concentration in statistics.

TOM LONDOS
MANAGING DIRECTOR

Mr. Londos has more than 28 years of experience in energy management service delivery for commercial, industrial and government customers. Currently he is supporting the Pennsylvania Public Utility Commission for EM&V oversight of the Commonwealth's Act 129 Energy Efficiency Programs. As the Statewide Evaluation Contractor, Mr. Londos is working with the utilities and their EM&V contractors to update the existing Technical Resource Manual, develop and lead working groups for annual updates to the TRM, developed management processes for EM&V plan approval and scheduling of resources for field activities and development of the Audit Plan for the Act 129 EM&V activities. He has provided design and management oversight for the development of three state energy programs in New York, Wisconsin and Oregon including the assembly of the infrastructure and staffing of these offices. These programs deliver energy management services to commercial industrial customers implementing retrofit and new construction programs at their facilities. Mr. Londos has lead in the development and management of numerous hardware and technology programs for commercial and government customers. He has created testing protocols for the Gas Research Institute for the evaluation of natural gas energy systems for commercial/industrial applications. He has hands-on

experience in the technical and economic evaluation of advanced electric and gas end use technologies. This included onsite assessments and evaluation of the operational feasibility of these systems in a variety of commercial and industrial applications.

Previously, Mr. Londos was the manager of Science Applications International Corp. energy consulting practice managing 60 Employees in 9 locations across the US. His responsibilities included program/project management, profit and loss responsibilities both at a project and business unit level, contract review and management of subcontractors, staff reviews and reporting to corporate management.

ROBERT FRATTO, CEM
MANAGING DIRECTOR

Mr. Fratto's 30 plus years of experience in the energy industry includes extensive work in the area of energy efficiency planning, including managing and conducting several energy efficiency potential studies. Mr. Fratto has also designed implemented and evaluated energy efficiency program for various utilities and energy efficiency organizations. Bob joined GDS in July 2004 after working as an independent energy consultant and holding various management positions with Progress Energy and Commonwealth Electric Company (now NSTAR). He is currently based in Raleigh, NC where he is providing energy efficiency consulting services to the Missouri Department of Natural Resources, the Maryland Energy Administration, Oglethorpe Power Corporation and the Efficiency Maine Trust.

Mr. Fratto has also provided energy efficiency consulting services to various other clients including the Maryland Department of Housing & Community Development, Central Maine Power Company, U.S. Environmental Protection Agency, Bonneville Power Administration, GasNetworks, KeySpan Energy (now National Grid), Vermont Department of Public Service, New Hampshire Public Utilities Commission, Connecticut Energy Advisory Board, South Mississippi Electric Power Association and Springfield Massachusetts Housing Authority. At Commonwealth Electric Company, Mr. Fratto held various management positions including, Manager Market Planning & Research, Manager Demand Program Administration and Manager Load Forecasting. At Progress Energy Mr. Fratto directed DSM planning activities and designed and delivered various energy efficiency services.

Mr. Fratto earned his Master's Degree in Business Administration from Suffolk University and has a Bachelor of Science Degree in Industrial Engineering from Northeastern University. Mr. Fratto is also a Certified Energy Manager.

JEFFREY HUBER, CEM, CMVP
PROJECT MANAGER

Mr. Huber is a Project Manager at GDS Associates and is responsible for project management of energy efficiency and demand response potential studies and market research projects for GDS clients. He led the completion of the Pennsylvania Residential Baseline study in 2011-12 and developed the residential Market Potential Study for Pennsylvania in 2012. Jeffrey also provides technical support to GDS clients on energy efficiency program design and implementation projects, benefit/cost analyses for energy efficiency programs, and other market research studies. Jeffrey is experienced in conducting statistical analyses (frequency distributions, cross tabulations, multivariate analyses) and he is proficient in MS Office (Word, Excel, PowerPoint). Jeffrey has a BA degree in Criminology (2001) from the University of Florida and a MA degree (2004) in Anthropology from the University of Tennessee. He received his certification as a Certified Measurement and Verification Professional in 2012

CAROLINE L. GUIDRY, CMVP
PROJECT ENGINEER

Ms. Guidry joined the GDS Marietta office in the fall of 2008. She serves as a Project Engineer for the Energy Efficiency and Renewable Energy department. Recently Ms. Guidry received her certification as a

Certified Measurement and Verification Professional – in Training. Her duties include: data collection and analysis; report writing and development of presentations; developing detailed EM&V Plans; developing detailed economic analysis spreadsheets; conducting on-site energy audits and in-depth market research interviews; conducting building energy simulation modeling; and developing market research questionnaires and plans for market research studies. While at GDS, Ms. Guidry has performed verification analysis of technical potential studies and has assisted in developing energy and demand savings targets for utilities in Florida. She has assisted in the evaluation and audit of energy efficiency and demand response programs implemented throughout Pennsylvania and Maryland. She was the principal author of the Pennsylvania Statewide Evaluator Audit Plan and the Maryland Energy Administration (MEA) Evaluation, Measurement and Verification Plans. Currently, Ms. Guidry is assisting in the verification of Pennsylvania's Act 129 Residential sector energy efficiency and demand response programs. She is also leading the interview process for the program managers of MEA's portfolio of programs for the development of program logic modes; additionally, she is leading the impact evaluation of MEA's Appliance Rebate Program and assisting in the evaluation of MEA's Residential Renewable Energy Program. Prior to joining GDS Caroline worked toward the completion of her Master of Science degree at Georgia Institute of Technology with the Sustainable Design and Manufacturing group of the School of Mechanical Engineering. She received her Bachelor of Science degree in Mechanical Engineering from Columbia University in 2006 and is an Engineer-in-Training certified by the State of New York.

WARREN HIRONS
ENGINEER

Mr. Hirons has assisted with the development of energy efficiency potential studies and benefit/cost analysis of energy efficiency and demand response measures and programs. Mr. Hirons has developed designs and plans as well as economic feasibility studies for energy efficiency and demand response programs. He is experienced in conducting residential and commercial energy audits and assisted with the analysis of energy data for these sites. Mr. Hirons has managed energy efficiency projects and has provided impact and process evaluations of energy efficiency and demand response programs. Mr. Hirons has a Bachelor's degree in Environmental Engineering from North Carolina State University and a Bachelor's degree in Environmental Economics and Management from the University of Georgia.

ANDREA JESTER
ANALYST

Ms. Jester assists with tasks such as data analysis for market assessments, researching program methods, gathering measure assumptions for potential studies and writing reports. She has been extensively involved in the evaluation, measurement and verification of appliance rebate and removal programs for the Pennsylvania Public Utilities Commission and the Maryland Energy Administration. She has worked to verify savings from these programs using impact evaluations, audits and database checks. She has additionally assisted with various research efforts relating to program protocols and savings. She has overseen the review of individual Pennsylvania Electric Distribution Companies' reports and has made significant contributions to Statewide Evaluator Quarterly and Annual reports. She led the development of the SWE Annual Report for Program Year 3. Ms. Jester is a graduate of the Georgia Institute of Technology and received a Bachelor of Science in Science, Technology and Culture. She worked full time at GDS for over a year as an Associate Analyst and had previously interned with GDS for two consecutive summers.

BROCK KEASLER
PROGRAMMER/ANALYST

Mr. Keasler is a Programmer/Analyst at GDS. Mr. Keasler has a Bachelor's degree in Information Systems and has over 2 years of experience in the IT Field. Previously working as a software developer at another consulting firm, Mr. Keasler has experience developing, testing, and supporting software responsible for

auditing the financial activity of state lotteries throughout the United States. After joining GDS, Mr. Keasler has been responsible for the development and testing of several enhancements to our client's existing energy efficiency data tracking and reporting systems as well as new tools to provide increased functionality to end-users.

KAYTIE RUDITYS
EXECUTIVE ASSISTANT

Ms. Ruditys is an Executive Assistant at GDS Associates. She has a Bachelor's degree in Business Management from Shorter College and has over ten years of experience in the administrative field. At GDS, Ms. Ruditys offers data collection, data analysis and administrative support to engineers, consultants and executives of GDS.

MELISSA YOUNG
ENGINEERING ASSISTANT/CO-OP STUDENT

Ms. Young is a Mechanical Engineering student at Georgia Institute of Technology in Atlanta, Georgia and works as an Engineering Assistant/cooperative student at GDS. She has been responsible for using tables and models to generate savings data on various energy efficiency programs, will be responsible for assisting with research and reporting of energy efficiency programs and will be responsible for assisting company executives with various projects and reports.

MARTY ALCALA
ENGINEERING ASSISTANT/CO-OP STUDENT

Mr. Alcala is an Engineering Assistant/Co-op at GDS. He is currently attending the Georgia Institute of Technology in Atlanta, Georgia to receive a Bachelor of Science degree, dual major in Electrical Engineering and Economics. Mr. Alcala has experience working as a Mechanical Engineering Co-op.

NEXTANT PLANNING AND EVALUATION, LLC (NPE)

SALIL GOGTE, LEED AP

**DEPUTY PROJECT MANAGER
EVALUATION FRAMEWORK / C&I OVERSIGHT ACTIVITIES SUPPORT**

Salil Gogte is a Principal with Nexant Planning & Evaluation, LLC (NPE), where he provides DSM consulting services to investor-owned utilities, government agencies and energy end users. His areas of focus include development of EM&V plans, M&V protocols, estimating energy and demand savings, statistical sampling models, demand response evaluations, market assessments and research and technical potential studies. In recent years, Salil has directed and overseen all evaluation activities for the Con Edison (NYSEDA) System-Wide Demand Reduction and Gas Efficiency Programs in New York, and has managed several residential evaluation studies including the evaluation of NYSEDA's EmPower and Assisted Multifamily residential programs and the Connecticut Home Energy Solutions program evaluation. In addition, he currently provides principal oversight on EM&V contracts with DNREC in Delaware, Georgia Power Company in Georgia, the Public Utilities Commission in Pennsylvania (PA PUC), the Public Utilities Commission in Wisconsin, the Maryland Energy Administration in Maryland, and the Ontario Power Authority (OPA) in Canada.

IRWIN KIM, PE, CMVP, LEED AP

C&I OVERSIGHT ACTIVITIES LEAD / TRM UPDATES LEAD

Irwin Kim is a Project Manager with Nexant Planning & Evaluation, LLC (NPE) with five years of energy consulting and engineering experience, and is located in the Atlanta, Georgia office. His expertise includes; creating evaluation frameworks for utilities and government agencies; developing uniform measure savings protocols; performing measurement & verification; and designing HVAC systems. Irwin lead audit activities for all non-residential programs, and managed the TRM updates for the Pennsylvania Public Utility Commission. He has also managed impact evaluation projects for clients such as the Wisconsin Public Service Commission, the Pennsylvania Public Utility Commission, Georgia Power Company, the Maryland Energy Administration and the New York State Energy Research and Development Authority. Irwin received his Bachelor's degree in Mechanical Engineering from Columbia University in New York. He is a Professional Engineer licensed in the state of Georgia, Certified Measurement and Verification Professional, and a LEED Accredited Professional.

JESSE SMITH

C&I OVERSIGHT ACTIVITIES SUPPORT / DEMAND RESPONSE PLANNING & POTENTIAL STUDY SUPPORT

Jesse Smith is a Senior Project Analyst with Nexant Planning & Evaluation, LLC (NPE) with over three years of experience delivering energy consulting services and managing the measurement & verification of demand response and energy efficiency programs. His expertise includes; statistical analysis of demand response programs, regression modeling, database architecture, estimating demand and energy savings, and metering technology. During Phase I of Act 129, Jesse developed a white paper and guidance memos on statistical testing and reporting and performed audits of EDC verified savings estimates and benefit cost ratios. He was also the primary contributor to the SWE Demand Response Study where he developed a survey instrument and scoring methodology that will be used to assess overlapping participation between Act 129 load curtailment programs and the load curtailment programs offered by PJM. Prior to joining NPE, Jesse worked as a load research analyst for GoodCents Solutions where he performed statistical analyses of the energy and demand savings of a number of direct load control and energy efficiency projects for client utilities. He received a Bachelor's of Science degree in Psychology from the University of North Carolina at Chapel Hill and a Master's of Science

degree in Applied Statistics from Kennesaw State University. Jesse holds a Base SAS programming certification and a Six Sigma Green Belt certification from the American Society for Quality.

PRANAV JAMPANI

C&I OVERSIGHT ACTIVITIES SUPPORT / TRM UPDATES SUPPORT

Pranav Jampani is a Project Engineer with Nexant Planning & Evaluation, LLC (NPE), and is located in the Philadelphia (Malvern), Pennsylvania office. Pranav provides technical consulting for planning and evaluation projects for utilities and regulatory bodies. His areas of focus include energy research, measurement & verification (M&V) of energy and demand savings, and developing M&V protocols for technical reference manuals (TRM) and measure databases. Pranav has worked on projects for several clients including the Delaware Department of Natural Resources and Environmental Control, Georgia Power Company, the Maryland Energy Administration, the Pennsylvania Public Utility Commission (PAPUC), and the Wisconsin Public Service Commission. As part of the Statewide Evaluation team for the PAPUC, he works on several tasks including developing and updating the TRM; conducting on-site verification inspections, metering and analysis; reviewing M&V plans, sampling designs, TRC calculations, and reports submitted by the EDCs; developing guidance and study memos spanning a wide variety of research topics; and performing on-site surveys for the baseline study. Pranav is also actively involved in writing sections of the TRM Orders and quarterly and annual evaluation reports. Prior to joining NPE, Pranav worked as a Consultant at several organizations where he specialized in providing due diligence consulting services that included; designing energy and environmental management systems; life cycle impact assessments; sustainability reporting; process optimization; air quality forecasting; and sustainability tool development. Pranav holds a bachelor's degree in Chemical Engineering from Birla Institute of Technology & Science, Pilani, Rajasthan, India, and holds a Master's degree in Environmental Engineering from the North Carolina State University.

PATRICK BURNS, PE, CEM, LEED AP

BASELINE & MARKET POTENTIAL STUDIES LEAD

Patrick Burns is a Principal with Nexant Planning & Evaluation, LLC (NPE), and is located in the Boulder, Colorado office. Patrick has over 15 years of engineering, planning and analytic experience with a focus on demand side management (DSM) program planning and evaluation, energy-efficiency analysis, and building lighting and electrical systems design. He provides key staff leadership and mentoring to his project team working on DSM planning and evaluation, energy-efficiency analysis and auditing. In his tenure at NPE, Patrick has successfully led market potential studies for Pennsylvania ACT 129 Potential Study, NorthWestern Energy and Tri-State Generation. Patrick has successfully led market evaluations for Georgia Power Company, Ontario Power Authority and Colorado Energy Office. Patrick has experience working with a large variety projects and clients including multi-use facilities, hospitality, government, commercial and industrial facilities, school districts, hospitals, and residential.

TYLER HAMMER

BASELINE & MARKET POTENTIAL STUDIES SUPPORT

Tyler Hammer is a Senior Project Analyst with Nexant Planning & Evaluation, LLC (NPE), and is located in the Boulder, Colorado office. Tyler offers more than six years of project management experience in the energy and sustainability fields. At NPE Tyler specializes in DSM planning activities, leading or contributing to baseline, market potential and program planning activities in Texas, South Carolina, Delaware, Montana, the Pacific Northwest, and Pennsylvania. In Phase I of Act 129, Tyler successfully led the Commercial & Industrial Baseline Study efforts, was a key contributor to the Market Potential Study, and was responsible for formulating the adopted Phase II targets. In addition, he serves as Secretary of

the Board for the Rocky Mountain chapter of the Association of Energy Services Professionals (AESP). Prior to joining NPE, Tyler worked for Navigant Consulting where he developed the 2010 Colorado Utilities Report. He was also the executive director for Sustainable San Mateo County, where he forged a partnership with Pacific Gas and Electric Company to market their residential and commercial rebate programs. Tyler holds a master's degree in business administration from the University of Colorado, Leeds School of Business with a focus in finance and energy, and received a bachelor's of science degree from the University of Wisconsin-Madison.

KATIE RYDER

DEMAND RESPONSE PLANNING & POTENTIAL STUDY SUPPORT

Katie Ryder is a Project Analyst with Nexant Planning & Evaluation, LLC (NPE). She supports a variety of energy efficiency and demand side management (DSM) programs for utilities and government agencies. Katie's experience includes energy efficiency program design and implementation, and process and impact evaluations. Katie provides research design, project consulting, survey design, sampling, analysis, and report writing focused on demand side management and energy efficiency for utility and energy organization clients. Prior to joining NPE, Katie was an Analyst with the Cadmus Group, Inc. As part of the evaluation of Pennsylvania EDC's energy efficiency and conservation programs, Katie assisted in designing an attribution survey instrument and scoring methodology focused on allocation of benefits when customers participate in multiple load curtailment programs simultaneously.

RESEARCH INTO ACTION, INC.

JANE S. PETERS, PHD PRESIDENT AND OWNER

Jane S. Peters, PhD, President and owner, has more than 30 years of experience in evaluation, focusing on: energy efficiency, renewable energy, and other environmental issues; program performance measurement; customer research; and market assessment. She helped pioneer and continues to champion process evaluation as an effective tool to understand the motivations that underlie individuals' and organizations' energy-related actions. She has conducted research on all types of programs: commercial/institutional, industrial, residential/low-income, agricultural, research and development, end-use renewables, and distributed generation. She has been the principal investigator for process evaluations of the New York State Energy Research and Development Authority's (NYSERDA) 40+ energy efficiency and renewable energy programs since 2003. For the US Department of Energy (USDOE), she is directing a multi-year evaluation of the 40+ Better Buildings programs. She has directed all of the projects we highlight in this proposal. In addition, she was a member of the teams that developed the 2006 Evaluation Protocols and 2001 Framework for Planning and Assessing Publicly Funded Energy Efficiency for the California Public Utilities Commission (CPUC). Among her many publications, Dr. Peters co-authored the 2012 white paper "Reconsidering What We Measure; Awareness, Knowledge, Attitudes, and Behavior" for Southern California Edison, and wrote the white paper "Process Evaluation Insights on Program Implementation" (2009) about lessons learned from 30 years of process evaluations of energy efficiency programs for the California Institute for Energy and Environment and two books on energy program evaluation for the Electric Power Research Institute (EPRI). She is a member of the Evaluation, Measurement, and Verification (EM&V) training team for the Association of Energy Services Professionals (AESP). Dr. Peters earned her Ph.D. in Urban Studies from Portland State University, and received an A.B. in Psychology from Occidental College.

RYAN BLISS PRINCIPAL-IN-CHARGE

Ryan Bliss, Project Director, has more than 25 years of research and analysis experience, including over five years conducting energy-related market research and program evaluations for Research Into Action. He directs all aspects of evaluation and market research projects, from conception to final presentation of results, including budgeting, work plan development, and management of staff and subcontractors; he also conducts secondary research and analysis, including logic model diagrams and program theory research. Of greatest relevance to this project, he has served as project manager of our evaluations of the ARRA-funded Better Buildings programs for the USDOE and in Colorado and Oklahoma, Northwest Energy Efficiency Alliance's (NEEA) BetterBricks (commercial sector) and Building Operator Certification training initiatives, NYSERDA's Workforce Development program, Ontario Power Authority's (OPA) Large Commercial and Industrial program, Energy Trust of Oregon's Building Efficiency and Existing Buildings programs, and Sempra Energy's Nonresidential Energy Efficiency program. He also has led our three-year process and impact evaluations of the National Theatre for Children "Energized Guyz" Program, and three consecutive annual trade ally surveys for the Energy Trust of Oregon. Prior to joining Research Into Action, he had more than 20 years' experience as an analyst on National Institutes of Health-funded social and health research for Harvard University, the Veterans Administration, and Midwest Research Institute; as a biostatistician at a private research firm in Maryland; and as a research consultant for several university faculty members in Bangkok. He has published research reports in peer-reviewed journals and presented at national and international conferences. Mr. Bliss has an M.A. in Psychology from the University of Minnesota, and a B.A. in Psychology from Cornell University.

OTHER KEY RESEARCH INTO ACTION STAFF:

MARJORIE McRAE, PHD

PRINCIPAL

Marjorie McRae, PhD, Principal, has been active in the assessment and support of energy efficiency and demand response programs since 1980. For the past 12 years, she has focused on the design and implementation of process and market research studies for energy efficiency, demand response, renewable energy, market transformation, information, and new technologies programs in all sectors. Her experience includes program planning, portfolio evaluation, and the estimation of free-ridership and program impacts. Dr. McRae has directed or contributed to 100 projects at Research Into Action. She has conducted multiple evaluations of many programs, gaining insights into the evolution of programs over their life cycles. These include: MidAmerican Energy's and NorthWestern Energy's energy efficiency portfolios; Energy Trust of Oregon's and NYSERDA's industrial programs; and the Northwest Energy Efficiency Alliance's (NEEA) commercial-sector initiative (BetterBricks). In addition, she contributed to an evaluation of the national Weatherization Assistance Program sponsored by Oak Ridge National Labs, led the update of the Bonneville Power Administration's (BPA) M&V protocols, and contributed to an assessment of the size and composition of the national energy efficiency workforce for LBNL. She is the author of DSM Evaluation: Six Steps for Assessing Program Effects, a guide to process and impact evaluation and market research published by EPRI. She has provided expert testimony on process evaluation findings in regulatory proceedings. She is a member of the evaluation, measurement, and verification (EM&V) training team for AESP. She has a Ph.D. in Psychology from The Wright Institute, an M.A. in Economics from University of California, Berkeley, and a B.A. in Economics from Goucher College.

BOBBI TANNENBAUM

PRINCIPAL

Bobbi Tannenbaum, Principal, has dedicated her 30-year career to evaluation and market research to improve energy efficiency and renewable energy programs in all sectors. She has substantial expertise in the design of both qualitative and quantitative data collection, as well as focus group moderation. Her clients appreciate her actionable recommendations and clear reports that address the research issues. She grounds her research in an interdisciplinary understanding of energy and program issues to address both the technical and human dimensions of the problems. Since joining Research Into Action in July 2012, she is the principal-in-charge of our process evaluations of Ameren Missouri's nonresidential program, and has worked on the process evaluations of MidAmerican Energy's commercial and residential program portfolio and a California nonresidential lighting study. Prior to joining Research Into Action, she was a principal at KEMA for nine years. There, she led dozens of projects, including the impact and process evaluations of Alliant Energy's portfolio of 13 commercial and residential programs, a process evaluation of ConEdison's Small Business Direct Install program, as well as custom rebate, prescriptive rebate, lighting, and commercial new construction programs. She has taught evaluation-related courses for the International Energy Program Evaluation Conferences and the International Energy Agency, and has published widely on energy topics since 1993. Ms. Tannenbaum has an M.S. in Land Resources with a Certificate in Energy Analysis and Policy, and a B.S. in Environmental Policy, all from the University of Wisconsin.

DULANE MORAN

PROJECT DIRECTOR

Dulane Moran, Project Director, has more than ten years of experience in energy efficiency policy research and program evaluation. She directs and conducts all aspects of project planning, implementation, and report preparation, including market research and program evaluations, and articulates program theory and logic to guide energy efficiency and renewable energy program improvements. She is part of the team that is evaluating the 40+ ARRA-funded residential programs for

the USDOE, and is leading our process evaluations of OPA's Small Business Lighting Program and the Home Performance program in Vermont. Recently, Ms. Moran led process evaluations of San Diego Gas & Electric's residential enabling technology and residential demand response programs; and Sempra Energy's Residential Whole House, Mobile Homes, K-12 Education programs. She also led four waves of pilot program evaluations to inform the development of Clean Energy Works Portland, a residential on-bill financing program supported by Energy Trust of Oregon, which was designed to encourage comprehensive whole house upgrades among homeowners in Portland, Oregon. Prior to joining the firm, Ms. Moran had seven years of experience working on behalf of organizations focused on energy, water and land conservation, social services, and the arts. She has a Master of Public Administration from Portland State University and a B.A. in English from the University of Oregon.

ADAM GARDELS
SENIOR PROJECT ANALYST

Adam Gardels, Senior Project Analyst, has nine years of global research experience as a social marketing analyst/strategist across energy, manufacturing, medical, consumer products, automotive, and services industries. He is skilled in survey design, database administration and analysis, statistical modeling, behavior measurement, strategic planning/development, economic forecasting, product usage measurement, performance measurement, interviewing, writing, and report presentation. He managed our evaluations of BPA's Energy Smart Industrial program and the Energy Trust of Oregon's Production Efficiency (industrial) program. He also managed evaluation projects for Sempra Energy's nonresidential program portfolio and contributed to an evaluation of Snohomish County PUD's commercial and residential lighting programs. Previous employers include Hewlett Packard, ATI (now AMD, an engineered materials manufacturer), and Ethos Research. He has conducted market research for high-tech, medical, aerospace, thermonuclear, and chemical products. He earned an M.A. in Cultural Anthropology from Oregon State University, where he specialized in social marketing, particularly in consumer behavior, marketing, psychology, and statistics. He also earned a B.S. in Cultural Anthropology, with a minor in Journalism, from the University of Idaho.

ANNA KIM
SENIOR PROJECT ANALYST

Anna Kim, Senior Project Analyst, applies her mathematical and analytical abilities, and academic background in economics and environmental science to the analysis of energy programs. She uses her process and impact evaluation skills to execute and manage complicated projects in the industrial, commercial, and residential sectors that have diverse technical and organizational requirements. She performs analytical tasks, including billing analysis, instrument design, survey analysis, end-use saturation surveys, benchmarking, meter data analysis, load-shape modeling, cost-benefit analysis, and demand-side management forecasting. She managed the evaluation of NorthWestern Energy's residential, commercial, and irrigation program portfolio, and the process evaluation of Consumers Energy's Business Solutions program. She also conducted research to inform a Net Savings Scoping Paper for the Northeast Energy Efficiency Partnerships, and conducted technical edits of sampling and regression guides for BPA's M&V protocols. She is skilled in SPSS, R, SAS, and other statistical packages; End Use Forecaster; and DSM Portfolio Pro. She particularly enjoys converting data into effective and graphically interesting findings and results. She joined Research Into Action in March 2011 and has four years' experience in energy efficiency research. She has a Master of Economics (M.S.) from Portland State University, a Master of Environmental Studies from The Evergreen State College, and a B.A. in Environmental Science from the University of California Berkeley.

SUSAN LUTZENHISER
SENIOR PROJECT ANALYST

Susan Lutzenhiser, Senior Project Analyst, has more than 25 years of experience in project management, survey design, and data analysis focused on understanding the patterns of behavior that underlie the

demand for energy. Ms. Lutzenhiser's work includes program evaluation, market research, and special projects focused on revealing the most effective aspects of energy efficiency programs. Her sociology background contributes to the design of studies that explore behavioral and demand response. As a Senior Project Analyst at Research Into Action, she manages all aspects of evaluation projects, including developing research plans, testing analytical approaches, and coordinating data collection and analysis. She has managed the analysis of complex data sets, conducted in-depth interviews, and developed algorithms for understanding the effects of free-riders on program effectiveness. She is managing our multi-year, Lawrence Berkeley National Laboratory-funded analysis of residential consumer choice and behavior related to the implementation of home energy audit recommendations. She also directed a study for the Demand Response Research Center of LBNL, which involved economic (price response) and behavioral research with a group of customers on a unique time-of-use rate (Sacramento Municipal Utility District's PowerChoice), which tested the impact of passive and active information on customer response to the rate. For Southern California Edison (Edison), she wrote Enhanced Inspection Plans and led evaluations of three Innovative Designs for Energy Efficiency Activities sub-programs. She also led our process evaluations of Consumers Energy's Business Solutions Program. Ms. Lutzenhiser has an M.A. and a B.A. in Sociology from the University of Montana, with additional graduate studies in survey research methodology, demography, and higher education administration.

MARNIE MCPHEE
COMMUNICATIONS SPECIALIST

Marnie McPhee, Communications Specialist, has more than 30 years' experience as a freelance writer and editor, specializing in energy efficiency, renewable energy, resource conservation, green design and construction, cutting-edge environmental products and services, and organic agriculture. She began working with Research Into Action in 1997 as a consultant, and has been a staff member since January 2009. She edits reports, presentations, and other documents; participates in the design of survey instruments; and conducts primary research for a variety of projects. She also writes project proposals and manages the proposal process and provides communications and marketing services. She has been active in the solar energy field since she co-founded Portland Sun, a nonprofit solar education and research organization, in 1978; she served as Vice President of the Solar Energy Association of Oregon (now Solar Oregon) for eight years. Her work reflects her long-term commitment to sustainable approaches to energy, food, and shelter. Ms. McPhee has a B.A. in French from DePauw University.

APEX ANALYTICS

SCOTT DIMETROSKY

PRESIDENT

Mr. Scott Dimetrosky, president of Apex Analytics, has led planning and evaluation studies for dozens of utility energy-efficiency, load management, and market transformation programs. His projects, spanning over 20 years, have addressed all market sectors—large and small commercial, industrial, agricultural, residential, and low income. Mr. Dimetrosky is currently providing technical and analytical oversight for portfolio evaluations in Arkansas, Illinois, Massachusetts, Missouri, and the Carolinas.

Mr. Dimetrosky is a nationally recognized expert in residential lighting programs. He led the 2009 California Upstream Lighting Market Effects Evaluation, has spoken at numerous conferences regarding the impacts of the 2007 Energy Independence and Security Act, and is the lead author for the upcoming Department of Energy Uniform Methods Project (UMP) recommendations for national standards regarding evaluation approaches for residential lighting programs.

Mr. Dimetrosky was a founding member and principal at Quantec, LLC, which merged with the Cadmus Group in 2008. During his 13 years at Quantec and Cadmus, Mr. Dimetrosky led some of the largest evaluations in the United States, including evaluations of the 2006-2008 California Residential Retrofit Programs and the 2009-2010 Massachusetts Residential Retrofit Programs. Both of these projects represented multi-year, multi-million dollar evaluation efforts with thousands of telephone surveys and site visits, a full range of analytical approaches including statistical billing, metering, and engineering analysis, and presentations to public stakeholder groups and commissions. Mr. Dimetrosky has also led potential studies and planning efforts, including the potential studies for the Iowa Utilities Commission and Commonwealth Edison, as well as the preparation of plans and regulatory filings for five Colorado gas utilities and MidAmerican Energy's Illinois and Iowa service territories.

Mr. Dimetrosky has delivered papers at over 20 energy efficiency conferences, and taught principles of Demand-Side Management (DSM) and DSM evaluation courses. He has an M.B.A. in Marketing Research & Quantitative Methods from Cornell University and a B.A. (Magna Cum Laude) in Sociology from the University of Michigan.

KATIE PARKINSON

ASSOCIATE

As an associate at Apex Analytics, Katie Parkinson manages evaluation projects and conducts quantitative and qualitative data analysis and for a broad range of projects including program evaluations, market characterization studies, and potentials assessments. She specializes in residential impact evaluations, and is currently managing the evaluation of the Residential Lighting Program for Progress Energy and the Appliance Recycling Program for Ontario Power Authority. As an associate at the Cadmus Group, Ms. Parkinson was responsible for the day-to-day management of three single family and multifamily programs within the Residential Retrofit project for the California Public Utility Commission.

Ms. Parkinson holds bachelor's degrees in both Economics and Environmental Studies from the University of California Santa Cruz.

6.0 STATEMENT OF POTENTIAL CONFLICTS OF INTEREST (II-6)

GDS Associates, Inc. has not performed any work during the past five years for any of the seven Pennsylvania EDCs subject to Pennsylvania Act 129. To the best of our knowledge, GDS has never performed any work for these seven EDCs since our firm was founded in 1986. GDS did prepare and file testimony in the Commission's 2012 evidentiary hearings on the Act 129 Phase 2 Savings Targets for PECO, PPL and First Energy on behalf of the PUC's Technical Utility Services Staff. GDS will continue to be fully compliant with the Commission's Conflict of Interest requirements for the Pennsylvania Statewide Evaluator contract.

Nexant Planning & Evaluation, LLC (NPE) is an autonomous, wholly owned subsidiary of Nexant Inc. NPE or its parent company Nexant Inc. has not performed any work during the past five years for any of the seven Pennsylvania EDCs subject to Phase 1 of Pennsylvania Act 129. Nexant Inc. did prepare and file testimony in the Commission's 2012 evidentiary hearings on the Act 129 Phase 2 Savings Targets for PECO, PPL and First Energy on behalf of the PUC's Technical Utility Services Staff.

Research Into Action, Inc. reports one minor conflict of interest. In 2011, Research Into Action provided research design consulting services to the Customer Performance Group (CPG), which was under contract to Duquesne Light in Pennsylvania. The purpose of the research was to provide assistance to CPG in the development of a sampling plan for assessment of the effects of utility interventions on consumer confidence, rate choice, equipment choice, and energy-using behaviors among consumers who received smart meters. In addition to developing sampling plans, we addressed data analysis issues associated with different sampling strategies.

Apex Analytics has not performed any work for these seven EDCs since our firm was founded in 2011. Mr. Dimetrosky and Ms. Parkinson had previously worked for Cadmus, which provides evaluation services for PPL and PECO, but neither Mr. Dimetrosky nor Mr. Parkinson were on these project teams. Apex Analytics will continue to be fully compliant with the Commission's Conflict of Interest requirements for the Pennsylvania Statewide Evaluator contract.

APPENDIX A

Resumes of Key Personnel

Richard F. Spellman

President



EDUCATION Management II Program, University of Michigan, Graduate School of Business, 1987
M.S. in Business Science, Thomas College, 1980
Amos Tuck Graduate School of Business, 1974-75
B.A., Math/Economics, Dartmouth College, 1974 (graduated with distinction)

PROFESSIONAL MEMBERSHIP Association of Energy Service Professionals,
Board of Directors of AESP – 2005 to 2010
Chair of AESP Policy Committee – 1997 & 1998,
Vice Chair AESP Policy Committee – 1995 & 1996

EXPERIENCE

Mr. Spellman is the President of GDS Associates and the Chair of the GDS Board of Directors. He has over 33 years of energy industry experience. He has managed natural gas and electric energy efficiency, demand response and renewable energy consulting projects in such states as Arkansas, California, Connecticut, Georgia, Florida, Hawaii, Indiana, Louisiana, Maine, Massachusetts, Mississippi, Nebraska, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Oregon, Pennsylvania, Rhode Island, South Carolina, Texas, Utah, Vermont, Virginia, and Wisconsin for GDS clients.

Mr. Spellman has also completed over forty electric and natural gas energy efficiency technical potential studies for clients across North America. He has also served in project management positions for energy efficiency and demand response implementation projects for electric utility clients, Wisconsin Focus on Energy and Efficiency Maine. From 1999 to December 2002, Mr. Spellman served as the Program Manager for the Wisconsin Focus on Energy Commercial and Industrial pilot energy efficiency programs (Systems Benefit Charge funded) implemented in a 23-county area in Northeast Wisconsin, and he served as the Deputy Project Director for the \$60 million Wisconsin Focus on Energy Business Program from March of 2001 until June of 2003. He also served as the Deputy Program Manager for the Efficiency Maine Small Business Program from 2003 through 2007.

He has designed and implemented **DSM bidding programs** for such clients as Central Maine Power Company, the Business Program of Wisconsin Focus on Energy, and the East Texas Electric Cooperative. Mr. Spellman has also chaired several committees to review energy efficiency and demand response proposals received in response to DSM RFPs (for Central Maine Power Company, Wisconsin Focus on Energy, East Texas Electric Cooperative, etc.).

In addition to program implementation projects, Mr. Spellman has completed renewable energy and conservation program market assessments, technical potential studies, market research, program designs, and Integrated Resource Plans for a number of the firm's clients. He has served as the Chair of the Policy Topic Committee of the Association of Energy Services Professionals (AESP) and he is currently a member of the Board of Directors of AESP.

Before joining GDS in Atlanta, Mr. Spellman was the Manager of Marketing and Product Development at Central Maine Power Company, where he was employed from 1977 to 1993. He has extensive experience working with collaboratives and community organizations on conservation and renewable energy issues.

While at CMP he managed CMP's \$26 million portfolio of energy efficiency programs. He also worked on CMP's market transformation program efforts with appliance and building standards, energy efficient lighting and motors, new construction and renewable energy programs. He worked on national market transformation programs such as the Super Efficient Refrigerator Program, and the EPA's Green Lights and Energy Star Programs. Finally, he has a solid track record testifying for clients before Commissions and legislative committees on energy issues. He was also the chairperson of the New England Power Pool DSM Planning Committee for several years, and worked on a wide range of regional DSM and renewable energy projects in New England during his sixteen years at CMP.

His education includes a BA degree with distinction in Math/Economics from Dartmouth College (graduated cum laude) and a Masters in Business from Thomas College Graduate School of Business. He is a graduate of the University of Michigan Graduate School of Business Administration Management II Program (1987), and the Electric Council of New England Skills of Utility Management Program (1986). In 1974 Mr. Spellman was awarded a research grant by the Richard King Mellon Foundation to study how colleges and universities in the Northeast were responding to the 1973-1974 U.S. energy crisis.

Specific Experience Includes:

GDS Associates, Inc., 1993 to Present

At GDS Associates, Mr. Spellman has directed and completed numerous management consulting, IRP, renewable energy, DSM planning and implementation, market research, load research and market planning assignments for the firm's clients, which include electric and natural gas utilities, municipal utilities, electric cooperatives, government agencies, and large commercial and industrial organizations.

Listed below are examples of consulting projects completed by Mr. Spellman relating to energy efficiency technical, economic and achievable potential studies:

1. **Pennsylvania Public Utility Commission, Bureau of Conservation, Economics and Energy Planning** – In September 2011 GDS was retained by the Pennsylvania PUC to prepare a detailed report with findings on the technical, economic, achievable and program potential for electric energy efficiency measures and programs in the State of Pennsylvania. The final report was completed on May 10, 2012. The final report presented the technical, economic, and achievable potentials of Energy Efficiency measures for the Commonwealth of Pennsylvania for the period 2013-2022.
2. **Vermont Department of Public Service** – GDS was retained by the Vermont Department of Public Service to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency and conservation resources in the State of Vermont. GDS collected and analyzed extensive information on over 100 energy efficiency and conservation measures, developed supply curves to show the achievable potential and completed a final report in May 2011. The GDS Team also examined the amount of energy efficiency savings that could be achieved given different budget scenarios for Efficiency Vermont. The GDS Team also conducted an analysis of the electric rate and electric bill impacts from these various budget scenarios.
3. **PowerSouth** – GDS was retained by PowerSouth to conduct an assessment of the cost effective achievable potential for several electric energy efficiency and demand response measures in the PowerSouth service area. GDS collected and analyzed extensive information on selected energy efficiency measures and demand response measures, developed supply curves to show the achievable potential and completed a report by July 1, 2011.
4. **Maryland Natural Gas Potential Study** – In the spring of 2011, the Maryland Energy Administration (MEA) identified the need to determine the potential for natural gas energy efficiency savings in Maryland, and to identify the types of natural gas energy efficiency programs and measures that could save the most natural gas and be the most cost effective for the State of Maryland. The need for this analysis was initially created by the Maryland Energy Efficiency Act of 2008, which requires a study of the feasibility of setting energy savings targets in 2015 and 2020 for natural gas companies.

MEA contracted with GDS in June of 2011 to conduct this natural gas energy efficiency potential study for the State of Maryland. As part of the project, GDS conducted analysis and prepared a technical-economic-achievable-program potential study documenting a base estimate of natural gas energy efficiency potential to determine the feasibility of setting energy savings targets in 2015 and 2020 for natural gas companies in Maryland. GDS presented alternative scenarios in low and high cases in terms of market potential and determined what likely can be achieved for market penetration in 2015 and 2020. This included information regarding required programs or market approaches addressing technologies, threshold incentive levels (by market or segment) pricing strategies, trade ally involvement and communications efforts. An implementation plan was also developed that recommended programs for 2015 and provided detailed recommendations on “best practice” strategies, program designs, requisite budgets, incentives and expected market penetration. GDS completed this study in November 2011.

5. **Consolidated Edison of New York** – Consolidated Edison Company of New York retained GDS to prepare an assessment of the natural gas energy efficiency potential in its service area and to develop a portfolio of natural gas energy efficiency programs. GDS developed this Gas Efficiency Plan for Con Ed, and the Plan was filed with the New York Public Service Commission in March 2009. The program plans included detailed benefit/cost calculations using the Total Resource Cost test. The plan also included a detailed plan for evaluation of each individual program, including details on the scope and method of measurement and verification activities pursuant to the Commission’s rules and regulations.
6. **District of Columbia Energy Office** – In September 2007, GDS Associates and Ed Meyers Consulting completed a detailed assessment of energy use in the District of Columbia, and developed findings and recommendations for cost effective electric and natural gas energy efficiency programs for the District. The report included detailed information on residential energy measures recommend for consideration in the upcoming Comprehensive Energy Plan IV for DC (CEP-IV) as well as energy efficiency programs and measures for DC Government facilities. The report found that the effectiveness of the District’s programs can be increased working with the Metropolitan Washington Council of Governments (MWCOG) to leverage resources with federal agencies and coordinate policies and programs throughout the region to produce mutually targeted results. Such regional cooperation also reduces administrative costs per program unit delivered, as costs are amortized over more clients served. One particularly promising opportunity may involve regional government purchasing of energy efficiency products, where each governmental unit would gain from regional quantity discounts. The report determined the successful energy conservation programs can yield about 6,000 new jobs in the District of Columbia over a fifteen year period. DC’s job creation totals in energy efficiency can be boosted for DC residents through First Source Employment Agreements and LSDBE requirements, when businesses receive tangible benefits from the DC government (for example, low-interest loans or down payment assistance).
7. **New Hampshire Public Utilities Commission** - In 2008, GDS in partnership with RLW Analytics, Research Into Action and RKM Research and Communications was retained by the New Hampshire Public Utilities Commission to conduct a thorough assessment of the potential for electric and natural gas energy efficiency in the state of New Hampshire. To support the energy efficient potential analysis, the GDS Team conducted residential and small commercial telephone surveys and large C&I site visits. The data collected will help determine key study inputs such as equipment saturations and baseline efficiency levels. The GDS Team has identified hundreds of electric and natural gas energy efficiency measures which are being analyzed to identify cost-effective measures. Estimates of the technical, economic and achievable electric and natural gas savings potential over the next ten years and the cost necessary to achieve these savings will then be developed.
8. **Hoosier Energy** - GDS was retained by Hoosier Energy to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency and demand response measures in service area of Hoosier Energy in southern Indiana. GDS collected and analyzed extensive information on over 200 energy efficiency measures and 25 demand response measures, developed

- supply curves to show the achievable potential and completed a report by December 2008.
9. **Brazos Electric Cooperative** - GDS was retained by Brazos Electric Cooperative to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency and demand response measures in the service area of this large electric cooperative in Eastern Texas. GDS collected and analyzed extensive information on over 200 energy efficiency measures and 25 demand response measures, developed supply curves to show the achievable potential and completed a draft report by September 2008.
 10. **Arkansas Electric Cooperative Corporation** - GDS was retained by Arkansas Electric Cooperative Corporation to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency and demand response measures in the service area of this large electric cooperative in Arkansas. GDS collected and analyzed extensive information on over 200 energy efficiency measures and 25 demand response measures, developed supply curves to show the achievable potential and completed a draft report by September 2008.
 11. **Central Maine Power Company (CMP)** - As a subcontractor to La Capra Associates, GDS was retained by CMP to conduct an assessment of the potential for cost-effective electric energy efficiency and demand response as an alternative to transmission system expansion in 5 sub-areas of the CMP service area. GDS collected and analyzed extensive information on over 100 energy efficiency and conservation measures, developed supply curves to show the achievable potential and is in the process of developing a draft findings report.
 12. **Bonneville Power Administration (BPA)** - GDS was retained by BPA to conduct an assessment of their Non-Wires Solutions initiative development process and the current state of the initiative. The BPA Non Wires Solutions Program assesses the feasibility of energy efficiency and demand response programs as an alternative to building new electric transmission lines in the BPA service area. GDS reviewed program materials and reports, designed an interview guide and conducted in-depth, interviews with key BPA staff. Our analysis identified program strengths, weaknesses and potential improvements in key program areas including design, implementation, planning, cost impact & allocation and resources. A final report was delivered on June 8, 2007.
 13. **Reading Municipal Light Department (Reading, Massachusetts)** - GDS was retained by the RMLD to assess the technical, economic, and market potential for reducing (avoiding) electricity use and peak demand, and reducing fossil-fueled electricity use and peak demand, in RMLD's service territory by implementing a wide range of end-use efficiency measures and renewable energy resource technologies. GDS collected and analyzed extensive information on over 100 energy efficiency, conservation and demand-response measures and renewable energy technologies, developed supply curves to show the achievable potential and is in the process of developing a draft report.
 14. **Concord Municipal Light Department, Concord, Massachusetts** – GDS completed a detailed study for the potential for energy efficiency and renewable energy technologies for the Concord Municipal Light Department (CMLD). GDS's specific responsibilities for this project include identification and analysis of demand-side alternatives, including distributed generation and other demand response technologies (i.e., direct load control).
 15. **North Carolina Electric Membership Corporation (NCEMC)** - GDS was retained by the NCEMC to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency and conservation resources in service area of the North Carolina Electric Membership Corporation (NCEMC). GDS collected and analyzed extensive information on over 200 energy efficiency and conservation measures, developed supply curves to show the achievable potential and completed a final report in 2007.
 16. **Central Electric Power Cooperative Inc. (CEPCI)** - GDS was retained by the CEPCI to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency, conservation and demand response resources in the service area of CEPCI. GDS collected and analyzed extensive information on over 200 energy efficiency and conservation measures, developed supply curves to show the achievable potential and completed a final report in August 2007.

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17. **Maine** – GDS recently completed a technical potential study for high efficiency residential lighting equipment for the Efficiency Maine Residential Lighting Program. GDS conducted this study for the Maine Public Utilities Commission.
 18. **North Carolina Public Utilities Commission** -GDS was retained by the North Carolina PUC to conduct an assessment of the cost effective achievable potential for electric energy efficiency and conservation resources in the State of North Carolina. GDS collected and analyzed extensive information on over 100 energy efficiency and conservation measures, developed supply curves to show the achievable potential and completed a final report in December 2006.
 19. **Vermont Department of Public Service** - GDS was retained by the Vermont Department of Public Service to conduct a thorough assessment of the cost effective achievable potential for electric energy efficiency and conservation resources in the State of Vermont. GDS collected and analyzed extensive information on over 100 energy efficiency and conservation measures, developed supply curves to show the achievable potential and completed a final report in January 2007. GDS also conducted market research with energy services providers in Vermont to collect information on baseline levels of energy efficiency in the State.
 20. **Big Rivers Electric Corporation – 2005 Energy Efficiency Technical Potential Study - Kentucky** - During 2005, GDS completed a study of the technical and maximum achievable cost effective economic potential of energy efficiency measures and programs for the service area of the Big Rivers Electric Corporation, a large Generation and Transmission electric utility in Ohio. This technical and economic potential study was completed as part of the comprehensive analysis of supply-side and demand-side options for the latest BREC Integrated Resource Plan filing with the Kentucky Public Service Commission.
 21. **Public Service of New Mexico** – GDS completed this natural gas DSM technical and achievable potential study in May 2005. This study presents estimates of the maximum achievable cost-effective potential for natural gas Demand-Side Management (DSM) opportunities in the service area of Public Service of New Mexico. The main output of this study is a concise, fully documented report on the opportunities for achievable, cost effective natural gas energy efficiency programs in New Mexico.
 22. **Utah Energy Office and Questar Gas Company** – GDS completed this natural gas DSM technical and achievable potential study in June 2004. This study presents estimates of the maximum achievable cost-effective potential for natural gas Demand-Side Management (DSM) opportunities in the State of Utah. The main output of this study is a concise, fully documented report on the opportunities for achievable, cost effective natural gas energy efficiency programs in Utah. This study assessed the impacts that gas DSM measures and programs can have on natural gas use, assesses the economic costs and benefits of DSM programs, and assesses the revenue impacts to Questar Gas Company. The final report also includes an assessment of the environmental impacts of the achievable DSM options identified in this study.
 23. **Energy Efficiency Potential in Georgia – Study for the Alliance to Save Energy** – GDS completed this study for the Alliance to Save Energy in July 2004. This study provides estimates of the maximum achievable cost effective potential in the State of Georgia for several “top-ranked” energy efficiency programs. In addition, GDS presented expert witness testimony on behalf of the ASE before the Georgia Public Service Commission that covered the following issues:
 - The potential net present value dollar savings to ratepayers in Georgia due to the implementation of cost effective energy efficiency programs.
 - The cost effectiveness of these energy efficiency programs.
 - Energy efficiency tariffs that could be implemented in Georgia to save energy.
 - Up-to-date information on energy efficiency and DSM success stories and energy savings in other regions of North America and the technical potential for DSM in Georgia.
 - Improvements that could be made in the DSM measure screening process in Georgia.
 - Recommendations for DSM cost recovery and shareholder incentive mechanisms.

24. **Energy Efficiency Potential in Florida – Study for the Alliance to Save Energy and the Southern Alliance for Clean Energy** – GDS completed this study for the Alliance to Save Energy in July 2004. This study provides estimates of the maximum achievable cost effective potential in the State of Florida for several “top-ranked” energy efficiency programs
25. **Connecticut Energy Conservation Management Board** – In March 2003, GDS was retained by the Connecticut Energy Conservation Management Board to conduct a thorough assessment of the cost effective maximum achievable technical potential for energy efficiency and conservation resources in the State of Connecticut and two sub-regions of the State. GDS collected and analyzed extensive information on over 250 energy efficiency and conservation, and developed supply curves to show the maximum achievable potential. GDS completed the final report in June 2004.
26. **Alliant Energy Corporate Services** - As an update to an assessment of potential customer-sited/distributed generation technology applications in all categories (residential, small/large commercial, industrial, and agricultural) conducted by GDS in 2001, Alliant requested that modeling assumptions be reviewed and revised, as necessary. In addition, the Distributed/Onsite Generation Screening (DOGS) tool was reviewed by MN Department of Commerce as part of a filing in 2001 and they requested expansion of applicable technologies and fuels, including: bio-diesel and methane from landfills and digesters to fuel reciprocating engines; methanol, ethanol, gasoline, and methane for electricity production from fuel cells. The revised model results will be used to estimate the market potential for distributed/onsite generation within Alliant's Minnesota service territories.
27. **Massachusetts GasNetworks** – In January of 2004, GDS was hired by GasNetworks (a network of several natural gas utilities in Massachusetts) to develop benefit/cost analyses and energy savings potential estimates for GasNetworks’ regional market transformation and demand-side management programs. Benefit/cost ratios and energy savings potential estimates were developed for several regional gas energy efficiency programs using a spreadsheet model, and similar data were developed for each program for each service area for each natural gas utility participating in this study.
28. **Northern Utilities (Gas Company)** – In 2002 GDS was hired by Northern Utilities to prepare benefit/cost analyses and energy savings potential estimates of a portfolio of energy efficiency programs proposed for implementation in their New Hampshire service area. This project was completed during September 2002 and a final report was filed with the New Hampshire PUC. A workshop was conducted at the NH Public Utilities Commission early in 2003 to review cost-effectiveness methodologies and key model input/output requirements.
29. **KeySpan Energy Delivery (Gas Company)** – In 2002 GDS was hired by KeySpan Energy Delivery – New Hampshire to prepare benefit/cost analyses and energy savings potential estimates of ten energy natural gas energy efficiency programs proposed for implementation in the KeySpan New Hampshire service area. This project was completed during September 2002 and a final report was filed with the New Hampshire PUC that month.
30. **Big Rivers Electric Corporation – 2002 Energy Efficiency Technical Potential Study - Kentucky** - During 2002, GDS completed a study of the technical and economic potential of energy efficiency and load management measures and programs for the service area of the Big Rivers Electric Corporation, a large Generation and Transmission electric utility in Ohio. This technical and economic potential study was completed as part of the comprehensive analysis of supply-side and demand-side options for the latest BREC Integrated Resource Plan filing with the Kentucky Public Service Commission.
31. **City of Grand Island, Nebraska – Municipal Utility – Energy Efficiency Technical Potential Study** - GDS completed a study of the technical and economic potential for energy efficiency and load management measures and programs for the service area of this large municipal electric utility in Nebraska. This technical and economic potential study was completed as part of the comprehensive analysis of supply-side and demand-side options for an Integrated Resource Plan for this utility.
32. **City of Lafayette, Louisiana – Municipal Utility – Energy Efficiency Technical Potential Study** - GDS completed a study of the technical and economic potential for energy efficiency and load

management measures and programs for the service area of this large municipal electric utility in Louisiana. This technical and economic potential study was completed as part of the comprehensive analysis of supply-side and demand-side options for an Integrated Resource Plan for this utility.

- 33. New York State Energy Research and Development Authority (NYSERDA) - Energy \$martSM Program Evaluation Services:** In the fall of 1999, GDS was retained by NYSERDA to be the prime evaluation contractor for the New York Energy \$martSM program. During the years 2000, 2001, 2002, and 2003, GDS has been responsible for providing energy efficiency program and measure data collection, analysis, and report writing services to NYSERDA in support of their overall evaluation and market assessment efforts, and to determine actual savings of the programs. To date, GDS team evaluation activities have included development of a Gap Analysis for the purpose of setting priorities and allocating evaluation resources to the various New York Energy \$martSM project areas; and numerous evaluation activities leading to development of a draft and final Program Evaluation Status report which provided the New York Public Service Commission with sufficient information to determine the future of SBC-funded public benefits programs beyond its initial three-year transition period which ended July, 2001.
- 34. Distributed Generation Technical Potential Assessment for Minnesota and Iowa:** During the fall of 2001, GDS assessed the technical potential of customer-sited distributed generation technology applications for Alliant, a major investor owned utility located in the MidWest. The analysis covered the residential, small/large commercial, industrial, and agricultural sectors. GDS developed a Distributed/Onsite Generation Screening spreadsheet model to determine the cost-effectiveness of various distributed generation options; used the model to assess the potential for various customer groups and then scaled results using customer profiles. Model results were also used to estimate the technical potential for distributed/onsite generation within Alliant's Minnesota and Iowa service territories.
- 35. Renewable Electric Energy and Peak Demand Savings Methodology Reviews - Wind Power and Photovoltaics Programs:** GDS performed detailed reviews of NYSERDA's methodologies for estimating electric energy savings and peak demand reduction benefits associated with NYSERDA's Wind Power Research & Development Program and two Photovoltaic (PV) programs. These Savings Methodology reviews entailed three-components: 1) a review of the current method used by NYSERDA for estimating savings (including algorithms and inherent assumptions), 2) a review of the methods and assumptions used by other utilities and program administrators for estimating savings from similar programs being implemented elsewhere in the country, and 3) a presentation of key findings and recommendations.
- 36. Evaluation Services for Commercial/Industrial Program Areas and Technical Assistance Reviewing Engineering Analyses- Efficiency Vermont:** GDS Associates is the lead contractor in a team that has been hired to assist the VT DPS in evaluating a statewide portfolio of energy efficiency programs targeted to the Commercial and Industrial market sectors. The GDS team is also providing technical engineering and review assistance, on an "on-call" basis, to the administrator of Vermont's energy efficiency programs.
- 37. Development and Implementation of Five-Year Energy Efficiency Plan – Boston Edison:** GDS Associates was retained by Boston Edison to assist BECo staff with the development of program designs, evaluation plans, technical potential estimates and budgets for the Company's Five Year Energy Efficiency Plan. For this project GDS performed energy efficiency technology screenings to identify potentially viable measures for utility funding/support, and developed the program designs for a number of new initiatives, including over a dozen new market transformation programs. GDS also conducted cost effectiveness screening for all of the new DSM initiatives included in the plan.
- 38. Energy Efficiency Technical and Market Potential Analysis:** This report presented the results of a technical and market potential study for energy efficiency options for the East Texas Electric Cooperative, Inc. (ETEC). The purpose of this report was to review energy efficiency options that comply with the Public Utility Commission of Texas (PUCT) orders issued in Northeast Texas Electric Cooperative (NTEC), Sam Rayburn Electric Cooperative (SRG&T) and Tex-La Electric Cooperative of

Texas (Tex-La) rate cases. This study presented cost effectiveness findings and recommendations on energy efficiency options and programs for ETEC and its member generation and transmission electric cooperatives (NTEC, SRG&T, and Tex-La). In this study, GDS evaluated the cost effectiveness of over 90 energy efficiency options and found many of them to be cost effective according to the Total Resource Cost Test.

39. **Technical and Market Potential Analysis for Load Management and Energy Efficiency Options:** GDS was retained to update energy efficiency and load management technical and market potential analyses completed in the mid 1990's time period, and to develop recommendations relating to cost effective DSM programs for electric cooperatives in East Texas. This study identified energy efficiency and load management (DSM) options that were viable based on economic tests presented in the California Standard Practice Manual for Economic Analysis of Demand-Side Management Programs. DSM options that had a Total Resource Cost test benefit/cost ratio greater than 1.3 and a positive net present value for the participant were ones that were recommended by GDS for further program development.

Central Maine Power Company - Manager of Marketing Services/Marketing and Product Development, August 1990 to May 1993

From 8/90 to 8/92 - Responsible for managing the design and implementation of CMP's residential, commercial, and industrial demand-side management programs. Also responsible for corporate market research, five-year DSM implementation plans, testifying on DSM topics before regulatory agencies, and for participating in integrated resource planning activities. Accountable for managing a \$26 million DSM budget and a staff of 50 persons. Served on three person lead team from 1989 to 1992 to develop CMP's first integrated resource plan. During 1991 traveled to Czechoslovakia and Poland to provide consulting to foreign utilities on DSM issues.

From 8/92 to 5/93, responsible for identifying and developing marketing strategies for products and services which would improve the competitiveness of CMP's customers, increase the efficiency of energy use, increase CMP's profitability, and which would reduce the rate of growth of electricity prices for all customers. Directly responsible for the design of renewable energy and demand-side management programs, integrated resource planning, research on new technologies, and managing marketing and product development staff. Also provided consulting services to utilities in New Zealand, Australia, and Bulgaria relating to DSM program design and implementation.

Central Maine Power Company - Director of Market Research and Forecasting, June 1986 to August 1990

Responsible for managing twenty-five professional employees. Duties included supervising DSM program evaluation activities, short and long range load forecast development, local area energy and peak load forecasts, market and load research, economic forecasting, and developing and updating DSM assumptions for use in the Company's long range planning models. Also participated in the development of the first Power Partners RFP, and in the evaluation and selection of proposals submitted in response to this RFP.

Central Maine Power Company - Corporate Economist, May 1985 to May 1986

Responsible for monitoring and forecasting energy and economic trends in the CMP service area and in the New England Region. Duties included development of corporate short-term kWh sales and revenue forecasts, market research studies, and CMP's energy management strategy. Instrumental in promoting the use of state-of-the art PC-based computer models for integrated resource planning (UPLAN). Authored a second report on CMP's DSM strategy in April 1986. Also responsible for supervising several analysts.

Central Maine Power Company - Staff Economist, May 1977 to May 1985

(5/77 to 5/78) Joined CMP in May 1977 and worked in the Customer Services Department. Responsibilities included short-term forecasting, annual appliance saturation surveys, and preparation of the 1977 and 1978 long-range energy and peak load forecasts.

(5/78 to 12/80) In May of 1978, selected to join a new group, the Corporate Financial Model Staff, to develop a new corporate financial model for CMP. Had major responsibility for development of a revenue forecasting model, and assisted with development of models to produce income statement, balance sheet, and sources and uses of funds forecasts. In addition to corporate model development, responsibilities included short-term forecasting and market research.

(12/80 to 5/85) In December of 1980, moved to CMP's Research Department and worked for Phil Hastings for five years. Responsible for all corporate market research, short-term kWh sales and revenue forecasts, economic analyses and forecasts, and forecasts of key corporate planning assumptions. Prepared and published CMP's first DSM strategy study in March 1985.

OTHER PROFESSIONAL ACTIVITIES:

- Board of Directors, Association of Energy Services Professionals (AESP), 2005 to 2010
- Member of the Association of Energy Service Professionals (1993 to Present), Vice Chairman of the Policy Committee (1995-1996), Chair of Policy Committee (1997 and 1998)
- Panel Leader, 1992 American Council for an Energy Efficient Economy (ACEEE) Summer Study on Building Energy Efficiency.
- Chairman of the NEPOOL Demand-Side Management Planning Committee, September 1989 to September 1990, August 1991-July 1992.
- Vice Chairman of the NEPOOL Demand-Side Management Committee - January to August 1989, July 1990 - July 1991.
- Member of the NEPOOL Demand-Side Management Task Force (1986-1988).
- Member of the Load Research Committee of the Association of Edison Illuminating Companies (1988-1991).
- Alternate to the NEPOOL Governor's Liaison Committee (1986-1988).
- State Forecast Analyst for the NEPOOL Load Forecasting Model (1979-1986).
- Maine Model Manager of the New England Economic Project economic forecasting model, 1983-1986.
- Member of the Statistical Research Committee of the Electric Council of New England (Chairperson 1982-1983, member 1977-1986).
- Member of the Edison Electric Institute Economics Committee (1986-1991).
- Past member of the International Association of Energy Economists.

PUBLICATIONS:

1. Spellman, Richard F., *Modeling of Energy Management Strategies with the Utility Systems Analysis Model*, paper presented at the International Load Management Conference, November 1984, Chicago, Illinois
2. Spellman, Richard F., *Use of Computer Models and Load Research Data for Developing Energy Management Strategies*, paper presented at the Fifth Annual Northeast Load Research Conference, September 10-12, 1986, Farmington, Connecticut
3. Spellman, Richard F., *Potential Market Penetration of DSM Programs at Central Maine Power*, paper presented at Third National Conference on Utility DSM Programs, June 16-18, 1987, Houston, Texas
4. Spellman, Richard F., *Demand-Side Management Market Penetration: Modeling and Resource Planning Perspectives from Central Maine Power Company*, paper presented at the Fourth National Conference on Utility DSM Programs, May 2-4, 1989, Cincinnati, Ohio

5. Spellman, Richard F., *Using Program Evaluation Data for Long-Range Resource Planning at Central Maine Power Company*, paper presented at the Canadian Electrical Association's Conference on Enhancing Electricity's Value to Society, October 22-24, 1990, Toronto, Canada
6. Spellman, Richard F., *Demand-Side Management from a North American Perspective*, Keynote Address to the International Energy Agency Conference on Advanced Technologies for Electric Demand-Side Management, written for Joe C. Collier, Jr., President and Chief Executive Officer of Central Maine Power Company, paper presented in Sorrento, Italy on April 3, 1991
7. Leamon, Ann K., and Spellman, Richard F., *From the Bottom Up: T&D and DSM*, paper presented at the 5th National Demand-Side Management conference, July 30 - August 1, 1991, Boston, Massachusetts
8. Haeri, M. Hossein, and Spellman, Richard F., *Integration of Evaluation Results into the Resource Planning Process*, paper presented at the 5th National Demand-Side Management Conference, July 30 - August 1, 1991, Boston, Massachusetts
9. Spellman, Richard F., *Does Fuel Switching Make Sense for an Electric Utility?*, paper presented at the 1992 International Energy Efficiency and DSM Conference, October 22, 1992, Toronto, Ontario
10. Spellman, Richard F., and Brunette, Marguerite, *Market Research for the Design, Implementation, and Evaluation of a Compact Fluorescent Lighting Program*, paper presented at the EPRI/EUMRC Market Research Symposium, November 17-20, 1992, Dallas, Texas
11. Spellman, Richard F., Forum For Applied Research and Public Policy/Fall 1992, *Energy Management: A View from Maine* (Journal Article)
12. Spellman, Richard F., *DSM Incentives Plus Electric Rate Adjustment Mechanisms Equal Bottom Line Impact*, paper presented at the 6th National Demand-Side Management Conference, March 24-26, 1993, Miami Beach, Florida
13. Spellman, Richard F., Van Wie, David A., Peaco, Daniel E., Lawrence, and Dennis R., *Optimizing Demand-Side and Supply Resources Using Linear Programming*
14. Spellman, Richard F., Utility Experience With Load Management in Texas, EPRI/Houston Lighting and Power Co. Load Management Conference, May 3, 1994, Houston, Texas.
15. Spellman, Richard, F., The Role of DSM in the Privatized Electricity Sector in England and Wales, and New Zealand, Paper Presented at the Association of Demand-Side Management Professionals Annual Meeting, Orlando, Florida, December 1994.
16. Spellman, Richard, F., Energy Services in A Global Environment, Paper Presented at the Association of Energy Services Professionals Annual Meeting, Phoenix, Arizona, December 1995.
17. Spellman, Richard, F., Value Added Services as Profit Centers in Texas, Paper Presented at the Association of Energy Services Professionals Annual Meeting, Beverly Hills, California, December 1996.
18. Spellman, Richard, F., "Preparing for Competition by Updating Corporate Marketing Strategies", Paper Presented at the Association of Energy Services Professionals Annual Meeting, Boca Raton, Florida, December 1997.
19. Megdal, Lori, Spellman, Richard, F., Johnson, Bruce "Methods and Measurement Issues for a DSM Evaluation versus a Market Transformation Market Assessment and Baseline Study", Paper Presented at the 1999 Energy Program Evaluation Conference, Denver, Colorado, August 1999.
20. Spellman, Richard F., Shel Feldman, Bruce Johnson, Lori Megdal, "Measuring Market Transformation Progress & the Binomial Test: Recent Experience at Boston Gas Company", Paper presented at the ACEEE Summer Study on Building Energy Efficiency, August 2000.
21. Spellman, Richard F., Giffin, Thomas M., Sheil, Jolene A., Nicol, John, "Experience and Lessons from the Wisconsin Industrial Focus on Energy Program: Transformation in Industrial Energy Efficiency Markets", presented at American Council for and Energy Efficient Economy Summer Study on Energy Efficiency in Buildings, Tarrytown, New York. July 25-27, 2001

22. Spellman, Richard F., Shel Feldman, Bruce Johnson, Lori Megdal, "Transition Strategies for Market Transformation Programs: Recent Experience at KeySpan Energy Delivery", Paper presented at the December 2001 12th National Energy Services Conference.
23. Rooney, Thomas; Spellman, Richard; Rufo, Michael; Schlegel, Jeff; "Estimating the Potential for Cost Effective Electric Energy and Peak Demand Savings in Connecticut", Paper presented at the 2004 American Council for an Energy Efficient Economy Summer Study in Pacific Grove, California, August 2004.
24. Spellman, Richard F., Goldfarb, Lynn K., Barnes, Harley, "Using Market Research to Improve Program Design and Delivery of Residential Lighting Programs in the US Northeast Region", Paper presented at the 15th National Energy Services Conference, December 7, 2004, Clearwater Beach, Florida.
25. Spellman, Richard F.; Goldfarb, Lynn K.; Huber, Jeffrey; "IS THERE A POTENTIAL NATIONAL MARKET FOR TRADING ENVIRONMENTAL CREDITS BASED ON THE ENVIRONMENTAL SAVINGS ACHIEVED THROUGH ENERGY EFFICIENCY SAVINGS?", Paper presented at the 16th National Energy Services Conference, December 2005.
26. Spellman, Richard F.; Rooney, Thomas; Burks, Jeffrey; Bean, Stephen; "Potential for Natural Gas Savings in the Southwest", Paper presented at the 2006 ACEEE Summer Study on Building Energy Efficiency, held at Pacific Grove, California.

Direct Testimony of Richard F. Spellman:

1. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket Nos. 85-48, 85-82, 85-83, filed July 7, 1986. Subject Matter: Economics of Commercial and Industrial Conservation Programs in the CMP Service Area
2. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket Nos. 88-111 and 87-261, filed November 6, 1987. Subject Matter: DSM Assumptions for Central Maine Power Company in Long Term Avoided Cost Filing.
3. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket Nos. 88-111 and 87-261, filed June 22, 1988. Subject Matter: DSM Potential and Cost Effectiveness in the CMP Service Area.
4. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket No. 89-68, filed May 19, 1989. Subject Matter: Review and explain the basis for the updated short-term kWh sales forecast on which CMP's revised Attrition Study is based.
5. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket No. 89-68, filed October 24, 1989. Subject Matter: Review and explain the basis for the short-term kWh sales forecast on which CMP's Attrition Study is based.
6. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket No. 91-213, filed November 15, 1991. Subject Matter: Present CMP's conclusions regarding the advisability of inaugurating a residential space heat conversion program in the Company's service territory.
7. On Behalf of Central Maine Power Company, Before the State of Maine Public Utilities Commission, Docket No. 91-213, filed July 31, 1992. Subject Matter: Present updated information regarding the advisability of inaugurating a residential space heat conversion program in the Company's service territory.
8. On Behalf of Tex-La Electric Cooperative of Texas, Inc. Before the Public Utilities Commission of Texas, Docket No. 12289, filed July 1993. Subject Matter: Tex-La's DSM activities and updating of TEX-LA Energy Efficiency Plan.
9. On Behalf of Tex-La Electric Cooperative of Texas, Inc. Before the Public Utilities Commission of Texas, Docket No. 12289, filed July 1993. Subject Matter: Rebuttal testimony relating to TEX-LA's DSM activities.
10. On Behalf of H.E. Butt Grocery Company, Before the Public Utilities Commission of Texas, Docket No.

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- 12820, Filed October 17, 1994. Subject Matter: Proposed modifications to Central Power and Light DSM Programs.
11. On Behalf of The Coalition of Cities and The City of Houston, Before the Public Utilities Commission of Texas, Docket No. 12065, filed November 15, 1994. Subject Matter: Proposed changes to Houston Lighting and Power Company's DSM programs.
 12. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket NO. 5602-U, filed May 8, 1995. Subject Matter: Proposed modifications to DSM programs proposed by Georgia Power Company in Integrated Resource Plan filed by the Company in January 1995.
 13. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket NO. 5601-U, filed May 8, 1995. Subject Matter: Proposed modifications to DSM programs proposed by Savannah Electric and Power Company in Integrated Resource Plan filed by the Company in January 1995.
 14. On Behalf of the Sam Rayburn G&T Electric Cooperative, Inc., Before the Public Utilities Commission of Texas, Docket No. 14893, filed September 1995. Subject Matter: Description of SRG&T Compliance with prior Commission orders relating to SRG&Ts DSM activities.
 15. On Behalf of the Sam Rayburn G&T Electric Cooperative, Inc., Before the Public Utilities Commission of Texas, Docket No. 14893, filed January 1996. Subject Matter: Rebuttal testimony relating to SRG&Ts DSM activities.
 16. On Behalf of the Sam Rayburn G&T Electric Cooperative, Inc., Before the Public Utilities Commission of Texas, Docket No. 14893, filed March 1996. Subject Matter: Surrebuttal testimony relating to SRG&Ts DSM activities.
 17. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket Nos. 6315-U and 6325-U, filed April 5, 1996. Subject Matter: Evaluation of Benefits and Costs of Residential Load Management Program Proposed by Georgia Power Company.
 18. On Behalf of Green Mountain Power Company, Before the Vermont Public Service Board, Docket No. 5983, filed December 8, 1997. Subject Matter: Rebuttal Testimony relating to the effectiveness of the Company's historical DSM activities.
 19. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket NO. 8708-U, filed May 29, 1998. Subject Matter: DSM programs proposed by Georgia Power Company in Integrated Resource Plan filed by the Company in 1998.
 20. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket NO. 8709-U, filed May 29, 1998. Subject Matter: Proposed modifications to DSM programs proposed by Savannah Electric and Power Company in Integrated Resource Plan filed by the Company in January 1995.
 21. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 8709-U, filed May 29, 1998. Subject Matter: Proposed modifications to DSM programs proposed by Savannah Electric and Power Company in Integrated Resource Plan filed by the Company in January 1998.
 22. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 13305-U, filed May 11, 2001. Subject Matter: DSM programs proposed by Georgia Power Company in Integrated Resource Plan filed by the Company in January 2001.
 23. On Behalf of the Georgia Public Service Commission Staff IRP Adversary Team, Before the Georgia Public Service Commission, Docket No. 13306-U, filed May 11, 2001. Subject Matter: Proposed modifications to DSM programs proposed by Savannah Electric and Power Company in Integrated Resource Plan filed by the Company in January 2001.

24. On Behalf of the Alliance to Save Energy, Before the Georgia Public Service Commission, Docket Nos. 17687 & 17688-U, filed May 14, 2004. Subject Matter: Proposal for new energy efficiency programs to be paid for and implemented by Savannah Electric and Power Company and Georgia Power Company (this was intervener testimony filed in the Integrated Resource Plan dockets heard before the Georgia Commission during 2004).
25. On Behalf of the Southern Alliance for Clean Energy, Before the Georgia Public Service Commission, Docket Nos. 4822-U & 19279-U, filed November 12, 2004. Subject Matter: Provided comments on the rules of the Georgia Commission relating to the methodology for the calculation of electric energy and capacity avoided costs that would apply to renewable energy producers in the State of Georgia.
26. On behalf of the Public Staff of the North Carolina Utilities Commission, Before the North Carolina Public Service Commission, Docket No. E-7, Sub 831, June 26, 2008, Subject Matter: The purposes of this testimony were the following: (1) to determine whether the SAVE-A-WATT (SAW) approach was in the public interest of the ratepayers of Duke Energy Carolinas, LLC (Duke or the Company); (2) to determine whether the SAW program administrator costs per lifetime kWh saved were reasonable and whether projected utility margins for energy efficiency and demand response resources under the proposed SAVE-A-WATT approach were reasonably based; (3) to determine whether the SAW approach would achieve the maximum achievable cost-effective potential for kilowatt-hour (kWh) and kilowatt (kW) savings in the Company's service area in North Carolina.; (4) to determine whether any additional cost-effective energy efficiency and demand response programs should be included in the Company's Energy Efficiency Plan; (5) to determine whether an alternative to SAW exists that provides superior electricity and dollar savings to the Company's ratepayers at a much lower cost to them.
27. On behalf of Communities Against Regional Interconnect, Before the State of New York Public Service Commission, Case No. 06-T-0650, Filed January 9, 2009, Subject Matter: The purpose of this testimony were the following: to present the achievable, cost effective non-route alternatives to construction of the New York Regional Interconnect (NYRI) project and to demonstrate that with the implementation of the proposed non-route alternatives there is no real need for the NYRI project.
28. On behalf of Connecticut Natural Gas Corporation, Before the State of Connecticut Department of Public Utility Control, Docket No. 08-12-06, Filed January 16, 2009, Subject Matter: The purposes of this testimony were the following: (1) describe how the new Connecticut Natural Gas (CNG) energy efficiency programs will strengthen the partnership with customers through expanded communication and outreach, consistent with the state's policy encouraging energy efficiency; (2) present an overview of existing CNG energy efficiency programs; (3) present information on best practice natural gas energy efficiency programs in other States; (4) describe CNG's proposal to expand energy efficiency program offerings; (5) provide a summary of proposed budgets, energy savings and cost effectiveness of proposed program offerings; (6) describe staffing needs to support the proposed programs; (7) present information on the impact of proposed programs on natural gas use per customer; (8) describe the regulatory mechanism for recovery of program costs.
29. On behalf of the Southern Connecticut Gas Company, Before the State of Connecticut Department of Public Utility Control, Docket No. 08-08-17, Filed January 20, 2009, Subject Matter: The purposes of this testimony were the following: (1) describe how the new Southern Connecticut Gas Company (SCG) energy efficiency programs will strengthen the partnership with customers through expanded communication and outreach, consistent with the state's policy encouraging energy efficiency; (2) present an overview of existing SCG energy efficiency programs; (3) present information on best practice natural gas energy efficiency programs in other States; (4) describe SCG's proposal to expand energy efficiency program offerings; (5) provide a summary of proposed budgets, energy savings and cost effectiveness of proposed program offerings; (6) describe staffing needs to support the proposed programs; (7) present information on the impact of proposed programs on natural gas use per customer; (8) describe the regulatory mechanism for recovery of program costs.
30. On Behalf of the Public Interest Advocacy Staff of the Georgia Public Service Commission, Docket Nos. 31081 & 31082, filed May 2010. Subject Matter: Reviewed energy efficiency and demand response

programs included in the 2010 Georgia Power Company Integrated Resource Plan and made recommendations for an enhanced portfolio of such programs. Also made recommendations relating to DSM cost recovery and financial incentives for the Company's shareholders.

Richard J. Hackner, P.E.

Principal and Region Manager



EDUCATION B.S., Mechanical Engineering, University of Wisconsin-Madison, 1982

EXPERIENCE

Rich joined GDS in December 2000 and is the Regional Manager for GDS's office in Madison, Wisconsin. He is working mainly on the Focus on Energy Business Programs Public Benefits Program for the Public Service Commission of Wisconsin. His current responsibilities include acting as Sector lead for the Agriculture and Rural Business Program of the Focus on Energy program. Rich has over 25 years experience in the energy efficiency field. Over the course of his career he has designed, implemented and evaluated numerous energy efficiency products and programs in the commercial, industrial and residential areas. He has acted as both contractor and contracting person on a wide variety of energy efficiency programs including research, technology demonstration, program delivery, and measurement and verification. He has written and responded to numerous Request For Proposals, chaired selection committees for many proposal review teams, and negotiated contracts and developed Memorandums of Understanding for jointly funded projects and programs. He has made numerous connections with State, regional and National organizations and individuals in the energy efficiency field. Further, he has continued to keep abreast of current energy efficiency trends, technologies, processes and policy through his active participation in trade associations such as the American Society of Heating, Refrigerating and Air conditioning Engineers (ASHRAE) and the Airconditioning Refrigeration Institute (ARI).

PREVIOUS WORK EXPERIENCE

Energy Center of Wisconsin, 1995–2000

Associate Director

- Responsible for supervising 6 direct reports and 7 additional indirect reports including project managers covering education, commercial, agriculture and residential areas; library; computer support; and publications.
- Directly responsible for preparing ECW's research and development agenda.
- Other responsibilities included fiscal year planning, contract review and negotiation, and maintaining member and participant relations.
- **Chair of ASHRAE Technical Committee 7.4, "Building Operation Dynamics."** This committee is concerned with the dynamic characteristics and interactions of comfort conditions, the active and passive components of HVAC systems, control systems, and building operation strategies. The committee is concerned with the methods of building system operation that minimize energy use and how to design HVAC systems that take dynamic and interactive characteristics into consideration. Term: 1998-2002
- **Chair of the Wisconsin Rural Energy Management Council.** An 18-member council established in 1999 by the Wisconsin Department of Agriculture, Trade and Consumer Protection to "promote safe, efficient, and cost-effective energy use in Wisconsin's rural communities." Term: 1999-present
- **Member of the Systems Integration Subcommittee for Air Conditioning and Refrigeration Institute 21-CR Program.** The Twenty-First Century Research (21-CR) initiative is a private-public sector research collaboration of the heating, ventilation, air-conditioning and refrigeration industry. Its mission is to identify, prioritize, and undertake pre-competitive research that focuses on decreasing energy consumption, increasing indoor environmental quality, and safeguarding the environment. Term: 1999-2002

Wisconsin Center for Demand-Side Research (now the Energy Center of Wisconsin), 1990–1995

Senior Program Manager

- Involved with HVAC technology evaluation, model and software development, product design, project management, data and model verification protocols, and data monitoring and analysis.
- Developed a library of commercial building load information, computer models, and monitored building data.
- Directed a multi-year, multi-utility evaluation of direct load control programs for residential air conditioners.
- Developed a systematic method to monitor ASD performance with respect to energy and power quality. The following products were developed: ASD Assessment Guide, Generic ASD Monitoring Plan, and Case Studies report.

The Fleming Group, 1984–1990

Project Manager and Field Office Manager

- Senior project manager responsible for numerous residential, commercial, and industrial technology demonstration and evaluation projects. Field office manager responsible for establishing a remote office, including staffing and administrative support structure.
- Performed computer modeling and simulation of heat pump, earth loop, and building load performance characteristics.
- Established and ran a field project office for the Wisconsin Electric commercial end-use metering project. This project entailed detailed end-use monitoring of more than 60 commercial buildings, including offices, retail establishments, restaurants, and grocery stores.

OTHER PROFESSIONAL ACTIVITIES

- Rural Energy Management Council, sponsored by the Wisconsin Department of Agriculture, Trade, and Consumer protection, Chairperson, 1999–present
- American Society of Heating, Refrigeration, and Air Conditioning Engineers: 1982–present
- Technical Committee (TC) 4.6, Building Operations Dynamics, Member, 1993–2002
- Research Subcommittee Chairman, 1993-1995, Vice-Chairperson, 1995–1998, Chairperson, 1998–2002
- Technical Committee (TC) 4.11, Smart Building Systems, Member, 1998-2002
- American Society of Mechanical Engineers, 1982–present
- Professional Engineer-State of Wisconsin (PE 25012)

PUBLICATIONS & PRESENTATIONS

Available upon request

Scott Albert

Principal and Northeast Region Manager



EDUCATION MBA, Business Administration, New Hampshire College, 1984
BS, Civil Engineering (Environmental Concentration), Northeastern University, 1981

PROFESSIONAL MEMBERSHIPS

- American Society of Civil Engineers (member Emerging Energy Technologies Committee)
- Association of Energy Engineers (Certified Cogeneration Professional)
- Association of Energy Service Professionals
- Northeast Energy and Commerce Association (Board Member)
- New England Sustainable Energy Association

EXPERIENCE

Mr. Albert has over thirty years of experience in the energy industry. In addition to his extensive experience at GDS in the areas of energy efficiency, renewable resources and distributed generation policy development, cost-effective analysis, program design, delivery and evaluation, he has worked in both supply and demand-side resource planning positions with Public Service Company of New Hampshire and the Boston Edison Company. Scott joined GDS Associates in February 1999 and leads the firm's northeast regional office located in Manchester, NH.

SPECIFIC EXPERIENCE INCLUDES

Energy Efficiency and Demand Response Policy Planning, Program Design, Delivery and Evaluation

- Performing baseline studies, market assessments and estimating market effects associated with energy efficiency products, services and market transformation programs in both the residential and commercial/industrial sectors
- Managing and directly assisting in the design, implementation, monitoring and evaluation of innovative new energy efficiency, market transformation and load reduction programs (including multiple smart grid pilot programs facets)
- Conducting benefit/cost analyses, identifying key inputs and developing innovative cost-effectiveness modeling functionality and assessment techniques
- Promoting key energy efficiency, demand response and market transformation policies for clients to both their internal and critical external stakeholders
- Managing employee and consultant teams, and interactions with multi-utility, non-utility and regulatory parties
- Coordinating internal development and external settlement negotiation activities, regulatory filing and approval of utility energy efficiency plans
- Developing and coordinating implementation of competitive solicitations for demand-side resources and energy conservation services

Energy Codes Assessment, Training and Standard Practices Determination

- Identifying barriers and developing strategies to ensure compliance with energy codes for state and local jurisdictions
- Determining current levels of new construction and renovation activities (and associated code compliance levels) by town, county and statewide
- Assessing code officials' awareness and utilization of building energy codes

- Interviewing building officials, architects, engineers, equipment suppliers, etc. to identify efficiency levels associated with "standard" construction activities
- Overseeing development and testing of training curriculum and builder field guides promoting utilization of energy efficient construction practices
- Coordinating and assisting with implementation of residential and commercial building energy code training workshops (including innovative in-the-field and specialty stakeholder trainings)

Integrated Resource Planning (IRP) and Supply-Side Resource Procurement

- Managing development, defense and implementation of IRP filings with regulators
- Organizing and actively participating in utility strategy development sessions and settlement meetings with intervenors on supply-side planning and procurement issues
- Developing resource plans and presenting both prefiled and direct testimony
- Coordinating involvement of expert witnesses and responding to information requests in areas including supply/demand planning, non-utility generation, flexible RFPs and options procurement innovations
- Managing consultants and staff in tracking and reporting on local, state, regional, national and international activities relating to electric industry issues
- Developing/implementing corporate strategies and building key alliances
- Preparing and presenting testimony in state and federal regulatory proceedings relating to integrated resource planning, industry restructuring, environmental policy and new supply and demand-side resource procurement activities, and representing utilities on energy policy issues in other key forums
- Managing utility activities associated with independent power producers including development and implementation of "options-type" RFPs and other resource solicitations
- Designing, negotiating and administering long-term power purchase contracts

Renewable Resources, Non-Utility Generation (NUG) and Customer Retention

- Assessing technical, economic and market potential of distributed generation/ renewable resources
- Developing and assisting with implementation of renewable resource portfolio standards
- Estimating reliable capacity from intermittent resources
- Managing utilities' involvement, from inception through completion, in independent power projects throughout New England (including: hydro, wind, wood, solar, landfill gas, and municipal solid waste)
- Developing long and short-term energy, capacity and price forecasts of power purchases
- Developing competitive solicitations for independent power generation resources
- Preparing and presenting testimony, press releases, speeches and statements relating to renewable energy issues in regulatory proceedings and other forums.
- Meeting with customers considering installation of cogeneration units, assessing project viability, and identifying cost-effective alternatives
- Financing and developing small hydroelectric power projects and other entrepreneurial ventures

EMPLOYMENT HISTORY

GDS Associates, Inc.	02/1999 to Present
Boston Edison Company	11/1990 to 02/1999
Public Service Company of NH	03/1981 to 10/1990

Joseph Danes, P.E.

Principal



EDUCATION: University of Illinois at Urbana-Champaign, BS Mechanical Engineering, 1992
University of Wisconsin-Madison, MS Mechanical Engineering, 1994
Heat Transfer and Thermodynamics

EXPERIENCE:

GDS Associates, Inc., June 2001 to Present

Principal

- Managing energy assessments and compressed air engineering studies for Xcel Energy commercial and industrial customers
- Completed studies for Department of Veterans Affairs medical centers in VISN 4, 11, 15, 16, 17 and 18, to determine baseline energy use and recommend improvements, including initial cogeneration and renewables analyses.
- Managing commercial and industrial facility surveys, preparing recommendation reports, and assisting customers in implementing recommended measures as part of the State of Wisconsin's Focus on Energy Program
- Worked on natural gas potential studies for Utah and Public Service New Mexico in 2003-2004.
- Provided program training and training on Wisconsin Administrative Code Chapter 63.
- Conducted true power metering and lighting status metering
- Worked on 2003 Connecticut Light and Power technical potential study
- Worked on 2002 program evaluation for Northeast Utilities' Municipal Buildings Program

Wisconsin Energy Conservation Corporation, November 1999 to June 2001

Project Manager

- Managed several projects aimed at reducing energy costs and improving safety and comfort for utility residential customers in Wisconsin
- Managed appliance and lighting program for new homes
- Provided training to homebuilders and residential customers on energy efficient shell and mechanical system design
- Oversaw contractors on direct installation programs
- Managed Madison Gas & Electric's efficiency program for multifamily housing

Energy Center of Wisconsin, May 1996 to October 1999

Project Engineer

- Responsible for planning, budgeting, managing, and tracking of several projects with the goal of saving energy for Wisconsin utility customers, including:
- Research studies of commercial and industrial products under development
- Conducted training for commercial and local government customers on Wisconsin Administrative Code Chapter 63
- Reference materials on heat recovery technologies
- Program to develop a repeatable approach for designing efficient commercial buildings
- Worked and interacted with teams and committees.
- Developed requests for proposals and worked with committees to select contractors.

American Electric Power Service Corporation, November 1994 to May 1996

Program Engineer

- Participated in several programs aimed at helping AEP customers use electricity more efficiently, including:
- Developing load profiles for national accounts to be used in profitability assessments
- Electric storage water heater technology study
- Evaluated potential of heat pumps in specific applications as part of financing program
- Worked on benefit/cost evaluations of established and emerging commercial/industrial electric technologies.

Fermi National Accelerator Laboratory, June 1989 to December 1991

Cooperative Education Student

- Developed strength and pressure testing protocol for components of cryogenic hydrogen targets.
- Designed a composite, low heat transfer support ring for use in liquid hydrogen and liquid helium lines.
- Sized pumps for liquid hydrogen and liquid helium systems.

SKILLS

- Proficient using Excel, Word, Access, Filemaker Pro, and MS Project.
- Experienced programming in Pascal and C++
- Experienced using BLAST, DOE-2, and Energy-10 building energy simulation software
- Experienced using Campbell dataloggers and software, Dent multi-phase power loggers and software, and Pacific Scientific lighting loggers and software.

PROFESSIONAL REGISTRATIONS AND MEMBERSHIPS

- Professional Engineer registration in Wisconsin
- Certified Measurement and Verification Professional (Association of Energy Engineers)
- Membership in ASHRAE

EDUCATION: Master of Business Administration, Georgia State University, 1990
Concentration: Finance and Decision Sciences
Bachelor of Business Administration, The University of Texas at Austin, 1978.
Concentration: Statistics and Operations Research

PROFESSIONAL MEMBERSHIP: American Statistical Association (ASA)

EXPERIENCE:

1986-Present GDS Associates, Inc.

GDS principal whose responsibilities include the direction of statistical services provided by GDS and supervision of supporting project staff. Areas of expertise include statistics and quantitative analysis. Specific applications include load forecasting, weather normalization, load research, simulation analysis, billing analysis, sample design, customer surveys and customer profiling. Technical skill areas of expertise include sampling, econometrics, end-use modeling, neural networks, and data mining.

In addition to work in the utility industry, Mr. Hutts has provided consulting services in the banking, retail, commercial real estate, hotel, manufacturing, recreation, professional sports, college athletics, and education industries.

1980-1986 Southern Engineering Company

Responsibilities included participation and project management of projects focusing on statistical applications, including load forecasts and consumer surveys.

Specific Project Experience Includes:

- ⦿ Designed, implemented and currently manages load forecasting systems for fourteen electric utilities in Texas. Forecasting systems provide long-term (15 year) and short-term (12-month) forecasts for resource and financial planning and are supported by a network of econometric and end-use models. Consumer attitude and appliance stock surveys are conducted every three years. Outputs of the system include load forecast reports, consumer surveys, oral/written testimony when required, and documentation to regulatory agencies.
- ⦿ Developed load forecasts for electric utility systems in Alabama, Alaska, Arkansas, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, Missouri, Nebraska, North Carolina, Ohio, South Carolina, Texas, and Virginia. Methodologies included econometric modeling, neural networks, end-use modeling, trending, and delphi techniques.
- ⦿ Developed the load forecasts for the Virginia State Energy Plan and the North Carolina State Energy Plan.
- ⦿ Performed load forecast evaluations (audits) for clients in Alabama, Colorado, Connecticut, Georgia, Illinois, Michigan, Oklahoma, Texas, British Columbia, Nova Scotia, and New Brunswick. Conducted detailed reviews and analysis of the existing forecasting systems, identifying key strengths and weaknesses, comparing practices to industry standards, recommending specific improvements to the forecasting process, assisting clients enhance or replace existing forecasting models, and making presentations to management.
- ⦿ Performed weather normalization analysis on behalf of clients during regulatory proceedings.
- ⦿ On behalf of the Georgia Public Service Commission Staff Adversary Team, conducted evaluations of load forecasts developed by Georgia Power Company and filed with the PSC in support of Integrated Resource Plans or Requests to Increase Retail Rates. Evaluations were performed in 1998, 2001, 2003, 2004, 2007 and 2008. Presented expert testimony as needed.

- ⑥ Developed and implemented an electric load forecasting system for the Public Service Authority of South Carolina. Short-term models were based on ARIMA techniques, and long-term models were developed using both econometric (SAS software) and end-use models (EPRI's REEPS model, Residential End-Use Energy Planning System). Project highlights included: (i) extensive data collection and development of the end use model, (ii) on-site industrial customer interviews, and (iii) development of probabilistic models to simulate alternative scenarios and to produce forecast outputs as probability distributions.
- ⑥ Managed residential consumer survey projects for utilities in Colorado, Georgia, Texas, South Carolina, and Alabama. Performed questionnaire design, identified population frame, designed sample, validated responses, tabulated results, and documented conclusions and methodology. Developed applications software to select stratified random sample (Dalenius/Hodges and optimum allocation), produce mailing labels, tabulate responses, and calculate confidence bands by stratum and by total sample.
- ⑥ Designed samples for surveys and on-site audits conducted in conjunction with conservation and energy efficiency studies conducted by GDS.
- ⑥ Presented expert testimony before the Michigan Public Service Commission on behalf of the state of Michigan, Office of the Attorney General. Testimony addressed the review, conclusions and recommendations regarding the load forecast presented by Consumers Power Company.
- ⑥ Presented expert testimony before the Public Utility Commission of Texas on behalf of Wood County Electric Cooperative. Testimony addressed the defense of load research results utilized in the cooperative's rate filing.
- ⑥ Designed day-ahead load forecasting systems for electric utilities in Kentucky, Texas, and Louisiana. The forecasting systems automatically update historical and forecasted weather data and generate hourly load projections for up to 168 hours. Forecasting models were based on neural network systems and transferred to the clients' computer systems.
- ⑥ Developed a probabilistic modeling system for an electric cooperative in Texas to simulate market conditions with respect to fuel charges incurred under a power supply contract. The system was developed using Crystal Ball software, incorporates Monte Carlo simulation techniques, and provides information used for natural gas price hedging analysis. The system provides the means of analyzing the uncertainty associated with monthly fuel expense due to natural gas price volatility.
- ⑥ Conducted load research for ten electric cooperatives in Texas. Project involved sample design, sample selection, translation of pulse data, computation of class CP and NCP estimates, and development of relationship between class NCP and kWh sales. Provided input for cost of service and rate design studies.
- ⑥ Currently manages ongoing consulting services to an Atlanta, Georgia based marketing services firm in applications regarding consumer research in the retail industry. Primary areas of service include project management, statistical issues and analytical expertise. Specific services provided include: definition of consumer market trade areas, development of survey questionnaires, implementation of data processing procedures, development of sampling methodology, interpretation of survey results, and preparation of final survey reports. Developed a process for merging economic/demographic data (sources: U.S. Census and Bureau of Economic Analysis) with survey data. Developed models used to estimate average consumer expenditure in response to influential characteristics, including: area of residence, average household income, age, and gender. Managed development of comprehensive database and series of industry benchmarks.
- ⑥ Provided consumer survey services to a Marietta, Georgia based consulting firm for a series of surveys administered to banking customers at branches located throughout the north Georgia area. Provided cross-tabulations of survey results, developed local demographic and economic profiles of households located in the branch areas, and created indexes as a means of comparing banking customers to the general population.

TRAINING SEMINARS CONDUCTED:

1. Load Forecasting Techniques: Georgia Public Service Commission Staff
2. Econometric Modeling using SAS: Public Service Authority of South Carolina
3. Customer Surveys in the Retail Industry: Morris & Fellows, Inc.

SOFTWARE EXPERTISE:

Statistical Analysis System (SAS),
Microsoft Office Products
MetrixND
EPRI Residential End-Use Energy Planning System (REEPS),
Energy 2020,
Micro TSP,
Lotus 1-2-3,
Crystal Ball
@Risk

FILED TESTIMONY:

Georgia Public Service Commission
Michigan Public Service Commission
Texas Public Utility Commission
Oklahoma Corporation Commission

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Timothy F. Clark, CEM

Managing Director



EDUCATION	Masters of Business Administration -- Thomas College	1995
	BS, Business Administration -- Thomas College	1988
PROFESSIONAL MEMBERSHIP	Association of Energy Engineers	
	Association of Energy Services Professionals	
PROFESSIONAL CERTIFICATIONS	Certified Energy Manager (CEM)	

KEY QUALIFICATIONS

Timothy Clark of GDS has 26 years of success in electric and gas utility customer service operations and energy efficiency program administration. He works out of the GDS office in Augusta, Maine. His experience includes energy efficiency program design, implementation and evaluation. While at GDS he has provided technical energy efficiency assistance to commercial and industrial customers and trade allies in the State of Wisconsin and to businesses in the State of Maine as well as other GDS clients. He worked closely with the Maine Public Utility Commission designing and implementing the Pilot Efficiency Maine Small Business Program. Mr. Clark also assisted Hoosier Energy with a baseline study, business program design and implementation training for their staff. Mr. Clark has also participated in numerous onsite survey baseline studies and phone surveys.

Mr. Clark current manages the technical contract with the Efficiency Maine Trust which provides support and updating of the effRT Database, Forward Capacity Market, Residential & Commercial Technical Resource Manuals, Efficiency Maine Annual Report, and the Trust's Cost Benefit Program Model. He is also the Field Staff Coordinator for the Efficiency Maine Business program.

PROFESSIONAL EXPERIENCE

GDS Associates, Inc., Atlanta, GA, 2000 to Present

Managing Director

In his capacity as a Managing Director he is providing technical assistance to several GDS clients on energy efficiency and marketing transformation issues. Mr. Clark current manages the technical contract with the Efficiency Maine Trust which provides support and updating to the effRT Database, Forward Capacity Market, Residential & Commercial Technical Resource Manuals, Efficiency Maine Annual Report, and the Trust's Cost Benefit Program Model. He also serves as the Field Staff Coordinator for the Efficiency Maine Business Program providing technical support to qualified partner and program participants. In the State of Wisconsin, his primary role was to build upon and enhance trade ally involvement in the State of Wisconsin's Focus on Energy Commercial and Industrial Programs. The Wisconsin Focus on Energy Programs are designed to accommodate market transformation of energy efficiency components in the Industrial and Commercial markets, through the use of mass media campaigns, direct mailings, and participant involvement in the EPA's Climate Wise (Industrial) and Energy Star® Buildings (Commercial) national energy efficiency programs.

CNEX - Winthrop, ME (Subsidiary of Central Maine Power Company), 1995 to 2000

Director of Energy Management Services

Mr. Clark provided training and assistance to utilities in Eastern Europe regarding energy management planning, demand-side management, credit and collection, and customer service. He also provided project management, consulting services, and deregulation project support to utilities in the United States. (See attached project list for more detail.) Mr. Clark worked with GDS Associates, Inc. on energy efficiency projects in Massachusetts, Rhode Island, Bulgaria and Lithuania.

Central Maine Power Company, Augusta, ME, 1990 to 1995

Commercial Energy Management Program Administrator

Mr. Clark was responsible for the administration, of Central Maine Power's commercial audit program. He served as project manager for the selection, development, and Company-wide installation of Saratoga Systems' Sales and Productivity System Software Package and was responsible for full implementation, training, and technical support of this product, He also provided administrative support to the Commercial Marketing Department as well as the Director of Commercial and Residential Marketing. Mr. Clark coordinated a variety of training sessions on DSM related topics including refrigeration, lighting, and new construction practices.

Residential Energy Management Program Administrator, 1987 to 1990

Mr. Clark was responsible for the administration and annual budget preparation of the Good Cents Home Program, Commercial and Residential Bundle-Up Program (water heater wrap program), and the Storage Heat Program. Administered eight Bundle-Up contractor agreements and prepared request for proposals. Monitored and maintained the quality assurance of contractors, evaluated RFP pricing parameters for appropriate and industry consistent pricing levels, and monitored the accuracy and timely payment of contractor invoices. Administration functions include developing marketing goals and objectives, the preparation and tracking of program budgets, and the day-to-day activities of program administrative clerks.

Energy Management Specialist, 1986 to 1987

Mr. Clark assisted in the administration of the Good Cents Home Program, Residential Audit Program, and the Storage Heat Program. Corresponded with customers in regard to product information, program inquires, and general utility questions.

Customer Service Advisor, 1985 to 1986

As a Commercial and Residential Customer Service Advisor Mr. Clark was responsible for contact with customers regarding rates, energy management programs, energy audits, and high bill complaints. He provided commercial customers with technical advice and recommendations on equipment maintenance, equipment replacement, and general operation adjustments to improve the overall efficiency of the business.

ADDITIONAL TRAINING & SKILLS

Total Quality Management, Team leader Training, Facilitator Training, Self Directed Work Teams, and Process Management for Facilitators

Thomas C. Londos

Managing Director



EDUCATION:

Manufacturing Engineering, National University

EXPERIENCE:

Mr. Thomas Londos of GDS, has 30 years of program/project management experience in energy management service delivery and evaluation for commercial, industrial, State and Government customers. Located in Ashburn, Virginia, Mr. Londos is currently supporting the Pennsylvania Public Utility Commission for EM&V oversight of the states Act 129 Energy Efficiency and Conservation Programs. As the Statewide Evaluation Contractor, Mr. Londos is working with the utilities and their EM&V contractors to annually update the existing Technical Resource Manual, develop and lead working groups for NTG analysis and TRC test development for the seven electric distribution companies in the state, as well as leading the review process for custom measure protocols developed by the utilities. Mr. Londos is also managing an EM&V program for the Maryland Energy Administration (MEA). In this capacity, Mr. Londos is working with GDS staff and subcontractors developing an EM&V Plan and Strategy for MEA, developing program specific EM&V plans that include: development of key research questions from both an impact and process evaluation perspective, program logic models, sample design, survey instrument design, impact evaluation M&V approach and utilization of MEA's existing IT infrastructure to track program results and progress.

SPECIFIC EXPERIENCE INCLUDES:

Program management

Program management and reporting responsibilities including project scheduling, staff allocation and budget management for Pennsylvania act 129 statewide EM&V and the Maryland energy administration primary EM&V activities

Policy support

For the Maryland energy administration supporting analysis of empower Maryland utility 2012-2014 program plan submittals and providing recommendations for program improvements to improve program effectiveness and increase participation to reach the 2015 goals set by the state

EM&V

Development of EM&V methodology for oversight and due diligence EM&V of electric distribution utility programs implemented under Pennsylvania act 129 legislative requirements that include residential and commercial/industrial energy efficiency and demand response programs. Direct oversight of demand response program evaluation activities and adherence to PJM rules

TRM development

Mr. Londos oversees the development of the statewide TRM for the state of Pennsylvania which includes residential, commercial and industrial measures. For the State of Maryland, Mr. Londos has developed a savings calculator for the Maryland Energy Administration that allows MEA staff and contractors to develop savings estimates based on the Mid-Atlantic TRM.

Potential studies

For the Maryland energy administration, currently completing the development of an achievable potential study to set natural gas savings targets in the state of Maryland

EMPLOYMENT HISTORY:

Science Applications International Corporation

1979-2007

Previously, as Manager of SAIC's energy consulting practice, grew and oversaw management of a \$12M energy consulting practice delivering energy services to state and local government, and commercial/industrial customers across the U.S. Mr. Londos was responsible for revenue growth and profit growth and overall business unit QA/QC. Oversaw personnel management (65 employees) in six locations across the U.S., developed performance review processes and created a matrix management approach for project delivery. Business practice areas developed and managed by Mr. Londos included energy efficiency program design and implementation and impact evaluation for utility clients and state government organizations.

Provided design and management oversight for the development of state energy programs in New York, Wisconsin and Oregon, including the assembly of the infrastructure and staffing of these offices. These programs delivered energy efficiency solutions to commercial industrial customers implementing retrofit and new construction programs at their facilities. These services include demand and supply side energy management consulting services that encompass commodity procurement, risk management and demand side energy efficiency improvements and demand reduction strategies.

For the Department of Energy's Office of Energy Efficiency and Renewable Energy, Mr. Londos completed a study of the status of Systems Engineering management practices currently in use within the eleven EERE programs. The study concluded that Systems Engineering is being practiced in varying levels of maturity within the programs. He further developed a policy document that set a course for consistent application of Systems Engineering management practices across its programs.

During the 2000-2002 California energy crisis, designed and implemented the successful utility 20/20 program that provided all residential, commercial and industrial customers in the state with a monetary incentive to reduce energy consumption. Worked closely with senior staff from the three Investor Owned Utilities in the state to implement and track the program. Through the California Energy Commission, Mr. Londos worked with State staff to evaluate generation resources available to the State on a daily basis and evaluated the availability of alternative resources to meet the energy needs of the state.

Led and managed a multifaceted team to evaluate and recommend energy infrastructure needs for southern California. The study determined generation and transmission capacity requirements for the region and also provided alternatives to these requirements which included renewable, demand management, and efficiency programs.

Robert L. Fratto

Managing Director



EDUCATION Executive Management Development Program, Northeastern University, 1986
 Masters of Business Administration, Suffolk University, 1979
 BS Industrial Engineering, Northeastern University, 1973
 Certified Energy Manager

EXPERIENCE & ACCOMPLISHMENTS

GDS Associates, Inc. – Marietta, GA

Managing Director – 5/03 to Present

Manage energy efficiency projects and provide energy efficiency consulting services, including market research and analysis, program design and implementation, and program evaluation to GDS clients. Current and past projects include:

- Assisting the Missouri Department of Natural Resources with review of utility Integrated Resource Plans, including DSM programs.
- Providing business program implementation services to the Maine Public Utilities Commission and the Efficiency Maine Trust.
- Leading an analysis of commercial sector electric and gas energy efficiency potential for the Michigan Department of Technology Management & Budget.
- Leading an analysis of natural gas energy efficiency potential in the commercial sector for the Maryland Energy Administration.
- Reviewed energy efficiency program plans submitted by the Connecticut electric utilities and provided analysis and recommendations to the Connecticut Energy Advisory Board regarding alternative financing mechanisms and program design features that can reduce program costs.
- Managed an energy efficiency and demand response potential study for transmission need areas in Central Maine Power Company's service territory.
- Conducted an analysis of commercial sector energy efficiency potential for South Mississippi Electric Power Association.
- Reviewed a proposed Energy Efficiency Utility Order of Appointment for The Vermont Department of Public Service and provided findings and recommendations regarding the length of the appointment and compensation mechanism.
- Conducted a natural gas energy efficiency potential study for GasNetworks, a collaborative of local natural gas companies serving customers throughout New England.
- Developed commercial energy efficiency measure characteristics and baseline data in support of an all fuels energy efficiency potential study conducted for the New Hampshire Public Utilities Commission.
- Managed a process evaluation of Bonneville Power Administration's Non-Wires Solution Initiative.
- Assisted a Public Housing Authority with preparation of a performance contracting RFP and selection of an Energy Services Company.
- Conducted primary marketing research to identify customer preferences for various energy efficiency incentives.

- Prepared a research report on the use of energy efficient electrical equipment in the small business market.

Progress Energy – Raleigh, NC

Senior Fundamental Market Analyst – 4/01 to 2/03

Conducted market analysis in support of wholesale power business development. This included identification of market opportunities and trends, competitor tracking, and customer targeting.

Regulatory Project Analyst – 8/99 to 4/01

Managed regulatory compliance activities, tracked and analyzed industry marketplace changes and recommended positioning strategies for operating companies.

The Cadmus Group, Durham, NC

Account Manager/Consultant – 12/98 to 6/99

Assisted local governments and educational institutions with planning and implementing energy efficiency projects in conjunction with the EPA's Energy Star Buildings Partnerships.

Carolina Power & Light Company, Raleigh, NC

Product Developer/Manager – 4/96 to 12/98

Developed and screened new product ideas, conducted market and financial analysis, prepared business plans and identified partnering strategies. Marketed, delivered and had P&L responsibility for products and services.

Demand Planning Director – 8/93 to 4/96

Directed demand-side planning activities, including assessment of market potential, analysis of program costs/benefits and preparation of demand reduction forecasts.

Commonwealth Electric Company, Wareham, MA

Senior Project Engineer – 6/92 to 4/93

Provided project management support for the engineering and planning departments.

Manager Program Administration – 6/91 to 6/92

Administered the delivery of energy efficiency services, including lighting, HVAC and building shell programs to both consumer and business markets.

Manager Market Planning & Research – 6/80 to 6/91

Managed a group that developed marketing plans for demand-side management programs, prepared demand forecasts, and provided regulatory support.

Senior Resource Planner – 8/74 to 6/80

Developed plans for power purchases and plant additions to meet customer demand.

PROFESSIONAL MEMBERSHIPS

Association of Energy Engineers
Association of Energy Services Professionals

EDUCATION Master of Arts in Anthropology, Minor in Statistics (GPA of 4.0)
University of Tennessee, 2004
Bachelor of Arts in Criminology & Anthropology (GPA of 3.8)
University of Florida, 2001

WORK EXPERIENCE

GDS Associates, Inc., October 2005 to Present – Marietta, Georgia
Project Manager

Jeffrey Huber, a project manager with GDS Associates, Inc., has extensive experience in DSM potentials assessment, program planning, cost-effectiveness, market research, and data analysis for electric and natural gas utilities. Mr. Huber has worked on DSM potential assessments for utilities all over the country. All of these studies have included measure characterization, cost-effectiveness screening, and various other data analysis tasks. Additionally, he has helped several utilities design energy-efficiency plans.

DSM POTENTIALS ASSESSMENT

Mr. Huber has managed assessments of DSM potential for state of Vermont, Hoosier Energy, and the South Mississippi Electric Power Association (SMEPA). He has also had the lead responsibility for completing residential sector energy efficiency potential studies for electric cooperatives in Texas, Arkansas, North Carolina and South Carolina. This involves overseeing and coordinating all project activities, including data collection, measure characterization, modeling, and developing estimates of technical, economic, and achievable potential. Mr. Huber is currently working on potential studies for the state of Michigan as well as the state of Maryland.

COST-EFFECTIVENESS ANALYSIS

Mr. Huber has assessed the cost-effectiveness of many DSM resources for a wide variety of clients. This includes assessment of measures, programs, and DSM portfolios for the both planning, reporting, and evaluation purposes. He assisted in the design of GDS Benefit-Cost Screening model, as well as many other Excel-based calculators for specialized analysis.

PROGRAM PLANNING AND DESIGN

Much of the analysis Mr. Huber performs feeds directly into utility planning efforts. This includes information on DSM resource costs, savings, and potential program participants. In addition to the work noted above, Mr. Huber has assisted utilities in developing estimates of program potential and DSM program portfolio plans. This included drafting recommended program designs, assisting product managers determine appropriate measures and rebate levels, performing cost-effectiveness analysis, and working utility program managers.

MARKET RESEARCH

Mr. Huber has developed on-site survey instruments and conducted on-site assessments for residential sector baseline studies in several states, including Maine, Indiana, and Mississippi. This also included data cleansing, data analysis, and drafting the final market assessment reports. In addition, Mr. Huber has also developed focus group interview guides for Efficiency Maine to assess successful practices and identify market barriers.

PROJECT MANAGEMENT

Mr. Huber has effectively managed several projects of varying scope and duration. These include:

Vermont Dept. of Public Service: Managed a team to assess the potential for energy efficiency throughout the state of Vermont. This included managing frequent internal and external communication to ensure tasks were completed efficiently and in accordance with Department's regulatory schedule.

SMEPA Residential Baseline Study: Managed a team to conduct on-site surveys to assess the saturation of baseline and efficient equipment in the residential sector. This included overview of scheduling, data collection, quality control, data input, and analysis.

GDS Benefit/Cost Screening Tool Update: Managed the internal update of the GDS Benefit/Cost Screening Tool that included several feature enhancements, calculation revisions, and methodology review.

TECHNICAL CERTIFICATIONS & QUALIFICATIONS

Jeffrey Huber is a Certified Energy Manager (CEM). He is experienced in conducting statistical analyses (frequency distributions, cross tabulations, multivariate analyses) and he is proficient in MS Office. Mr. Huber is also familiar with the REM/Rate and Wright Soft building modeling software.

EDUCATION Master of Science, Mechanical Engineering
Georgia Institute of Technology, 2008
Bachelor of Science, Mechanical Engineering
Columbia University, 2006

CERTIFICATIONS Certified Engineer in Training

EXPERIENCE SUMMARY

GDS Associates, Inc. **2008 – Present**
Project Engineer

- Assist in the evaluation and audit of Energy Efficiency and Demand Response Programs
- Assist in reviewing and analyzing Technical Potential Studies and testifying to the accuracy of the methods and assumptions used
- Assist with data collection, analysis, report writing and development of presentations
- Develop detailed economic analysis spreadsheets
- Conduct on-site energy audits and in-depth market research interviews
- Conduct building energy simulation modeling
- Develop market research questionnaires and plans for market research studies

Systems Realization Laboratory

Lab Manager

- Plan agendas and coordinate faculty and student presentation for weekly lab meetings
- Plan and implement lab team building activities

Franks Casing and Crew, Inc.

Design Intern

- Designed a four-line pneumatic quick disconnect for production and immediate use
- Assisted in safety-driven retro-fit project regarding the Rotating Spiders, a device used to hold pipes steady while connecting pipes and feeding lines down hole
- Designed a lock gearshift for control systems

Introduction to Fluids

Grader

- Held weekly office hours to answer to fluid related questions for undergraduates
- Graded problem sets and exams

Material Science

Lab Assistant

- Assisted graduate students in material science research
- Explored the relationship between Hexamethylenetetramine (HMT) and particle growth, specifically Cerium Oxide and Copper Oxide nano-particles.

National Science Foundation Research Experience for Undergraduates Columbia University Material Research Science and Engineering Center

- Explored the relationship between HMT and its breakdown in solution to Ammonia and Formaldehyde and the formation of Zinc Oxide nano-particles
- Created Zinc Oxide nano-particles and studied their size and shape
- Presented research and findings to peers and professionals

EDUCATION

M.Sc. Renewable Energy, Murdoch University, (In progress)
B.S. Environmental Engineering, N.C. State University, May 2009
B.S.E.S. Environmental Economics & Management, University of Georgia, May 2006

PROFESSIONAL MEMBERSHIPS

Association of Energy Engineers
Association of Energy Services Professionals

PROFESSIONAL CERTIFICATIONS

Engineer in Training
Energy Manager in Training

KEY QUALIFICATIONS

Mr. Hiron has more than 4 years of experience as a consultant in the fields of energy and engineering. He joined GDS in early 2012, and works out of the Marietta, GA office. While at GDS he has worked on projects focusing on several different facets of energy efficiency. He has worked on energy efficiency potential studies for clients in Pennsylvania, Maine, Maryland, and North Carolina. He has provided consulting services to the North Carolina Utilities Commission (NCUC), serving as the lead consultant reviewing the evaluation, measurement and verification (EM&V) reports submitted by the electricity utilities to the NCUC as part of their application for cost recovery in various electricity rate case proceedings. He has helped prepare affidavits and testimony on behalf of the NCUC in these proceedings. He has also served as a consultant in natural gas rate case proceedings on behalf of attorneys representing various municipalities in the state of Texas, and helped draft testimony critiquing the energy efficiency programs proposed by one of the gas utilities. He has also served on a team of advisors to help the Office of Consumer Counsel (CT) represent the state's utility customers in matters of energy efficiency related endeavors.

Mr. Hiron previously worked as an engineer for more than 2 years at Brown and Caldwell, an environmental consulting company, out of the Virginia Beach office. This role focused on conducting an investigation of the sanitary sewer infrastructure of the City of Virginia Beach. While completing his degree in Environmental Engineering from N.C. State University, Mr. Hiron worked part-time for Southern Energy Management for the Building Science team. This role contributed to the EnergyStar certification of several hundred homes in the state of North Carolina.

PROFESSIONAL EXPERIENCE

GDS Associates, Inc., Marietta, GA
Engineer

In his current role with GDS, Mr. Hiron performs the following tasks as they relate to performing potential studies and advising clients in EM&V related matters:

- Collects data on the costs, savings, useful lives and saturation of energy efficiency and demand response measures.
- Estimates energy efficiency and demand response potential in various regions of North America.
- Conducts benefit/cost analysis of energy efficiency and demand response measures and programs.
- Conducts statistical analysis of data.

- Conducts economic feasibility studies of energy efficiency and demand response measures and programs.
- Develops and reviews engineering estimates of energy savings for energy efficiency and demand response measures and programs.
- Reviews utility EM&V reports and prepares data requests in an effort to require the utilities show sufficient evidence of reported savings in cost recovery proceedings
- Drafts recommendations for clients to use in affidavits and testimony in cost recovery proceedings in order to help make cost-effective improvements to EM&V efforts
- Reviews EM&V plans for future programs to advise clients on the adequacy of the plans
- Manages several projects and serves as primary contact with one of his clients

Brown and Caldwell, Virginia Beach, VA

Engineer II – Business Consulting practice

Mr. Hiron worked with multiple contractors and the City of Virginia Beach Department of Public Utilities (DPU) to complete an investigation of the City’s sanitary sewer infrastructure. The job required supervising contractor fieldwork activities, analyzing fieldwork data, compiling data and generating condition assessment reports. He also worked on a project to re-write the City’s DPU design standards manual, and led an investigation into the stormwater infrastructure serving a portion of the Ft. Eustis military base in Newport News, VA.

Southern Energy Management, Morrisville, NC

Building Science Plan Review Analyst

Mr. Hiron worked on residential energy savings efforts by helping builders construct homes that earned Energy Star certification. His duties included conducting plan reviews by analyzing construction design drawings and entering the results of the analysis along with builder supplied specifications into the REM/Rate software program to estimate the energy efficiency of new homes. Mr. Hiron consulted with builders to help them make decisions regarding cost effective upgrades in energy efficiency.

United States Department of Agriculture-Agricultural Research Service, Raleigh, NC

Biological Science Aide

Mr. Hiron provided support to the plant physiologist in charge of completing tasks associated with conducting air quality experiments designed to investigate the effects of carbon dioxide and ozone on crop yield.

EDUCATION Bachelor of Science in Science, Technology and Culture Graduated May 2010
Georgia Institute of Technology, Atlanta, Georgia

EXPERIENCE

Analyst

GDS Associates, Inc., Marietta, GA, 2008 – Present

- Assists a variety of clients with projects involving energy efficiency planning, program implementation and evaluation.
- Provides research and data tracking for Market Research and Technical Potential Studies
- Responsible for program evaluation for residential programs in both Pennsylvania and Maryland
- Contributed to the revised 2010 Pennsylvania Technical Reference Manual by authoring sections and protocols for several residential programs

Summer Intern

GDS Associates, Inc., Marietta, GA, 2008 – 2010

- Responsible for using tables and models to generate savings data on various energy efficiency programs.
- Responsible for assisting with research and reporting of energy efficiency programs.
- Responsible for assisting company executives with various projects and reports

Summer Intern/ Junior Sales Representative

The Boaz Group, Alpharetta, GA, Summer, 2007

- Assisted with analysis of client's credit card statements.
- Responsible for assisting with client relations through telesales and instructions on how to implement new systems.

EDUCATION Bachelor of Science, Computer Information Systems
Kennesaw State University, 2008

SKILLS Platform Proficiency: Windows 7, XP, and Windows Server 2003

Software Proficiency: Microsoft: Office, Visio, Project, FrontPage; Oracle (Express, 10g)

Visual Studio: 6, 2005, 2008, 2010; SQL Uniform, UltraVNC, TortoiseSVN, Bugzilla, NetBeans, JGRASP, Dreamweaver, Photoshop

Language Proficiency: ASP.NET, VB.NET, VB, Java, JavaScript, ANSI C, SQL, HTML, XML, CSS, UML

WORK EXPERIENCE

GDS Associates, Inc., March, 2011 – Present

Programmer/Analyst

- Responsible for the development and testing of energy efficiency tracking and reporting software.
- Provided several customized enhancements to the energy efficiency tracking systems for the states of Maine, Illinois, and Massachusetts.
- Developed a search tool to allow users to find contractors and suppliers relative to a specified zip code.

Elsym Consulting, Inc., February, 2009 – March, 2011

Programmer/Analyst (ICS Specialist)

- Responsible for the development, testing, implementation, and support of financial software that audits the activity of multiple state lotteries as well as authorized retailers in a real-time production environment.
- Provided continuous support for the test and production environments of VA, NC, SD, WA, & USVI.
- Worked closely with customers of varying technical backgrounds at each state lottery to troubleshoot production issues, document new functional requirements, and assist in their testing efforts.
- Maintained 59 programs written in C, a GUI written in VB, all powered by an Oracle 10g DB.
- Assisted with on site server installations in Virginia and North Carolina.
- Responsible for analyzing a pre-existing code base and understanding its relationship to each state lottery's financial activity for the purposes of debugging, modifications, and development of new functionality.
- Directly responsible for the development, testing, implementation, and subsequent support of 7 major and 25 minor software releases.
- Accountable for the completion of multiple tasks before their respective deadlines.
- Followed company defined ISO 9001 process flows to ensure quality software, useful documentation, and accurate version control.

Kaytie D. Ruditys

Executive Assistant



EDUCATION

Bachelor of Science in Management, December 2006
Shorter College, Atlanta, Georgia

EXPERIENCE

Ms. Ruditys is an Executive Assistant at GDS. She has a Bachelor's degree in Business Management from Shorter College and has over twelve years of experience in the administrative field. At GDS, Ms. Ruditys offers data collection, data analysis, proposal development and administrative support to engineers, consultants and executives of GDS.

GDS Associates, Inc., Marietta, GA, 2008-Present

Executive Assistant

- Responsible for assisting with design and implementation of energy efficiency programs.
- Responsible for assisting company executives with various projects and reports.
- Responsible for composing and editing text for various projects.
- Assists engineers, consultants and executives with administrative functions.

Moore Investment Group, Inc., Atlanta, GA, 2003-2007

Office Manager/Executive Assistant

- Responsible for assisting company executives with various projects and reports.
- Responsible for all administrative duties.
- Managed accounts with duties including general ledger reconciliations, bank reconciliations and accounts payable.
- Managed office staff and office operations.

Chattahoochee National Bank, Alpharetta, GA, 1999-2003

Operations Specialist

- Responsible for assisting company executives with various projects and reports.
- Managed accounts with duties including general ledger reconciliations, bank reconciliations and accounts payable.
- Trained new staff on accounting software and bank operations.

Melissa Young

Engineering Assistant/Co-op Student



EDUCATION Bachelor of Science in Science in Mechanical Engineering
Georgia Institute of Technology, Atlanta, Georgia
Graduation Date: 5/2015

EXPERIENCE

Engineering Assistant/Co-op Student

GDS Associates, Inc., Marietta, GA, 2012 – Present

- Responsible for using tables and models to generate savings data on various energy efficiency programs.
- Responsible for assisting with research and reporting of energy efficiency programs.
- Responsible for assisting company executives with various projects and reports.
- Worked on Statewide Evaluator Residential Potential Study for the state of Pennsylvania. Calculated energy efficiency saturation figures for each utility by extracting data from individual surveys and analyzing those numbers to calculate statistics for individual measure saturations.

Full-Time Student

Georgia Institute of Technology, Atlanta, GA, 2010 – Present

Sales Associate

The Gift Loft of Evans, Evans, GA, 2007 – 2011

- Cashier, took inventory, restocking, personal shopping, organized/cleaned, and gift wrapped.

SKILLS

- Microsoft Office Suite- Excel, Word, PowerPoint, Publisher, Access
- SolidWorks
- Autodesk Inventor
- ArchiCAD
- AutoCAD
- MATLAB
- Basic Photoshop

Marty Alcala

Engineering Assistant/Co-op Student

EDUCATION

Bachelor of Science in Electrical Engineering and Economics
The Georgia Institute of Technology, Atlanta, Georgia
Expected Graduation 2014

EXPERIENCE

Engineering Assistant/Co-op Student

GDS Associates, Inc., Marietta, GA, 2012 to Present

- Responsible for using tables and models to generate savings data on various energy efficiency programs
- Responsible for assisting with research and reporting of energy efficiency programs
- Responsible for assisting company executives with various projects and reports

Mechanical Engineering Co-op

Onity, May 2011

- Performed Root-Cause Analysis to determine why certain locks were failing prematurely
- Designed effective, low-cost solutions to prevent future failures by utilizing SolidEdge 3d modeling software
- Improved the design of an existing component to increase product life, which was in the final stages of testing before being placed in production at time of leave

Alcala Change Consulting, July 2009

- Secured domain name and established client account
- Designed layout, navigation, and general look and feel
- Worked with client to develop and refine website content
- Designed interactive flash carousel animation to display client services
- Developed "Quick Connect" contact functionality to facilitate convenient communication with site users

EuroShip, October 2008

- Developed business concept for connecting European consumers to U.S. products
- Secured domain name and established hosting account
- Designed layout, navigation, and general look and feel; Developed all web content
- Utilized PHP to generate dynamic web content from secure MySQL database
- Developed user account system to keep track of member information
- Developed secure checkout system enabling online credit card and PayPal transactions

SKILLS

- Website Design and Development
- Dreamweaver, Flash, Photoshop, AutoCAD, Inventor, SolidEdge, Matlab, Microsoft Office
- C, HTML, CSS, PHP, SQL, Javascript

Salil Gogte, LEED AP

Principal



Salil Gogte is Principal and Director of Nexant's Planning & Evaluation (NPE) business practice and is located in the Philadelphia (Malvern), Pennsylvania office. His expertise includes DSM policy planning, program design, assessing market potential, market research and characterization, and providing evaluation, measurement & verification (M&V) services. Salil directs and oversees project activities for multi-sector evaluation contracts and provides key staff leadership and mentoring to a team of over 25 engineers and analysts in the NPE business practice. Salil is an active contributing member of the Efficiency Valuation Organization's IPMVP Technical Committee and is responsible for developing and reviewing M&V methodologies and protocols.

Areas of Expertise

- **Program Evaluation, Measurement & Verification:** Setting evaluation objectives, defining baseline scenarios, statistical sampling and probability analysis, metering studies, calculating energy and demand savings, quality assurance, gross billing analyses, deemed savings estimation, emissions analyses, statistical forecasting, attribution and benefit-cost analyses.
- **Market Potential Assessments:** Assessing the available potential for energy efficiency, demand response, distributed generation, and renewable energy sources, including: expertise in measure development; cost-effectiveness; primary market research; customer billing analysis; and estimating technical, economic, and achievable potentials. Complementary efforts include Integrated Resource Planning (IRP) support, baseline end-use disaggregation and on-site market research studies.
- **Market Characterization Studies:** Conducting research activities to understand technical and qualitative characteristics of a specific or broad market. Activities include on-site inspections, logistics coordination, customer telephone surveys and market actor interviews.
- **Conservation Planning and Program Design:** Designing, implementing, marketing, and managing DSM programs focused on electric and gas energy efficiency measures. Developing program materials, manuals, and M&V protocols. Ensuring compliance with energy program rules; working directly with service providers and customers on projects; advising contractors on savings estimates; providing technical advice to service providers.
- **Building Energy Analysis and Quality Control:** Performing energy audits and retro commissioning studies in commercial and industrial facilities to identify both control- and capital-based energy efficiency measures. Mentoring staff engineers in auditing processes and providing quality review of audit reports. Utilizing computer modeling for new and existing buildings to conduct life-cycle costs analysis of energy conservation measures.

Education and Licensing

MS, Mechanical Engineering,
University of New Mexico, NM

BE, Mechanical Engineering,
University of Pune, India

LEED Accredited Professional

Work History

Nexant Planning & Evaluation LLC:
Malvern, PA
Principal, NPE Director
(2010-Present)

Nexant, Inc.: White Plains, NY
Sr. Project Manager (2006-2010)

ACR Engineering Inc.: Austin, TX
Mechanical Engineer (2005-2006)

Affiliations

Efficiency Valuation Organization
IPMVP Technical Committee

Association of Energy
Service Professionals (AESP)

Association of Energy Engineers
(AEE)

American Society of Heating
Refrigerating and Air Conditioning
Engineers (ASHRAE)

- **Design and Engineering:** Designing and analyzing HVAC mechanical and control systems, process pumping systems and refrigeration systems to optimize system efficiency, code compliance verification, evaluating load management technologies; auditing buildings; performing building energy simulations (DOE2/eQUEST, Carrier HAP, Trane 700), specifying lighting retrofits; reviewing metering and verification plans and load monitoring.

Representative Project Experience

Pennsylvania Public Utilities Commission - PA Act 129 Statewide Evaluator - Evaluation of Pennsylvania Electric Distribution Companies' Energy Efficiency and Conservation Programs (2011-PRESENT)

Salil is the Principal in Charge of NPE's Statewide Evaluation contract with the Pennsylvania Public Utilities Commission to develop policy and technical guidelines and verify the energy savings and peak demand reduction claims made by seven large electric distribution companies for the Act 129 DSM portfolio. He co-chairs the Act 129 Program Evaluation Group, tasked with updating the PA Technical Reference Manual, conducting market potential assessments and market characterization studies, and managing collaborative discussions on numerous topics including demand response, hours of use studies, statistical methods for savings verification, PJM resource offerings and annual reporting.

Wisconsin Public Service Commission - Impact Evaluation of Focus on Energy Portfolio (2012-PRESENT)

Salil is the Principal in Charge of multi-sector evaluations of the Focus on Energy program conducted by NPE for the Wisconsin Public Service Commission. Salil is responsible for all key deliverables and staff activities. He provided leadership and authorized key sections of the Strategic and Program Specific long-term evaluation plans developed by the NPE team. The evaluation spans all market sectors and energy efficiency measure types, both custom and prescriptive in nature. The project involves developing statistical sampling algorithms, reviewing M&V methods, performing on-site inspections, and calculating gross and net impacts.

Ontario Power Authority - Cross Cutting Evaluation of Business Incentive Programs (2008-PRESENT)

Salil is the Principal in Charge of NPE's multi-year EM&V contracts with the Ontario Power Authority to conduct an impact and process assessment of the Business Incentive, Small Business Lighting and Consumer Products programs. The programs include large commercial custom and prescriptive, small commercial lighting, and upstream residential buy down rebates. The evaluations involve developing statistical sampling algorithms, developing M&V plans, on-site inspections, metering studies, and calculating gross and net impacts.

Georgia Power Company - Evaluation of 2011 Certified DSM Programs (2011-PRESENT)

Salil serves as a technical advisor for Georgia Power Company's evaluation of seven certified programs, including residential water heating, residential home energy improvement, residential high efficiency new homes, residential lighting and appliance, residential refrigerator recycling, commercial prescriptive and commercial custom programs. The evaluation project includes the formation of key program questions, planning, stakeholder interviews, customer surveys, on-site inspections, measurement of key measure parameters and cost-effectiveness analysis. Evaluation key questions, plans and cost-effectiveness procedures are developed considering input from stakeholder groups, including the Georgia Public Service Commission.

Delaware Department of Natural Resources and Environmental Control - EM&V of Delaware Energy Efficiency and Demand Response Programs (2011-PRESENT)

Salil is the Principal in Charge of NPE's contract with the Delaware Department of Natural Resources and Environmental Control (DNREC) to conduct an independent evaluation of programs administered by the Delaware Sustainable Energy Utility, Delmarva Power Company and Delaware municipals and electric cooperatives. The evaluation includes performing over 200 site inspections, many of which require the deployment of end-use metering equipment. Numerous analytic techniques are used to calculate ex post impacts for a wide range of lighting, HVAC, motor, drives and custom measures offered in commercial, industrial, residential and institutional segments. Evaluation techniques include building simulation and modeling, retrofit isolation engineering calculations and billing analysis.

Public Service Electric & Gas Company - M&V Plans (2011-2012)

Salil worked as a Technical Advisor for the effort to create measurement & verification plans for all of Public Service Electric & Gas Company's (PSE&G) commercial DSM programs outside the New Jersey Clean Energy Program. The plans were drawn within the framework of PJM Interconnection's capacity bidding requirements, and committed PSE&G to deliver over 10MW of capacity to the grid. The plans were ultimately accepted without modification by PJM, leading to a future payment of over \$1 million to PSE&G.

Connecticut Energy Conservation Management Board - Home Energy Solutions Program Evaluation (2009-2011)

Salil managed NPE's EM&V contract with the Connecticut Energy Conservation Management Board (ECMB) to conduct an impact and process assessment of the Home Energy Solutions program administered by Northeast Utilities and United Illuminating. Tasks included calculating gross achieved energy and demand savings, updating prescriptive measure assumptions in the Program Savings Document (PSD), conducting comprehensiveness studies, attribution studies and providing regulatory support.

Ohio Energy Efficiency and Conservation Block Grant - Applicant Eligibility Reviews (2009-2010)

Salil was the Principal in Charge of the NPE team reviewing applicant eligibility for funding under Ohio's SEP and EECBG programs and authored an in-depth review of two large-impact cogeneration and waste water treatment projects. He delivered NPE's final presentation and report recommending funding amounts to the Ohio SEP and EECBG administrators and their stakeholders.

New York State Energy Research and Development Authority - New York Energy \$Mart Program Evaluation (2006-2009)

As a team leader of the New York State Energy Research and Development Authority's (NYSERDA) M&V team, Salil reviewed savings calculation methods and results for the New York Energy \$mart program portfolio. Activities included conducting field inspections to verify equipment installation, taking power and flow measurements to support engineering savings calculations, monitoring energy use, and reviewing energy savings calculation algorithms.

Con Edison of New York - Evaluation of System-Wide Demand Reduction Program (2007-2010)

Salil managed a team of engineers providing measurement & verification, market assessment and causality and cost-effectiveness study services to the Con-Edison (NYSERDA) System-Wide Demand Reduction program. The team's evaluation results were used to file lost revenue claims by Con-Edison to the New York Public Service Commission. Salil coordinated all day-to-day activities with the evaluation team members, subcontractors, and NYSEDA project managers. Tasks included overall project management, field inspections, reviewing energy savings calculations, developing load shapes, conducting customer interviews, conducting time of use analysis and designing statistical sampling techniques.

Con Edison of New York - Gas Efficiency Program Evaluation (2007-2009)

Salil designed and executed the M&V review of the Con-Edison (NYSERDA) Gas Efficiency program regulated by the New York Public Service Commission. The project involved performing site visits, verifying the stated equipment was installed and operational, calculating gross and net program savings and developing a gas measures deemed savings database.

Con Edison of New York - Distributed Load Reduction Program Process Evaluation (2007)

As a team leader of the evaluation team, Salil conducted a process evaluation of the Con Edison Distributed Load Relief Program (DLRP). The project involved developing and administering surveys to participants, non-participants and demand response aggregators to conduct a market assessment and make recommendations to improve process efficiency. The project also included a best practices study to compare best practice programs and identify gaps and shortcomings in the DLRP logic model.

Representative Publications

Gang Tan, Salil Gogte, Dakers Gowans, Cherie Gregoire, "Application of Risk Analysis to Evaluating M&V Requirements for Energy Efficiency Programs", International Conference for Enhanced Building Operations (ICEBO) 2007, San Francisco, USA.

Irwin Kim, PE, CMVP, LEED AP

Project Manager



Irwin Kim is a Project Manager with Nexant Planning & Evaluation, LLC (NPE) with five years of energy consulting and engineering experience, and is located in the Atlanta, Georgia office. His expertise includes; creating evaluation frameworks for utilities and government agencies; developing uniform measure savings protocols; performing measurement & verification; and designing HVAC systems. Irwin lead audit activities for all non-residential programs, and managed the TRM updates for the Pennsylvania Public Utility Commission. He has also managed impact evaluation projects for clients such as the Wisconsin Public Service Commission, the Pennsylvania Public Utility Commission, Georgia Power Company, the Maryland Energy Administration and the New York State Energy Research and Development Authority. Irwin received his Bachelor's degree in Mechanical Engineering from Columbia University in New York. He is a Professional Engineer licensed in the state of Georgia, Certified Measurement and Verification Professional, and a LEED Accredited Professional.

Education and Licensing

BS Mechanical Engineering,
Columbia University, NY

Professional Engineer (PE)
GA - 037593

Work History

Nexant Planning & Evaluation, LLC:
Atlanta, GA

Project Manager (2009-Present)

Cosentini Associates, New York, NY
Mechanical Engineer (2007-2009)

Affiliations

American Society of Heating,
Refrigeration and Air-Conditioning
Engineers (ASHRAE)

American Society of Mechanical

Areas of Expertise

- **Evaluation Frameworks:** Planning evaluations for utilities and government agencies, setting impact evaluation goals, developing cost-effective evaluation strategies within regulatory and utility context, designing overarching sampling strategies.
- **Uniform Measure Savings:** Developing standardized savings estimates and algorithms, developing protocols for calculating energy and demand savings, researching measure operating assumptions, assembling technical reference manuals.
- **Measurement & Verification:** Developing measurement & verification plans, conducting on-site inspections, analyzing energy consumption patterns and savings.
- **HVAC Design:** Designing and analyzing HVAC and mechanical systems, calculating heating and cooling loads, specifying central plant equipment, designing distribution systems, performing building energy simulations (DOE2/eQUEST, Trane 700).

Representative Project Experience

Pennsylvania Public Utilities Commission - PA Act 129 Statewide Evaluator - Evaluation of Pennsylvania Electric Distribution Companies' Energy Efficiency and Conservation Programs (2011-PRESENT)

As part of the Statewide Evaluation team, Irwin provides day-to-day management and engineering support to the Pennsylvania Public Utilities Commission to audit verifiable energy savings and peak demand reduction across the state for seven electric distribution companies (EDCs). Irwin has authored numerous white papers, policy papers and memos advising EDCs on topics such as demand response, sampling guidelines and custom measure M&V guidelines. He has extensive experience developing, analyzing, and reviewing savings protocols for prescriptive and custom measures. He has chaired

Pennsylvania Program Evaluation Group meetings tasked with updating the Pennsylvania Technical Reference Manual M&V protocols, with a focus on lighting, motors and VFDs, and HVAC measures in the non-residential sector.

Wisconsin Public Service Commission - Impact Evaluation of Focus on Energy Portfolio (2011-PRESENT)

Irwin manages and leads the Wisconsin Focus on Energy impact evaluation team for the Targeted Markets portfolio, which includes the Business Incentive Program, Large Energy Users Program, Chain Stores and Franchises Program, Small Business Program, Retro-commissioning Program, and New Construction Program. He is developing strategic evaluation plans to direct portfolio level activities as well as program specific evaluation plans. He also leads the impact evaluation activities for HVAC and process measures as part of the 2011 evaluation of legacy programs.

Maryland Energy Administration - ARRA Impact Evaluation (2010-PRESENT)

Irwin manages and leads the Commercial and Industrial Impact Evaluation of several Maryland Energy Administration (MEA) programs to verify energy and demand impacts attributable to each program and identify areas of improvement. The MEA portfolio includes the Multifamily Energy Efficiency and Home Affordability Program, Farm Audit Program, Sunburst Program, Residential Renewable Program, State Agency Loan Program and Energy Efficiency and Conservation Block Grant Program, which span a variety of measures including prescriptive measures such as refrigerators, to custom measures such as process equipment for farms, to renewable technology such as solar PV systems up to 900 kW in capacity. Irwin developed the impact evaluation plans, designed the sample selection for each program, developed savings protocols, created inspection checklists, survey forms and reporting templates, conducted desk reviews and on-site inspections of participants, and calculated energy impacts.

Georgia Power Company - Evaluation of 2011 Certified DSM Programs (2011-PRESENT)

Irwin leads impact evaluation activities for Georgia Power Company's prescriptive and custom energy efficiency programs. His responsibilities included interfacing with utility staff and the implementation team, reviewing program databases, designing the evaluation sample, and coordinating on-site activities.

Santee Cooper - Program Design & Development for Commercial & Industrial Programs (2009-2010)

Irwin developed the preliminary program plan for Santee Cooper's Commercial and Industrial sector, including the Commercial Prescriptive Program, Commercial Custom Program, Retro-Commissioning Program, Small Commercial Direct Install Program, and Commercial New Construction Program. He also established eligibility requirements and basic incentive structures for each program.

New York State Energy Research and Development Authority - Existing Facilities Program (2009-2010)

Irwin provided technical support for the New York State Energy Research and Development Authority's (NYSERDA) Existing Facilities Program (EFP), a performance-based state-wide program in New York. He reviewed and approved project savings reports and M&V plans. Irwin also performed pre- and post-installation inspections, worked directly with the ESCOs and customers to confirm and approve savings, and provided technical advice to clients on metering and verification plans.

Ohio Energy Efficiency and Conservation Block Grant - Applicant Eligibility Reviews (2009-2010)

Irwin performed feasibility studies reviewing applicant eligibility for funding under Ohio's Energy Efficiency and Conservation Block Grant and authored an in-depth review of two large-impact projects at Ohio's request. He also assisted in preparing the final presentation and writing the final report recommending funding amounts based on engineering judgment for 30 large projects.

Jesse Smith

Senior Project Analyst



Jesse Smith is a Senior Project Analyst with Nexant Planning & Evaluation, LLC (NPE) with over three years of experience delivering energy consulting services and managing the measurement & verification of demand response and energy efficiency programs. His expertise includes; statistical analysis of demand response programs, regression modeling, database architecture, estimating demand and energy savings, and metering technology. During Phase 1 of Act 129, Jesse developed a white paper and guidance memos on statistical testing and reporting and performed audits of EDC verified savings estimates and benefit cost ratios. He was also the primary contributor to the SWE Demand Response Study where he developed a survey instrument and scoring methodology that will be used to assess overlapping participation between Act 129 load curtailment programs and the load curtailment programs offered by PJM. Prior to joining NPE, Jesse worked as a load research analyst for GoodCents Solutions where he performed statistical analyses of the energy and demand savings of a number of direct load control and energy efficiency projects for client utilities. He received a Bachelor's of Science degree in Psychology from the University of North Carolina at Chapel Hill and a Master's of Science degree in Applied Statistics from Kennesaw State University. Jesse holds a Base SAS programming certification and a Six Sigma Green Belt certification from the American Society for Quality.

Education

MS, Applied Statistics,
Kennesaw State University, GA

BS, Psychology and Chemistry,
University of North Carolina at
Chapel Hill, NC

Work History

Nexant, Inc.: Malvern, PA
Sr. Project Analyst (2011-Present)

GoodCents Solutions Inc.:
Atlanta, GA
Load Research Analyst (2010-2011)

Areas of Expertise

- **Demand Response, Measurement & Verification:** Designing sampling and metering plans to assess demand reduction produced using a variety of commercial & residential curtailment techniques including critical peak pricing (CPP), air conditioning and water heater cycling and programmable communicating thermostats (PCTs). Using regression models to create time-temperature matrices of expected demand reductions during curtailment and demand increase following curtailment events. Evaluating the cost-effectiveness of securing demand response and load curtailment resources as an alternative resource to generation in forward capacity planning.
- **Commercial Energy Audits:** Creating audits to be completed by CEMs and database architecture of the information collected. Development of summary reports of major loads by site/building type. Assessment of the commercial saturation of incumbent and more efficient technologies.
- **Savings Estimates Through Billing Analysis:** Quantifying energy savings produced by energy efficiency measures through billing analysis. Separating billed energy into baseline and weather dependent loads. Comparing weather dependent loads before and after the implementation of energy efficiency measures and estimating the associated savings.

- **End-Use Data Analysis:** Collecting and compiling end-use metered data from residential customers. Identifying the advantages and disadvantages associated with a variety of metering equipment. Designing processes to efficiently transfer load data from the recording device to other platforms for database creation and analysis.
- **SAS Programming:** Creating analysis and reporting programs for use by others. Working with extremely large utility databases in a variety of formats and developing import routines for AMI data in a number of different formats. SAS Base Certified programmer.

Representative Project Experience

Pennsylvania Public Utilities Commission - PA Act 129 Statewide Evaluator - Evaluation of Pennsylvania Electric Distribution Companies' Energy Efficiency and Conservation Programs (2011-PRESENT)

Jesse plays a key role in NPE's contract as the Statewide Evaluator of Pennsylvania's energy efficiency and demand response programs. The Statewide Evaluator's role is to provide guidance and oversight to each of the seven large electric distribution companies (EDCs) in the state and to audit the energy and peak demand savings values reported to the Pennsylvania Public Utility Commission (PAPUC). Jesse is responsible for compiling tracking data supplied by each of the seven EDCs on their commercial & industrial energy efficiency and demand response programs and verifying that this information is being calculated and reported correctly. Jesse writes sections on the accuracy of tracking data and cost-effectiveness for each of the Statewide Evaluator's quarterly and annual reports.

Jesse recently authored a white paper on statistical testing which will be used by the PAPUC to set future evaluation guidelines and determine each EDC's compliance with the energy and demand savings targets required by the state legislature. He is also leading a special demand response study for the PAPUC that will be completed in 2013. This study examines the cost-effectiveness of demand response in Pennsylvania and will develop recommendations on future demand response program design and targets. As part of his work on the demand response study, Jesse designed an attribution survey instrument and scoring methodology focused on the proper allocation of benefits when customers participate in multiple load curtailment programs simultaneously.

Georgia Power Company - Evaluation of 2011 Certified DSM Programs (2011-PRESENT)

Jesse leads the impact evaluation of Georgia Power Company's (GPC) five residential energy efficiency programs. GPC's residential portfolio includes the Residential Water Heating, High Efficiency New Home, Home Energy Improvement, Appliance Recycling and Residential Lighting programs. He is currently coordinating a staff of NPE field engineers and analysts to perform over 150 site inspections. Jesse is responsible for selecting and implementing measurement & verification approaches and analysis techniques that produce reliable estimates of each program's impacts. He oversees the review of project documentation, sample design, database development and engineering analysis. Jesse works closely with the client, its program implementers and the NPE sub-contractors performing process evaluations of each program.

Delaware Department of Natural Resources and Environmental Control - EM&V of Delaware Energy Efficiency and Demand Response Programs (2011-PRESENT)

Jesse is currently managing NPE's evaluation of the Delaware Department of Natural Resources and Environmental Control's (DNREC) commercial energy efficiency program. This evaluation includes performing a number of site inspections, many of which require the deployment of end-use metering equipment or lighting loggers. Jesse designed the evaluation sample and has lead the review of project documentation provided by DNREC's implementer and developed site specific measurement & verification plans for NPE field engineers. He is also coordinating the analysis of the projects sampled in the evaluation. A number of analytic techniques are required to deliver accurate ex post energy, demand and gas savings for the wide range of lighting, HVAC, motor and custom measures offered by DNREC in the Efficiency Plus Business program. Evaluation techniques used include building simulation, retrofit isolation engineering calculations and billing analysis.

Pranav Jampani

Project Analyst



Pranav Jampani is a Project Engineer with Nexant Planning & Evaluation, LLC (NPE), and is located in the Philadelphia (Malvern), Pennsylvania office. Pranav provides technical consulting for planning and evaluation projects for utilities and regulatory bodies. His areas of focus include energy research, measurement & verification (M&V) of energy and demand savings, and developing M&V protocols for technical reference manuals (TRM) and measure databases. Pranav has worked on projects for several clients including the Delaware Department of Natural Resources and Environmental Control, Georgia Power Company, the Maryland Energy Administration, the Pennsylvania Public Utility Commission (PAPUC), and the Wisconsin Public Service Commission. As part of the Statewide Evaluation team for the PAPUC, he works on several tasks including developing and updating the TRM; conducting on-site verification inspections, metering and analysis; reviewing M&V plans, sampling designs, TRC calculations, and reports submitted by the EDCs; developing guidance and study memos spanning a wide variety of research topics; and performing on-site surveys for the baseline study. Pranav is also actively involved in writing sections of the TRM Orders and quarterly and annual evaluation reports. Prior to joining NPE, Pranav worked as a Consultant at several organizations where he specialized in providing due diligence consulting services that included; designing energy and environmental management systems; life cycle impact assessments; sustainability reporting; process optimization; air quality forecasting; and sustainability tool development. Pranav holds a bachelor's degree in Chemical Engineering from Birla Institute of Technology & Science, Pilani, Rajasthan, India, and holds a Master's degree in Environmental Engineering from the North Carolina State University.

Areas of Expertise

- **Measurement & Verification:** Conducting energy audits and inspections to collect data on installed energy efficiency and renewable energy projects, and using that data to analyze the project's energy savings through defining baseline scenarios, calculating energy and demand savings, statistical sampling and probability analysis, metering studies, deemed savings estimation, cost-benefit analyses, report writing, and quality assurance.
- **Baseline Market Characterization:** Establishing baseline energy usage characteristics of sectors, segments, end-uses and equipment type; market research; conducting on-site audits/site visits; and ensuring data integrity through established QA/QC protocols.

Education and Licensing

MS, Environmental Engineering,
North Carolina State University, NC

BE, Chemical Engineering, Birla
Institute of Technology & Science,
Pilani, Rajasthan, India

Work History

Nexant Planning & Evaluation LLC:
Malvern, PA
Project Analyst (2011-Present)

ERS Global: Atlanta, GA
Sustainability Consultant
(2010-2011)

Sympliciti: San Ramon, CA
Energy Efficiency Consultant Intern
(2010-2010)

Air Quality Forecasting Lab:
Raleigh, NC
Research Assistant (2009-2009)

LCG Energy Consulting:
Los Altos, CA
Energy Analyst Intern (2009-2009)

Center for Energy & Environment
Division: Hyderabad, India
Senior Associate (2008-2008)

Affiliations

Professional Engineers of
North Carolina (PENC)

Air & Waste Management
Association (AWMA)

- **Uniform Measure Development:** Developing methods of verifying energy savings and peak demand reduction protocols and strategies for technical reference manuals; developing measure databases with measure life and costs for energy efficient measures.
- **Energy Analysis:** Analyzing and estimating energy consumption and savings for various energy efficiency and renewable technologies using computer simulation techniques including SAM, PVWatts, and Excel spreadsheets.

Representative Project Experience

Pennsylvania Public Utilities Commission - PA Act 129 Statewide Evaluator - Evaluation of Pennsylvania Electric Distribution Companies' Energy Efficiency and Conservation Programs (2011-PRESENT)

As part of the Statewide Evaluation team, Pranav provides engineering support to the Pennsylvania Public Utilities Commission (PA PUC) to achieve verifiable energy savings and peak demand reduction across the state for seven electric distribution companies (EDCs). He is actively involved in developing, analyzing, and reviewing savings protocols for a variety of measures in both typical prescriptive and unique custom contexts for the residential and commercial & industrial sectors. He performs on-site verification inspections and analysis to estimate energy and peak demand impacts and produces site inspection reports. Pranav also performed metering and analysis for several lighting projects. He contributes to the Technical Reference Manual (TRM), the quarterly and annual statewide evaluator impact evaluation reports and Audit Plan. Pranav reviews M&V plans, sampling designs and reports submitted by the EDCs and provides feedback. He also developed guidance and study memos spanning a wide variety of research topics which include "Energy Savings Evaluation for Appliance Recycling Program", "Energy Savings Evaluation for C&I Motor Rewinding", "Energy Efficiency Standards for Phase-Out of Inefficient Incandescent Lamps" by conducting secondary research and interviewing several state and utility jurisdictions across the United States.

Pennsylvania Public Utilities Commission - Commercial & Industrial Baseline Study (2011-2012)

Pranav conducted on-site surveys to collect information on the energy using equipment (HVAC, lighting, cooking, refrigeration, and other process loads) for customer's businesses for all the electric distribution companies in Pennsylvania. He performed measure level research including measure life, standards, and efficiency ratings to fill data gaps. He was actively involved in determining the saturation of energy using equipment and efficiency measures in the commercial sector.

Georgia Power Company - Evaluation of 2011 Certified DSM Programs (2012-PRESENT)

Pranav is providing engineering support for Georgia Power Company's certified Demand Side Management programs offered to Residential and Commercial & Industrial customers. Pranav conducted engineering desk reviews and developed a tracking databases for both C&I Prescriptive (76 projects) and Custom (111 projects) programs. He created recruiting scripts, letters, cover sheets and site inspection forms for scheduling site inspections and performed on-site M&V inspections for measures including lighting, HVAC, refrigeration, building envelope, appliances, and office equipment. He also deployed loggers and obtained on-site measurements.

Delaware Department of Natural Resources and Environmental Control - EM&V of Delaware Energy Efficiency and Demand Response Programs (2011-PRESENT)

Pranav is providing engineering support for the Delaware Department of Natural Resources and Environmental Control's (DNREC) DSM programs offered to Commercial & Industrial customers. Pranav conducted site visits for new construction residential homes for the Green for Green (G4G) program to confirm compliance with existing Delaware code requirements and LEED/NGBS certification standards and to compare building practices of homes built by non-participating builders to homes built by participating builders. He also conducted M&V on-site visits for the Efficiency Plus Business program to verify installation and review the various parameters used to determine the savings.

Delaware Department of Natural Resources & Environmental Control - Commercial & Industrial Baseline Study (2011-PRESENT)

Pranav is providing engineering support for DNREC's commercial & industrial end-use and baseline study of energy usage in the state of Delaware. His work focuses on performing baseline field surveys of existing lighting, HVAC and building envelope characteristics for businesses throughout the state of Delaware. Data from the site visits is used to develop baseline scenarios in support of DNREC's program evaluations.

Wisconsin Public Service Commission - Impact Evaluation of Focus on Energy Portfolio (2011-PRESENT)

Pranav is assisting with the impact assessment task for the Wisconsin Public Service Commission's Focus on Energy Portfolio. The portfolio includes a wide variety of programs, encompassing residential commercial, and industrial sectors, as well as both custom and prescriptive programs. He is performing measure reviews to check the reasonableness of assumptions for key performance variables, algorithms to calculate energy and peak demand savings, eligibility requirements, measure life, and incremental

Maryland Energy Administration - ARRA Impact Evaluation (2011)

Pranav was actively involved in conducting the impact evaluation for three of the Maryland Energy Administration's programs to verify energy and demand impacts. The programs include the Multifamily Energy Efficiency and Home Affordability program (MEEHA), the Sunburst program (SB), and the Local Funding Assistance program (LFA). Prescriptive and custom measures such as lighting, HVAC, solar PV and wind systems were evaluated. His activities included developing databases to track project data, creating data request memos tailored to each program participant, collecting project data, developing M&V protocols and data collection checklists, scheduling and conducting on-site inspections, desk reviews, performing analysis and writing site inspection and final impact evaluation reports. Pranav performed detailed stratified sampling to select statistically significant samples for conducting on-site inspections. He also developed an energy assessment tool for the MEEHA Program and performed simulation modeling using DOE's PVWatts and System Advisor (SAM) Models to estimate energy and demand impacts for energy efficiency and renewable technologies respectively.

Patrick Burns, PE, CEM, LEED AP

Principal



Patrick Burns is a Principal with Nexant Planning & Evaluation LLC (NPE) and is located in the Boulder, Colorado office. Patrick has over 15 years of engineering, planning and analytic experience with a focus on demand side management (DSM) program planning and evaluation, energy efficiency analysis, and building lighting and electrical systems design. He provides key staff leadership and mentoring to his project team working on DSM planning and evaluation, energy efficiency analysis and auditing. He excels in challenging and difficult projects, using communication and problem-solving skills to facilitate coordination between technical teams and clients.

Areas of Expertise

- **Program Evaluation, Measurement & Verification:** Establishing evaluation objectives and plans, statistical sampling and probability analysis, measurement & verification (M&V) approaches, emissions calculations and cost-benefit analysis. M&V efforts include defining baseline scenarios, metering studies, calculating energy and demand savings, utility billing analyses and deemed savings estimation. Designing and administering process and attribution surveys to determine program effectiveness and influence.
- **Market Potential Assessments and Planning:** Assessing the available potential for energy efficiency, demand response, distributed generation, and renewable energy sources, including: expertise in measure development; cost-effectiveness review; utility load profile analysis; and estimating technical, economic, and achievable potentials. Complementary efforts include Integrated Resource Planning (IRP) support, load profile analysis and program planning and benchmarking.
- **Market Characterization Studies:** Conducting research activities to understand technical and qualitative characteristics of a specific or broad market. Activities include on-site inspections, logistics coordination, customer telephone surveys and market actor interviews.
- **Building Energy Analysis and Quality Control:** Performing energy audits in commercial and industrial facilities to identify both control- and capital-based energy efficiency measures. Mentoring staff engineers in auditing processes and providing quality review of audit reports.
- **Litigation Support:** Providing detailed technical and contractual evaluation for energy projects and construction disputes. Tasks generally include expert reports, review of dispute documentation and detailed M&V with field inspections and data collection. Performing expert witness depositions and arbitration testimony.

Education and Licensing

BS, Civil, Environmental and Architectural Engineering, University of Colorado, CO

Professional Engineer (PE)

CA - 15948

CO - 35370

FL - 57217

HI - 12223

ID - 10286

NV - 17161

Certified Energy Manager (CEM)

LEED Accredited Professional (LEED AP)

Work History

*Nexant Planning & Evaluation LLC:
Boulder, CO*

Principal (2012-Present)

Project Manager (2009-2012)

*Beaudin Ganze Consulting
Engineers Inc.: Lakewood, CO*

Energy Services Leader (2008-2009)

Electrical Service Leader (2001-2008)

WSP Flack + Kurtz:

San Francisco, CA

Electrical Engineer (1996-2000)

Affiliations

Association of Energy Engineers (AEE)

Association of Energy Service Professionals (AESP)

Representative Project Experience

Pennsylvania Public Utilities Commission - Commercial & Industrial Baseline Study (2011-2012)

Patrick managed a commercial & industrial baseline study for the Pennsylvania Public Utilities Commission for the seven (7) electric distribution companies located in Pennsylvania. The baseline study included primary market research with over 400 commercial & industrial site visits, an end-use summary report with load profile calibration for electric sources, and an electric energy efficiency potential and supply curve analysis.

Pennsylvania Public Utilities Commission - Commercial & Industrial Market Potential Study (2011-2012)

Patrick managed a state-wide DSM energy efficiency market potential study for the Pennsylvania Public Utilities Commission for the seven (7) electric distribution companies located in Pennsylvania to help inform the planning and implementation of Phase II of Pennsylvania's Act 129 energy efficiency goals for 2018. The potential study included the determination of technical, economic, achievable and program potential for the commercial & industrial sectors.

Georgia Power Company - Evaluation of 2011 Certified DSM Programs (2011-PRESENT)

Patrick provides daily project management and engineering for Georgia Power Company's seven certified Demand Side Management programs, including residential water heating, residential home energy improvement, residential high efficiency new homes, residential lighting and appliance, residential refrigerator recycling, commercial prescriptive and commercial custom programs for the 2011 program year. The evaluation project includes the formation of key program questions, planning, stakeholder interviews, customer surveys, on-site inspections, measurement of key measure parameters and cost-effectiveness analysis. Evaluation key questions, plans and cost-effectiveness procedures are developed considering input from stakeholder groups, including the Georgia Public Service Commission.

Ontario Power Authority - Cross Cutting Evaluation of Business Incentive Programs (2012-PRESENT)

Patrick is providing management and engineering oversight for the impact assessment and process evaluation for the Ontario Power Authority's Large Business Cross-Cutting program. The project includes the evaluation of the Business Retrofit, Commissioning and Audit programs. Activities will include the assessment of approximately 300 large commercial and industrial custom, engineered and prescriptive projects. The project will also involve developing statistical sampling algorithms, reviewing M&V methods, on-site inspections, metering studies, and calculating gross and net impacts.

Ontario Power Authority - Evaluation of the Small Business Lighting Program (2012-PRESENT)

Patrick is providing Principal-In-Charge management and engineering overview for the impact process evaluation for the Ontario Power Authority's Small Business Lighting Direct Install program. The program evaluation included the assessment of 185 prescriptive lighting and water heating projects. The project also involves developing statistical sampling algorithms, reviewing M&V methods, on-site inspections, metering studies, and calculating gross and net impacts.

Montana-Dakota Utilities - Market Potential Study (2012-PRESENT)

Patrick is the Principal-In-Charge of an electric energy efficiency potential study for Montana-Dakota Utilities' (MDU) eastern Montana service territory. The study includes a disaggregation of the electric load in that service territory into residential, commercial, and industrial sectors, and further into sub-sectors and end-uses. The disaggregated load will be extrapolated to future years using the utility's load forecasts. Several hundred energy efficiency measures from NPE's measure library will then be applied at the sub-sector and end-use level of the load forecast to provide MDU with a clear picture of the technical, economic, and achievable potential. The energy saving potential achievable in this unique service territory will be informed, in part, by a direct-mail survey assessing awareness and willingness by residential, commercial, and industrial customers to participate in DSM incentive programs.

CPS Energy - Energy Guard Impact Evaluation (2011-PRESENT)

Patrick provides technical oversight for the evaluation of CPS Energy's (CPS) new Residential Direct Load Control program, Energy Guard. The program controls residential HVAC units, hot water heaters, and pool pumps, allowing CPS to curtail the energy use of these devices during peak periods. NPE is tasked with quantifying system demand reduction resulting from curtailment events throughout the summer of 2012.

Oklahoma Department of Commerce - ARRA Impact Evaluation (2011-PRESENT)

Patrick provides project management and engineering for the impact evaluation for the State of Oklahoma Department of Commerce American Recovery and Reinvestment Act (ARRA) funds. The project includes evaluation of the portfolio of programs within the State Energy Program (SEP) and Energy Efficiency and Conservation Block Grant (EECBG). The evaluation spans all sectors, energy efficiency measure types and renewable energy sources. The project also involves developing statistical sampling algorithms, reviewing M&V methods, on-site inspections, and calculating gross and net impacts.

Confidential Client - Litigation Support (2009-PRESENT)

Patrick provides detailed technical and contractual evaluation for energy projects when disputes have arisen between the owner and the energy service provider. Tasks generally include detailed M&V, project and report reviews, field inspections, data collection, and analysis review of depositions and mitigation support. Projects have included industrial and commercial applications such as a steam plant, civic buildings, educational facilities, and others. Patrick has been deposed and has provided expert witness testimony as part of this litigation support.

Iowa Utility Association - Assessment of State-Wide Energy and Capacity Savings Potential (2007, and 2011-PRESENT)

Patrick was the Principal-In-Charge of research for industrial energy efficiency measures for electric and gas fuels. The study provided estimates of technical and economic potentials for electric energy efficiency and peak capacity reduction, natural gas energy efficiency, and select renewable resources for all major end-uses in all customer sectors.

PacifiCorp - Comprehensive DSM Market Potential Assessment (2010, and 2012)

Patrick was the Principal-In-Charge of research for industrial energy-efficiency measure for electric fuels. The study provided estimates of technical and economics potentials for electric energy efficiency and peak capacity reduction, natural gas energy efficiency, and select renewable resources for all major end-uses in all customer sectors.

Colorado Energy Office - ARRA Impact Evaluation (2011-2012)

Patrick provides daily project management and engineering for the impact evaluation for the Colorado Energy Office (CEO) of ARRA funds. The project includes evaluation of the portfolio of program within the CEO State Energy Program (SEP), Energy Efficiency and Conservation Block Grant (EECBG) and State Energy Efficiency Appliance Rebate Program (SEEARP). The evaluation spans all sectors, energy efficiency measure types and renewable energy sources. The project involves developing statistical sampling algorithms, reviewing M&V methods, on-site inspections, and calculating gross and net impacts.

Ontario Power Authority - Small Commercial Direct Install Evaluation (2010-2011)

Patrick provided daily project management and engineering for the impact assessment and process evaluation for the Ontario Power Authority's Small Commercial Direct Install program. The program evaluation included the assessment of 185 prescriptive lighting and water heating projects. The project also involved developing statistical sampling algorithms, reviewing M&V methods, on-site inspections, metering studies, and calculating gross and net impacts.

Ontario Power Authority - Commercial and Institutional Cross-Cutting Evaluation (2010-2011)

Patrick provided daily project management and engineering for the impact assessment task for the Ontario Power Authority's Commercial and Institutional Cross-Cutting program. The program evaluation included the assessment of over 150 large commercial and industrial custom and prescriptive projects. The project also involved developing statistical sampling algorithms, reviewing M&V methods, on-site inspections, metering studies, and calculating gross and net impacts.

City Of Boulder - Energy Baseline Study (2011)

NPE led a team of consultants who completed an energy baseline study for the City of Boulder. The study was the first step in a feasibility study that the City of Boulder conducted to determine if it was a viable option for the City to create its own electric municipality. As part of the baseline study, the NPE team provided an inventory of the key data needed to characterize Boulder's electricity, supply, demand, and associated costs. The study also included a review and summary of Boulder's customer electric spending and average customer rates, underlying electric costs that the City would incur if they were to become a municipality, average electric sales and load data including load shapes and peak demand, and a review of the generation system and the reliability of the City's electric infrastructure.

Northwestern Energy - End-Use and Market Potential Study (2009-2010)

Patrick managed a DSM energy efficiency potential study for Northwestern Energy, the primary electric and gas provider for central and western Montana. The study included primary market research with over 200 commercial and residential site visits, an end-use summary report with load profile calibration for electric and gas sources, and an electric energy efficiency potential and supply curve analysis.

Xcel Energy – On-Site Energy Assessment Program (2009-2011)

Patrick provided quality control review and mentorship for NPE engineering staff for Xcel’s On-site energy assessment program. As a contractor to Xcel Energy, NPE conducted building energy audits, performed energy analysis; evaluated economic performance of potential energy conservation measures; and wrote energy savings reports, including recommendations for energy efficiency improvements.

Tri-State Generation and Transmission Association - Market Electric Potential Assessment (2009-2010)

Patrick managed a DSM energy efficiency potential study for Tri-State Generation and Transmission, the electric generation provider for 44 rural electric cooperatives in Colorado, Nebraska, New Mexico, and Wyoming. The study included primary market research interviews with more than a dozen cooperative general managers, electric load profile calibration, efficiency measurement development, electric energy efficiency potential, and program development recommendations.

Holy Cross Energy - DSM Potential Study and Program Recommendations (2010)

Patrick managed a DSM energy efficiency potential study for Holy Cross Electric (HCE). Leveraging the end-use data collected in a prior DSM potential study for Tri-State Generation and Transmission, NPE was able to assess the potential energy savings by using cost and savings information for individual efficiency measures. Using these results, NPE identified the customer segments and end-uses that could provide the greatest opportunities for HCE, including residential lighting and appliances, plug loads, commercial lighting, office equipment, and motors. Programs were designed for each of these areas, with recommendations focused on cost-effective implementation strategies. Supporting information was provided on eligibility requirements, potential energy savings, incremental customer costs, recommended incentive levels, and appropriate delivery mechanisms for each program.

Kingdom of Jordan-Electric Energy Efficiency Potential Study (2010)

NPE conducted an electric energy efficiency potential study for the Kingdom of Jordan. The Kingdom did not have any energy efficiency programs, and this study was meant to characterize their technical and achievable potential. Using local sources of information, NPE disaggregated the Kingdom’s energy sales and peak demand into customer segments and end-uses, and created a measure list suitable for their specific climate and socioeconomic circumstances. The results were integrated into a policy package presented to the King and the Minister of Energy and Natural Resources.

Ameren Illinois - DSM Market Research and Potential Study (2009)

Patrick led NPE’s research efforts that involved performing a total of 110 on-site residential and commercial customer surveys, along with 400 residential phone surveys. NPE engineers gathered data on buildings’ energy using equipment such as lights, furnaces, air-conditioners, plug-loads, and kitchen equipment. Through the use of streamlined survey instruments and refined data collection protocols, NPE was able to efficiently and accurately describe the energy usage characteristics of Ameren’s service territory.

Tyler Hammer

Senior Project Analyst



Tyler Hammer is a Senior Project Analyst with Nexant Planning & Evaluation, LLC (NPE), and is located in the Boulder, Colorado office. Tyler offers more than six years of project management experience in the energy and sustainability fields. At NPE Tyler specializes in DSM planning activities, leading or contributing to baseline, market potential and program planning activities in Texas, South Carolina, Delaware, Montana, the Pacific Northwest, and Pennsylvania. In Phase I of Act 129, Tyler successfully led the Commercial & Industrial Baseline Study efforts, was a key contributor to the Market Potential Study, and was responsible for formulating the adopted Phase II targets. In addition, he serves as Secretary of the Board for the Rocky Mountain chapter of the Association of Energy Services Professionals (AESP). Prior to joining NPE, Tyler worked for Navigant Consulting where he developed the 2010 Colorado Utilities Report. He was also the executive director for Sustainable San Mateo County, where he forged a partnership with Pacific Gas and Electric Company to market their residential and commercial rebate programs. Tyler holds a master's degree in business administration from the University of Colorado, Leeds School of Business with a focus in finance and energy, and received a bachelor's of science degree from the University of Wisconsin-Madison.

Areas of Expertise

- **Market Potential Assessments:** Assessing the available potential for energy efficiency, including: measure development; cost-effectiveness; customer billing analysis; Energy Use Intensity (EUI) analysis; and estimating technical, economic, achievable and program potential.
- **Baseline Market Characterization:** Establishing baseline energy usage characteristics of sectors, segments, end-uses and equipment types; EUI analysis; using applied statistics to conceive and develop defensible sampling plans; market research; managing and coordinating hundreds of on-site audits/site visits; ensuring data integrity through established QA/QC protocols; statistical data analysis using cross-tabs.
- **Energy Analysis:** Performing financial modeling and sensitivity analysis, statistical analysis, and LCOE analysis, as well as proficiency with the following software: SPSS, Crystal Ball Monte Carlo Simulation, Ventyx Velocity (Energy) Suite, and NREL's Solar Advisor Model (SAM).

Representative Project Experience

Pennsylvania Public Utilities Commission - Commercial & Industrial Baseline Study (2011-2012)

Tyler managed the day-to-day activities for the commercial & industrial baseline study on behalf of the Pennsylvania Public Utilities Commission (PA PUC) for the seven largest electric distribution companies (EDCs) in Pennsylvania. The baseline study included primary market research including 420 commercial and industrial site visits, forecast disaggregation, and an end-use and saturation summary report.

Education and Licensing

MBA, University of Colorado
at Boulder, CO

BS, University of Wisconsin
at Madison, WI

Work History

Nexant Planning & Evaluation LLC:
Boulder, CO

Sr. Project Analyst (2011-Present)

Navigant: Boulder, CO
Project Consultant (2010-2011)

Abengoa Solar: Boulder CO
Market Researcher (2010-2011)

Sustainable San Mateo County:
San Mateo, CA
Executive Director (2006-2009)

Affiliations

Association of Energy Services
Professionals (AESP)

Board Member, AESP Rocky
Mountain Chapter

Pennsylvania Public Utilities Commission - Commercial & Industrial Market Potential Study (2011-2012)

Tyler managed the day-to-day activities for the commercial & industrial market potential study on behalf of the Pennsylvania Public Utilities Commission (PA PUC) for the seven largest electric distribution companies (EDCs) in Pennsylvania. The potential study includes determination of technical, economic, achievable and program potential for the commercial and industrial sectors for each EDC. Findings from these reports were used by the commission to help inform updated targets for the implementation of Phase II of Pennsylvania's Act 129. Tyler worked closely with the staff of the PA PUC, the seven EDCs, and other stakeholders to execute the project and attended and presented at multiple stakeholder meetings.

Santee Cooper - DSM Strategic Plan Support & Program Forecasting (2012-PRESENT)

Tyler is leading the effort to update Santee Cooper's 12-year energy efficiency goals by providing advice and expertise to the energy efficiency program managers. Specifically, Tyler led the market research effort to benchmark program and portfolio savings potential based on a "% of sales" basis and used the findings to help model savings potential and cost-effectiveness of the current set of DSM programs.

PacifiCorp - Comprehensive DSM Market Potential Assessment (2012-PRESENT)

Tyler is actively managing the industrial measure list update for PacifiCorp's 2012 market assessment update. Specifically, he is responsible for ensuring all appropriate new codes and standards (including EISA's impact on lighting) are properly reflected in measures assumptions.

Delaware Department of Natural Resources & Environmental Control - Commercial & Industrial End-Use and Baseline Study (2011-PRESENT)

Tyler led the state-wide effort to conduct a commercial and industrial (C&I) end-use and baseline study for the State of Delaware. Tyler re-designed NPE's C&I survey instrument to better match the needs of Delaware and future clients, developed a sample plan, and oversaw the planning and execution of 140 on-site surveys for commercial and residential buildings in the State of Delaware. Tyler also led the data analysis and report writing for the C&I report.

Colorado Energy Office - ARRA Impact Evaluation (2011-2012)

Tyler was involved with the impact evaluation for the Colorado Energy Office (CEO) of American Recovery and Reinvestment Act (ARRA) funds. The project includes evaluation of the portfolio of programs within the CEO State Energy Program (SEP), Energy Efficiency and Conservation Block Grant (EECBG) and State Energy Efficiency Appliance Rebate Program (SEEARP). Specifically, Tyler evaluated two financial programs totaling more than \$14 million in funds – the Revolving Loan and Loan Loss Reserve programs.

Texas Comptroller of Public Accounts / State Energy Conservation Office - Energy Efficiency Best Practices Guide For Locally-Governed Electric Service Areas (2011-2013)

Tyler assisted with development of an Energy Efficiency "Best Practices Guide" for municipal utilities in Texas. The report was part of a larger stakeholder engagement plan to both educate and engage municipal utility representatives throughout Texas about energy efficiency program opportunities. Tyler specifically helped research and write portions of the report for the State Energy Conservation Office.

Katie Ryder

Project Analyst



Katie Ryder is a Project Analyst with Nexant Planning & Evaluation, LLC (NPE). She supports a variety of energy efficiency and demand side management (DSM) programs for utilities and government agencies. Katie's experience includes energy efficiency program design and implementation, and process and impact evaluations. Katie provides research design, project consulting, survey design, sampling, analysis, and report writing focused on demand side management and energy efficiency for utility and energy organization clients. Prior to joining NPE, Katie was an Analyst with the Cadmus Group, Inc. As part of the evaluation of Pennsylvania EDC's energy efficiency and conservation programs, Katie assisted in designing an attribution survey instrument and scoring methodology focused on allocation of benefits when customers participate in multiple load curtailment programs simultaneously.

Areas of Expertise

- **Energy Analysis:** Analyzing and estimating energy consumption and savings in various buildings; conducting cost-benefit analyses of energy conservation measures; reviewing and verifying residential, industrial and commercial building energy analysis.
- **DSM Program Design Assistance:** Assisting in the design of DSM programs by evaluating energy conservation measures, energy savings, and cost-effectiveness.
- **Process Evaluation:** Designing, writing, conducting, and analyzing on-site and telephone surveys for process evaluations, and presenting conclusions through reports and presentations.
- **Program and Policy Research:** Researching and analyzing the requirements and implications of efficiency/renewable energy policies and programs, including statewide renewable portfolio standards and efficiency mandates.
- **Survey Design, Implementation and Analysis:** Designing, writing, conducting, and analyzing surveys for planning and evaluation of resource conservation and efficiency policies and programs.

Representative Project Experience

Pennsylvania Public Utilities Commission - PA Act 129 Statewide Evaluator - Evaluation of Pennsylvania Electric Distribution Companies' Energy Efficiency and Conservation Programs (2011-PRESENT)

As part of the evaluation of Pennsylvania EDC's energy efficiency and conservation programs, Katie assisted in designing an attribution survey instrument and scoring methodology focused on allocation of benefits when customers participate in multiple load curtailment programs simultaneously.

Education and Licensing

MS, Managing for Sustainability,
University of Colorado, CO

BS, Biology,
University of Colorado, CO

Work History

Nexant Planning & Evaluation LLC:
Boulder, CO
Project Analyst (2011-Present)

The Cadmus Group, Inc.:
Boulder, CO
Analyst (2008-2011)

The Sierra Club: Boulder, CO
Conservation Organizer
(2007-2008)

Affiliations

Colorado Renewable Energy
Society (CRES)

Lawrence Berkeley National Laboratory - Evaluation of US Department of Energy's Better Buildings Program (2012-2014)

Katie is the lead analyst for NPE's role in the impact evaluation of the national Better Buildings Neighborhood Program (BBNP), providing quantitative and qualitative support including conducting interviews with grantees and conducting analysis on data gathered from those interviews. Evaluation activities include process and market effects assessments and energy impact evaluations, including M&V and billing analysis. NPE is leading the impact evaluation and M&V analysis and will conduct approximately 800 project reviews across the 41 BBNP Grantees. Our team's goal is to quantify energy savings resulting from program activities, to fully understand the various program activities, explain the theory and logic of how they address the Better Buildings objectives, and identify which programs and program elements were most successful and which can be easily replicated.

Sacramento Municipal Utility District - New Technologies Services Evaluation (2012-PRESENT)

Katie is the lead analyst for the Sacramento Municipal Utility District's (SMUD) Advanced Lighting Controls program to assess levels of satisfaction, concerns and barriers of various program participants and stakeholders. The Advanced Lighting Controls program encourages commercial customers to adopt integrated daylight harvesting and occupancy tuning technology. The study includes the development and delivery of web-based surveys as well as in-person interviews that will occur over two years. The results of this study will improve the estimates of saving persistence and program design.

Missouri Gas Energy - Residential Programs Impact Evaluation (2011-2012)

Katie was the lead analyst for Missouri Gas Energy's three energy efficiency programs, including Residential Water Heating, Residential Space Heating and Residential Home Performance with Energy Star for the 2009-2011 program years. The evaluation project included the formation of key program questions, planning, stakeholder interviews, customer surveys, on-site inspections, measurement of key measure parameters and cost-effectiveness analysis. Evaluation key questions, plans and cost-effectiveness procedures were developed considering input from stakeholder groups.



JANE S. PETERS, PHD

PRESIDENT

Dr. Peters provides overall direction and guidance to the technical staff of Research Into Action. She typically develops the project design at the proposal stage, selects and assigns the appropriate staff and project management team, and works with project managers to ensure they understand the project intention, purpose, and research design. Dr. Peters is the sole owner of Research Into Action and oversees the operation and management of the company. Dr. Peters is always directly involved in large, complex, and leading-edge projects.

- Ph.D. in Urban Studies from Portland State University, her dissertation: *Integrating Psychological and Economic Perspectives on Energy Consumption: The Determinants of Thermostat Setting Behavior*; A.B. with Distinction in Psychology from Occidental College

RESEARCH INTO ACTION, INC.

President

(1996 to present)

Jane S. Peters has more than 30 years of experience in energy-related program performance measurement and evaluation, customer research, market assessment, strategic planning, organizational analysis, and process reengineering. Dr. Peters is a recognized energy services industry leader in program process and performance measurement and program evaluation research and training. She is particularly interested in determining, through research, how best to design and implement programs that spur individuals and organizations to reduce their energy use and implement actions that contribute to climate change mitigation.

- ➔ **Assures quality of Research Into Action's work:** Has directed staff to develop and oversees the quality control procedures for designing surveys to track to research questions, tracking calls, reporting dispositions, managing data, conducting qualitative and quantitative analysis, documenting analysis, and providing data sets to clients.
- ➔ **Pursues areas of specialization and ensures staff's capability and competence:**
 - Program evaluation theory and practice
 - Logic theory/models and process flow diagrams
 - Market characterization and market research
 - Behavioral impacts and market effects
 - Best practices and benchmarking
 - Planning and policy support
- ➔ **Assigns the most qualified staff** to each project and assures staff availability throughout project implementation through ongoing communication and discussions with project managers and staff planning processes.



- ➔ **Conducts organizational assessments and strategic planning**, assisting clients to increase the efficiency and effectiveness of their implementation or evaluation functions and strategically positioning the client to meet their goals.
- ➔ **As Principal Investigator** designs research approaches and oversees research designs developed by senior staff.
- ➔ **Familiar with and leading proponent of state-of-the-art behavioral science methods**; assures staff are competent in these methods and applies them appropriately to the firm's research.
- ➔ **Experienced teacher and thought leader for energy program evaluation and market research**; author of books, white papers and chapters in leading documents on evaluation practice, as well as several papers considered seminal works in energy program evaluation; regularly presents at national and international conferences on energy program evaluation and market research.
- ➔ **Experienced with presentation to commissions and regulatory bodies**; has testified and submitted responses to questions supporting research conducted for clients.

BARAKAT & CHAMBERLIN, INC.**Principal****(1992 to 1996)****Project Director****(1991 to 1992)**

- ➔ Directed firm's process evaluation practice; managed staff of 15 researchers; developed research designs; assured project quality and on-time, on-budget delivery of work.

ERC ENVIRONMENTAL AND ENERGY SERVICES CO., INC.**Manager, Portland Office****(1983 to 1990)**

Additional experience and publications are available upon request.





RYAN BLISS, MA

research/into/action™

PROJECT DIRECTOR

Mr. Bliss has more than 25 years of research and analysis experience, including five with Research Into Action. He directs all aspects of market research and evaluation projects, from conception to final presentation of results, including budgeting, work plan development, and management of staff and subcontractors. He has published research reports in peer-reviewed journals and presented at national and international conferences.

- M.A. in Psychology from the University of Minnesota, and a B.A. in Psychology from Cornell University.

RESEARCH INTO ACTION, INC.

Project Director

(2007-present)

Representative experience includes:

Program Evaluation

- **Combined Process and Impact Evaluations:** Managed combined process and impact evaluations – and led the process evaluation work – of five nonresidential energy efficiency incentive programs. Used market penetration data combined with market size and average EUI to develop an index of remaining savings potential for various market segments. Estimated free-ridership. Also directed the process portion of a combined evaluation of in-house and third-party agricultural programs.
- **Third-Party Programs:** Managed process evaluations of five third-party nonresidential energy efficiency programs within two administrator portfolios, investigating a range of cross-cutting issues, including the role of utility account executives, utility-wide communication and coordination, data tracking, regulatory issues, and integration with the demand side management (DSM) portfolio. Two of the programs were designated as “innovative” by the administrator.
- **Pilot Programs:** Provided early feedback on a pilot expansion of nonresidential programs into a new utility territory and managed the process evaluation of the expanded programs. Used U.S. Census data to demonstrate that variability in participation rates was more affected by population density than other factors the program had focused on, thus identifying untapped residential potential.
- **Fast Participant Feedback:** Managed a pilot study to determine the best method to collect feedback on program satisfaction and free-ridership on recently completed projects from nonresidential energy efficiency program participants. Compared paper, telephone, and web survey methods and identified the key strategies for obtaining and integrating real-time participant feedback into program planning. Managed a roll-out of the methodology to the client’s portfolio of programs, tailoring the free-ridership assessment to multiple programs and measure types.
- **Research and Development (R&D):** Assessed a client’s process for developing solicitations for energy-related R&D projects and evaluating the resulting proposals. Integrated feedback from program staff, members of solicitation evaluation panels, and R&D contractors to identify actions to increase the quantity and quality of responses to solicitations.
- **Impact Verification Audit:** Directed a three-year verification audit of nonresidential, residential, and limited-income energy efficiency programs. Developed a spreadsheet system to automatically



calculate verifiable savings from inputs and client-supplied algorithms and update cumulative summary results with each year's data. Identified key causes of unverified data and made recommendations to improve data quality.

Market Characterization and Market Research

- **Commercial Market Transformation:** Coordinated the activities of multiple evaluation contractors to assess the progress of a multi-year, multi-market commercial-sector market transformation initiative. Developed research plans, guided multiple data collection efforts, and integrated findings to assess progress in the grocery, healthcare, office real estate, design and construction, and building operations markets. Assessed inputs into the program's cost-effectiveness model.
- **Energy Efficiency Workforce Needs:** Planned and performed analyses of responses to a survey of energy efficiency workforce needs in a major metropolitan area.

Best Practices and Benchmarking

- **White Paper on Evaluation:** Conducted in-depth interviews with evaluation experts to identify lessons learned from 30 years of process evaluation of energy efficiency programs.

Behavioral Impacts and Market Effects

- **Portfolio Trade Allies:** Managed the update and analysis of an annual survey of trade allies for a client's entire program portfolio. Led the review of more than 100 survey questions to improve question wording, type, and order to ensure valid and reliable data collection; devised additional survey questions to address new topic areas and to close previously open-ended questions; and supervised the analysis and write-up of survey results.

SELF-EMPLOYED

Consultant / Writer / Editor

(2000-2007)

Consulted on and taught research and data analysis and research design methods at a college of management in Thailand. Wrote research reports published in peer-reviewed journals. Consulted on data analysis and interpretation of research on cross-cultural issues for a Japanese company operating in Thailand. Authored proceedings for workshops and conferences for the World Bank and other nongovernmental organizations and agencies.

SPHERIX, INC.

Assistant Director for Government Business Development

(1991-2000)

HARVARD UNIVERSITY, SCHOOL OF DENTAL MEDICINE

Research Analyst

(1987-1991)

NORMATIVE AGING STUDY, VETERANS ADMINISTRATION OUTPATIENT CLINIC

Research Analyst

(1984-1987)

MIDWEST RESEARCH INSTITUTE

Research Analyst

(1981-1984)





MARJORIE MCRAE, PHD

research/into/action™

PRINCIPAL

Dr. McRae has been active in the assessment and support of energy efficiency and demand response programs since 1980. For the past twelve years, she has focused on the design and implementation of process and market research studies for energy efficiency, demand response, renewable energy, market transformation, information, and new technologies programs in all sectors. She authored *DSM Evaluation: Six Steps for Assessing Program Effects*, published by the Electric Power Research Institute (EPRI), has provided expert testimony, and conducts EM&V training for AESP.

- Ph.D. in Psychology from The Wright Institute; M.A. in Economics from University of California, Berkeley; B.A. in Economics from Goucher College

RESEARCH INTO ACTION, INC.

Principal

(1999 to present)

Program Evaluation

- ➔ **Program Roll-Outs and Pilots:** Directed repeated process evaluations of residential, commercial, and industrial programs six, twelve, eighteen, and twenty-four months after launch. These early evaluations helped refined program designs and implementation processes for goal attainment.
- ➔ **Measurement and Verification Protocols:** Co-led a team to write a new suite of custom project measurement and verification (M&V) protocols for a federal power administrator, replacing first-generation protocols written in the late 1990s with five protocols and five guides.
- ➔ **Free-ridership Assessment:** Developed and tested a free-ridership methodology driven by customers' prior intentions and capability, and stated influence of program.
- ➔ **Nonresidential:** Directed evaluations of commercial, industrial, and agricultural incentive and market transformation programs, retrocommissioning, industrial process savings, innovative industrial program with tune-ups, funding for Energy Project Managers, and executive training.
- ➔ **Residential:** Directed numerous residential program evaluations, such as weatherization, and heat pump incentives, loans, market transformation, and K-12-college programs.

Market Characterization and Market Research

- ➔ **Medical and Microelectronics Sectors:** Conducted in-depth research into medical-sector and microelectronics markets and programs, assessing program progress toward goals.
- ➔ **Residential Market Trend Evaluation:** Examined national behavioral and attitudinal trends in energy efficiency by assessing longitudinal survey data collected biennially since 2002.
- ➔ **Technical Potential, New Construction, and Energy Service Preferences:** Conducted market research to understand residential and nonresidential technical potential, new construction and building operation practices, and energy service preferences.



- ➔ **Renewable Energy, New Technologies, and Green Power:** Conducted research in support of photovoltaic (PV) installations, ground-source heat pumps, residential ductless heat pumps, microturbines using biofuels, and residential preferences for green power.

Behavioral Impacts and Market Effects

- ➔ **Impacts of Market Transformation:** Directed repeated savings validations and process evaluations for a market transformation program, estimating energy savings and quantifying market adoption of efficiency best practices among participants and nonparticipants.
- ➔ **Behavioral Impacts of Education Programs:** Assessed adoption of efficiency behaviors among adult education attendees, Building Operators Certification, and attendees at a children's museum.

Logic Theory/Models and Process Flow Diagrams

- ➔ **Logic Theory/Models and Process Flow Diagrams:** Developed logic theories and models in all sectors for incentive and market transformation programs, including education and training.

Best Practices and Benchmarking

- ➔ **Current Practice and Lessons Learned:** Regularly embeds best practice research into formative process evaluation and planning efforts, including programs encouraging comprehensive energy management by nonresidential customers and PV installer training.

Planning and Policy Support

- ➔ **Net Savings Definitions and Research:** Conducted interviews with program evaluation stakeholders and reviewed completed evaluation studies to assess net savings definitions used in evaluations conducted for Northeast program administrators.
- ➔ **Custom Project Evaluation Strategy:** Worked with client to develop a strategy for evaluating its custom projects (all sectors) as a portfolio in light of its requirements that each custom project include project-specific measurement and verification of savings.
- ➔ **Workforce Studies:** Assessed current and projected U.S. energy-efficiency workforce size needed to meet various scenarios of increased funding. Assessed connection between quality of PV installations and installer training, program's installer requirements, and program quality assurance.
- ➔ **Enhanced Inspection Planning:** Developed key metrics for tracking the performance of program activities and measuring outcomes.

BARAKAT & CHAMBERLIN, INC.

Project Director

(1989 to 1996)

XENERGY, INC. (NOW KEMA, INC.)

Director, West Coast Office

(1985 to 1989)

MINIMAX RESEARCH CORPORATION

Senior Economist

(1980 to 1985)





BOBBI TANNENBAUM, MS

research/into/action™

PRINCIPAL

Ms. Tannenbaum has dedicated most of her 30-year career to evaluation and market research to improve energy efficiency and renewable energy programs in all sectors. She has managed hundreds of program evaluation, market research, and related projects for utility and government clients that address the diverse issues associated with program success. In addition to developing research strategies that effectively and efficiently meet client needs, she has substantial expertise in the design of both qualitative and quantitative research data collection. She has moderated over 100 focus groups with residential and commercial utility customers on topics ranging from utility deregulation to in-home displays. She brings an interdisciplinary background that includes sociology, economics, statistics, and engineering to her work, and communicates technical issues to non-technical audiences. Ms. Tannenbaum has taught evaluation-related workshops for the International Energy Program Evaluation Conferences (IEPEC) in the US and Paris, and for the International Energy Agency. She has published on energy topics since 1993.

- M.S. in Land Resources and a Certificate in Energy Analysis and Policy, and B.S. in Environmental Policy, all from the University of Wisconsin

RESEARCH INTO ACTION, INC.

Principal

(2012-present)

Directs a range of projects and develops new project strategies. Conducts research in the following program areas: industrial, commercial/institutional, residential/low-income, agricultural, research and development, residential and nonresidential demand response, and energy efficiency program portfolio analysis.

- **Nonresidential Lighting:** Managed in-depth interviews with contractors, distributors, and manufacturers' representatives to: 1) understand the role of market actors in the California nonresidential lighting retrofit market and barriers to advanced lighting technologies, and 2) identify program approaches to accelerate the adoption of those technologies. Designed the interview guides, managed data collection, analyzed the data, and wrote the report.
- **Nonresidential Portfolios:** Managing the process evaluation of a Midwestern utility's statewide energy efficiency program portfolio. Tasks include: designing an omnibus nonparticipant trade ally survey, developing "analysis plans" for assorted surveys, and writing the Nonresidential Energy Analysis and Commercial New Construction program reports. The report covers a complicated audit, technical assistance, and rebate program offered to the utility's largest C&I customers.
- **National Residential Energy Efficiency:** Managing the impact and process evaluations and market analyses of Better Buildings programs operated by Midwestern grantee organizations. Key evaluation issues include determining attribution and lessons from the pilots applicable to future effects.
- **Home Performance with ENERGY STAR:** Managing the process evaluation of a statewide program that used trade allies to conduct free or reduced-cost whole-house energy audits and install optimal measures.



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KEMA**Principal****(2003-2012)**

Led a broad range of projects, including: evaluations of energy efficiency and renewable energy programs in all sectors, savings analyses, development of a comprehensive energy efficiency plan for a municipal utility, an electric and gas efficiency potential study, and a best practices study on energy-related adult education in Southern California. Clients included: Alliant Energy, City Public Service of San Antonio (Texas), Connecticut Clean Energy Fund, Consolidated Edison, Electricity Commission of New Zealand, Rochester Gas & Electric/New York State Gas & Electric, Southern California Edison, US Environmental Protection Agency, and Wisconsin Public Service Commission.

ENERGY CENTER OF WISCONSIN**Interim Associate Director, Technical Services****(2000-2002)**

Member of senior management team responsible for development and oversight of \$5 million annual budget. Managed 10-person team of project managers overseeing research and program projects. Responsible for management of major contracts involving multiple technical project managers.

Senior and Principal Project Manager**(1996-2003)**

Managed numerous evaluation and market research studies in the residential, commercial, and industrial sectors. Focused on low-income energy service issues. Oversaw Energy Center's work on the Baseline Market Research for the development of Focus on Energy, Wisconsin's statewide energy efficiency and renewable energy program. Led all market research related to Wisconsin's public benefits programs for the commercial, industrial, and agricultural sectors, and conducted selected market research for the residential sector. Provided consultation for other project managers on qualitative and quantitative data collection, especially instrument design.

OPINION DYNAMICS**Senior Consultant****(1994-1996)**

Responsible for research, project management, statistical analysis, and consultation for clients in the utility and other industries. Most projects involved market research or evaluation of residential and commercial energy efficiency programs. Specialty areas included: survey design and qualitative approaches, such as focus group moderation and in-depth interviews.

HBRS**Senior Project Manager and Project Manager****(1988-1994)**

Responsible for all facets of social science research projects. Conducted dozens of evaluations of residential energy efficiency programs for electric and gas utilities throughout the US. These studies often combined process and impact evaluations and included in-depth interviews, market assessments, and surveys with program participants and nonparticipants to determine program effects. Also conducted numerous studies to determine the cost of power outages to electric customers in all sectors.

PUBLIC SERVICE COMMISSION OF WISCONSIN**Project Assistance****(1988)**

In a project position, assisted in the development of the Wisconsin Center for Demand-Side Management (now called the Energy Center of Wisconsin).



WISCONSIN POWER & LIGHT (NOW ALLIANT ENERGY)

Consultant

(1986-1988)

Provided consulting services to the evaluation section of the Electric Marketing department. Conducted market research and evaluations of commercial demand-side-management programs.

SELF RELIANCE CENTER

Residential Housing Specialist

(1983-1985)

Residential Energy Auditor and Workshop Supervisor

(1981-1983)





DULANE MORAN, MPA

PROJECT DIRECTOR

Ms. Moran brings ten years of experience in energy efficiency, policy research, and program evaluation to her work as a Project Director at Research Into Action. She directs and conducts all aspects of research and evaluation projects, including planning, research design, data collection, data analysis, and report preparation. She is well-known in the field for her extensive experience in benchmarking and comparative analysis, identification of best practices, and program logic and program theory documentation.

- M.P.A. from Portland State University and B.A. in English from the University of Oregon

RESEARCH INTO ACTION, INC.

Project Director

(2003-present)

Representative experience includes:

Program Evaluation

- **Large C&I:** Conducted evaluations of programs focused on obtaining energy savings from large customers, including those in manufacturing, food processing, and retail, and the utility customers of a power marketing agency. Assessed program interventions to encourage the participation of large customers. Examined effectiveness of program components, including energy service company (ESCO)-driven performance contracting, process efficiency incentives, engineering and audit support, and wholesale energy rate credits.
- **Small Commercial:** Managed a multi-year evaluation of a large-scale, direct-install program targeting small commercial customers. Estimated reach and remaining potential for the program, measured satisfaction of participants and trade allies, and surveyed nonparticipating business owners. Estimated free-ridership and spillover through on-site and telephone survey efforts.
- **Demand Response:** Directed process evaluations for five programs designed to encourage nonresidential customers to reduce their energy use at critical peak periods, either by paying for curtailment capacity or installing enabling technologies. Identified the strategies employed to participate in curtailment events; explored the roles and effectiveness of third-party curtailment service providers in these programs.
- **Loan Fund and Financing:** Managed three process evaluations of energy efficiency loan programs that sought to increase penetration of energy efficiency measures for commercial and residential customers. Examined the role of these programs in supporting the broader efficiency portfolio, and made recommendations for program design.
- **Local Governments:** Developed process and program logic model diagrams to inform implementation staff working to leverage the expertise of local governments in delivering energy-efficiency options to their constituents.



Logic Theory/Models and Process Flow Diagrams

- ***Portfolio-Level and Program-Level Diagrams:*** Prepared numerous logic theory and model documents for a statewide program administrator's loan fund, new construction, small commercial lighting, and large commercial programs; also developed portfolio-level logic model diagrams.

Best Practices and Benchmarking

- ***Current Practice and Lessons Learned:*** Regularly embeds best practice research into formative process evaluation efforts. This comparative research has informed financing and loan programs, compact fluorescent lighting programs, large comprehensive programs (such as standard performance contracting), and the training component of photovoltaic programs.
- ***Portfolio Benchmarking:*** Directed and conducted secondary research and comparative data analysis for three projects in which utilities sought to compare their performance in energy efficiency to that of other program administrators. Identified and obtained cooperation of benchmark partners, interpreted assumptions underlying statistics given in diverse reporting documents, cleaned and analyzed data to support analogous interpretations, and created a report comparing utilities on important metrics of effectiveness.
- ***Solar Incentive Program Design:*** As part of a process evaluation, interviewed managers of 11 photovoltaic rebate programs to identify lessons learned in training, workforce development, quality assurance, and installer management strategies.
- ***National Energy Efficiency Best Practices Study:*** Through extensive comparative research and documentation, developed best practice reports for four program areas for the National Energy Efficiency Best Practices Study: residential lighting, single-family and multifamily weatherization, training, and education programs. Also directed best practice research to inform program design choices for direct-distribution CFL programs and lighting trade-ally engagement efforts. Conducted best practice research in support of a program administrator's program-cycle planning.

Planning and Policy Support

- ***Organizational Analysis:*** Directed two projects assessing program administrators' organizational structure, policies, and reporting pathways in order to improve credibility and effectiveness of research products procured by the program administrators.
- ***Long-Term Planning and Portfolio Assessment:*** As part of a team, prepared a five-year plan for a major power authority to identify best practices and lessons learned for all aspects of the program portfolio. Informed a planning process through targeted literature review and interviews with other sister utility contacts in order to understand energy efficiency planning, program selection, incentive levels, and the organizational strategies of the conservation departments of five comparable utilities.
- ***Workforce Planning:*** As part of a national energy efficiency workforce assessment, conducted in-depth interviews with program administrators in four states regarding their energy efficiency staffing, budgets, expectations for growth, and hiring processes to inform workforce training programs throughout the United States.
- ***Focused Assessments:*** Completed research on specific program approaches, including CFL acquisition strategies, ENERGY STAR[®] appliance marketing, and hard-to-reach customers in order to identify lessons learned and to inform future program design.



ENERGY TRUST OF OREGON, INC.
Renewable Energy Intern

(2003)

Researched demonstration components of solar electric programs offered nationwide. Identified contacts, and interviewed program directors and other stakeholders about lessons learned in solar electric promotion activities. Analyzed data, drafted reports, and presented results to stakeholder groups. Defined demonstration project selection criteria and recommended structure for project selection. Recommended a framework for distributing grant funding, and drafted implementation guidelines.

MARC SMILEY ORGANIZATIONAL DEVELOPMENT
Assistant, Organizational Development

(1999-2002)

As part of the team contracted to launch Energy Trust of Oregon, Inc., provided administrative and communication support, worked with the Board of Directors and the Oregon Public Utility Commission, and facilitated stakeholder communication. Provided assistance on a variety of consulting projects for this small nonprofit consulting firm focused on organization, board development, and strategic planning for organizations involved in land and water conservation, energy efficiency and renewable resources, and community development.





ADAM GARDELS, MA

SENIOR PROJECT ANALYST

Mr. Gardels has seven years of global research experience as a social marketing analyst/strategist across manufacturing, medical, consumer products, automotive, and services industries. He is skilled in survey design, database administration and analysis, statistical modeling, behavior measurement, strategic planning/development, economic forecasting, product usage measurement, performance measurement, interviewing, writing, and report presentation. He is proficient in *SQL*, *SAS*, and *Visio*. He joined Research Into Action in March 2011.

- M.A. in Cultural Anthropology from Oregon State University, with a specialization in social marketing, particularly consumer behavior, marketing, psychology, and statistics; B.S. in Cultural Anthropology, with a minor in Journalism, from the University of Idaho

RESEARCH INTO ACTION, INC.

Senior Project Analyst

(2011 to present)

Representative experience includes:

Program Evaluation

- ➔ **Innovative Industrial Program:** Managed the first-year process evaluation of an innovative industrial program that promotes custom efficiency projects, trade-ally-driven prescriptive measures, equipment tune-ups, on-site energy project management, and executive training. Developed interview guides and survey instruments, conducted in-depth interviews, estimated program metrics, and directed analysis and report writing.
- ➔ **Commercial / Industrial Energy Efficiency Portfolio Analysis:** Managed program portfolio analysis to assist client in more effectively allocating resources across programs. Included heating retrofits and insulation measures in the lodging, assisted-living, and private education sectors, vendor-driven on-bill financing, and portfolio-wide analysis of implementation contractor performance. Composed work plans; developed survey instruments from logic models and client interviews; collected data through phone, email, and in-depth interviews; analyzed data; and wrote reports.
- ➔ **Commercial Direct Install:** Lead process analyst for a process and impact evaluation of vendor-driven lighting and water insulation direct-install programs. Analyzed qualitative and quantitative data, estimated program reach, explored reasons for nonparticipation, and measured satisfaction of participants and trade allies.
- ➔ **Renewable Energy:** Analyst for a process evaluation of a pilot feed-in tariff program for commercial and residential photovoltaic systems. Analysis was used by a power authority and utility client to balance policies with marketplace attitudes and the business climate, and to adjust the tariff rate to market-sustainable levels. Conducted field interviews with key stakeholders and vendors, qualitative analysis, real-time client reporting, and CATI programming.
- ➔ **Residential Lighting:** Lead analyst for a process evaluation report used by a utility client to manage funding and outreach activities for its downstream CFL program. Conducted interviews with CFL



dealers, participating and nonparticipating lighting showroom staff, builders, and lighting distributors; conducted qualitative data analysis; and contributed to report writing.

Planning and Policy Support

- ➔ **Energy Efficiency Workforce Effects:** Assessed economic and employment-stimulating effects of a commercial lighting and insulation direct-install program. Developed the analytic framework; generated data by surveying implementers, contractors, and utility staff, and triangulated these findings with summary tax return data.

COLUMBIA-WILLAMETTE HEALTHCARE NETWORK

Business/Market Analyst

(2009 to 2011)

- ➔ **Improved Operations, Customer Satisfaction:** Mined patient records database, using *SQL*, to measure key performance indicators; documented workflows and processes using *Visio*; developed strategies and process improvement around patient trends; coordinated marketing strategies around patient volume benchmarks; and developed cross-cultural surveys to measure customer satisfaction.
- ➔ **National Healthcare Strategic Planning:** Developed scenario-based response model to 2014 National Healthcare Implementation. Conducted interviews of executives at community healthcare centers, and worked with the organization's Chief Operating Officer on strategy.
- ➔ **Community Outreach:** Structured and helped implement Community Outreach Program to increase awareness of the organization and reduce reproductive healthcare disparities in minority communities. Provided evidence-based strategies from analysis of U.S. Census and Centers for Disease Control epidemiological data. Worked with community leaders on healthcare initiatives.

HEWLETT PACKARD

Usage Analyst / Market Researcher

(2007 to 2009)

- ➔ **Usage Analytics:** Evaluated consumer product usage via embedded monitoring technologies and analysis of data warehouse. Insights were used to forecast product usage, plan new products, deliver quarterly reporting, and focus global marketing strategies.
- ➔ **Primary Research:** Developed surveys and managed household diary studies across 14 countries used to develop insights into customer motivations and opinions shaping their level of product usage. These deep studies help companies understand the interaction between customer intention, perception, and product use behavior.

ATI (ALLEGHENY TECHNOLOGIES INCORPORATED)

Lead Researcher/Analyst

(2005 to 2006)

Additional experience and publications are available upon request.





ANNA KIM, MS, MES

SENIOR PROJECT ANALYST

Ms. Kim applies her mathematical and analytical abilities, and academic background in economics and environmental science to the analysis of energy programs. She uses her process and impact evaluation skills to execute and manage complicated projects in the industrial, commercial, and residential sectors that have diverse technical and organizational requirements. She performs analytical tasks, including billing analysis, instrument design, survey analysis, end-use saturation surveys, benchmarking, meter data analysis, load-shape modeling, cost-benefit analysis, and demand-side management forecasting. She is skilled in *SPSS*, *R*, *SAS*, and other statistical packages; *End Use Forecaster*; and *DSM Portfolio Pro*. She joined Research Into Action in March 2011 and has three years' experience in energy efficiency research.

- Master of Economics (M.S.) from Portland State University, Master of Environmental Studies from The Evergreen State College, and B.A. in Environmental Science from the University of California, Berkeley.

RESEARCH INTO ACTION, INC.

Senior Project Analyst

(2011-present)

Representative experience includes:

Program Evaluation

- **Portfolio Evaluation:** Managed portfolio evaluation for a utility's 30 programs in the commercial, residential, and irrigation sectors, and interviewed staff members and reviewed portfolio for best practices.
- **Large Commercial/Industrial (C&I):** Interviewed and analyzed C&I participants and nonparticipants for a power authority's large C&I program to determine the effectiveness of program delivery and compare multiple program approaches. Examined issues such as the effect of repeat participation on project size, the program's effect on job creation, and challenges associated with separate implementation of the same program in multiple geographic locations.
- **C&I Custom and Prescriptive:** Managed a multi-year process evaluation of a utility's primary C&I program that was trade-ally-driven and provided both custom and prescriptive options. Designed data collection instruments, conducted interviews with program staff and trade allies, coordinated administration of participant surveys, analyzed data, and contributed to the report.

Market Characterization and Market Research

- **Distributed Generation:** Interviewed designers and installers of distributed generation and combined heat and power equipment for a program sponsored by a state energy authority. Discussed with participants their decision-making process regarding and experiences with systems incorporating combined heat and power with power generation from microturbines, fuel cells, organic Rankine cycles, reciprocating engines, and large steam and gas turbines. The project explored market characteristics and trends and prepared the client to meet the demands of this evolving market.



- **Multifamily:** Reviewed residential multifamily business models and papers on energy efficiency decision-making, which provided literature review background for a paper.

Behavioral Impacts and Market Effects

- **Market Transformation Energy Impacts:** Managed the billing analysis of a commercial real estate market transformation program to generate an estimate of program-wide electricity and gas savings. Used multiple data sources to create savings models for statistical estimates of savings. Assessed whether the program administrator had sufficient data to support billing analysis to estimate savings from a related commercial real estate endeavor.
- **Single-Site Billing Analysis:** Conducted a billing analysis to estimate electricity and gas savings from a hospital facility participating in a market transformation program.
- **New Technology Pilot Study:** Evaluated an economizer pilot study that used two new models that were being introduced to the region. This research explored different uses of cooling technology.

Planning and Policy Support

- **Net Savings Definitions and Research:** Conducted interviews with program evaluation stakeholders (including experts with regulatory agencies, complying companies, and complying companies' consultants) about net savings issues in individual states and jurisdictions. Reviewed completed evaluation studies to assess net savings definitions used in evaluations conducted for Northeast program administrators. The study assisted the Regional Evaluation, Measurement, and Verification Forum to make progress toward its goal of improving and ensuring the understanding, transparency, and credibility of electric and gas energy efficiency resource programs implemented in the Northeast and Mid-Atlantic regions.
- **Measurement and Verification Protocols:** Conducted technical edits of sampling and regression guides for a federal power administrator's suite of measurement and verification (M&V) protocols; edited for clarity and completeness of instructions.

THE CADMUS GROUP

Analyst

(2009-2011)

Conducted research projects in the residential, commercial, industrial, and agricultural sectors. Managed process and impact evaluations, wrote survey instruments, conducted surveys and interviews, prepared and analyzed survey and meter data, generated graphs and tables, and wrote reports. In addition, prepared lists of measures, conducted billing analyses, generated load shape modeling, performed building modeling, conducted engineering and cost-benefit analyses, and benchmarked research results. Specific projects included: a five-year energy efficiency plan for the Salt River Project; analyses of winter and summer loads for General Electric Company in Libya; and evaluations of low-income multifamily, other residential, and irrigation rebate programs. Clients included: Ameren Missouri, Bonneville Power Administration, ConEd, Consumers Energy, California Public Utilities Commission, DTE Energy, Idaho Power, National Grid/Unitil, NYSERDA, Northwest Energy Efficiency Alliance, Ontario Power Authority, PacifiCorp, PECO, PPL, Puget Sound Energy, Rocky Mountain Power, Salt River Project, and Tacoma Power.





SUSAN LUTZENHISER, MS

SENIOR PROJECT ANALYST

Ms. Lutzenhiser has more than 25 years of experience in project management, research plan development, survey design, and data analysis focused on the patterns of behavior that underlie the demand for energy. Her work includes program evaluation, market research, and special projects determining the most effective aspects of energy efficiency programs. Her sociology background contributes to the design of studies that explore behavioral and demand response.

- M.A. and a B.A. in Sociology from the University of Montana; additional graduate studies in survey research methodology, demography, and higher education administration

RESEARCH INTO ACTION, INC.

Senior Project Analyst

(2007 to present)

Representative experience includes:

Program Evaluation

- ➔ **Commercial and Industrial (C&I):** Managed annual process evaluations for the first four years of a large C&I program. Developed multi-year process evaluation work plans. Directed data collection comprising interviewing and surveying trade allies, participants, and program staff. Directed analysis, report writing, and presentation of findings.
- ➔ **Home Performance, Mobile Home, and Multifamily:** Designed and conducted process evaluations of Home Performance programs. Identified motives and barriers to participation, and evaluated the effects of contractor training, incentive structures, and verification protocols on project volume. Evaluated the ability of general contractors and subcontractors to partner and work together. Evaluated multifamily retrofit and mobile home programs.
- ➔ **Free-Ridership Estimation:** Compared different approaches to estimating free-ridership by reviewing assumptions underlying algorithms and comparing results. Developed and tested alternative new methodologies focused on program-specific, rather than measure-specific, calculations. Continuously refined estimation approaches based on program applicability.
- ➔ **Research and Development (R&D):** Designed an evaluation of an energy-related R&D solicitation process. Assessed solicitation development, at portfolio- and solicitation-specific levels, to identify the effects of procedures on proposal submission. Developed interview guides. Analyzed complex solicitation files to categorize appropriately the status of each applicant.

Market Characterization and Market Research

- ➔ **Medical Sector:** Conducted analysis of current market baseline energy efficiency and organizational characteristics in the medical sector. Identified barriers to and explored strategies for increasing commitment to energy efficiency. Findings were used to inform market transformation program strategies.



- ➔ **Residential Market Trend Evaluation:** Examined national behavioral and attitudinal trends regarding energy efficiency, energy conservation, and demand response by assessing longitudinal residential survey data collected biennially since 2002. Explored statistically significant relationships to determine notable changes in behavioral and attitudinal trends.

Behavioral Impacts and Market Effects

- ➔ **Behavioral Impacts and Experimental Design in the Residential Sector:** Directed a collaboration of researchers, utility staff, an advisory group conducting an economic analysis (on price response), and a behavioral research group on a unique time-of-use rate analysis. Collaborated on the design of a multi-pronged approach that included economic, social, behavioral, and experimental research components. Drafted the research proposal, and directed the two-year implementation of these components to test the impact of passive and active information on customer response. Designed and implemented three survey waves and managed data streams, working with both the utility and the research team.
- ➔ **Home Energy Audits/Assessments:** In collaboration with both a university and national laboratory, managed a project to assess residential customers' interest in comprehensive home assessments. Interviews focused on homeowners' pre- and post-audit perspectives on required upgrades and on the influence of the Home Energy Score. Assessed the impact of home assessment reports on homeowner energy upgrade decisions.

Planning and Policy Support

- ➔ **Workforce Planning:** Created a matrix of the past and current energy-related labor market. Projected the size of state and national energy services labor sectors for five- and ten-year periods based on scenarios that included expanding public-goods budgets collected by utility companies and increasing government support for energy efficiency and renewable energy initiatives.
- ➔ **Home Energy Labeling:** Managed two projects using targeted in-depth interviews and online surveys to examine Washington State and Oregon State real estate professionals' views and use of green/energy-efficient home labels, including how and when real estate agents discuss energy efficiency with clients during the selling and buying process.
- ➔ **Building Operator Certification Program Impacts:** Directed a literature review of building operator certification (BOC) evaluation reports to summarize program impacts and lessons learned. Developed a matrix for evaluating and comparing savings metrics across studies.
- ➔ **Enhanced Inspection Planning:** In support of utility efforts to establish performance metrics for all portfolio programs, developed key metrics for tracking the performance of program activities and measuring outcomes.

LUTZENHISER ASSOCIATES

Project Co-Principal

(2003 to 2007)

Additional experience and publications are available upon request.





MARNIE MCPHEE

COMMUNICATIONS SPECIALIST

Ms. McPhee has been working with Research Into Action since 1997, first as a consultant, and since January 2009, as a staff member. She designs survey instruments; conducts primary research for a variety of projects; and edits reports, presentations, and other documents. She also provides communications and marketing services. She has over 30 years' experience as a freelance writer and editor, specializing in energy efficiency, renewable energy, resource conservation, green design and construction, cutting-edge environmental products and services, and organic agriculture. Her work reflects her long-term commitment to sustainable approaches to energy, food, and shelter.

- B.A. in French from DePauw University

RESEARCH INTO ACTION, INC. Communications Specialist

(2009-present)

Representative experience includes:

Technical Writing and Editing

- ➔ **Technical Writing:** Worked with a utility's resources conservation management team to edit the utility's multi-year energy conservation plan.
- ➔ **Editing:** Provides technical editing for reports, presentations, and other project documents. Specializes in merging copy from multiple authors into cohesive documents. Edited reports for evaluations of residential lighting programs, energy-efficient building practices initiatives, a commercial/retail/light industrial energy efficiency/demand response program, an industrial process efficiency program, and a program that offered incentives for prescriptive and custom commercial energy efficiency improvements. Also edited a comprehensive evaluation and market assessment of a commercial and industrial energy efficiency program, and four statewide residential energy awareness and perceptions studies.

Program Evaluation

- ➔ **Commercial/Industrial - Survey Implementation:** Conducted surveys with: managers of grocery stores, hospital facilities, commercial real estate, multifamily and affordable housing properties, and utility energy efficiency programs; participants in an industrial process efficiency program; participants in a commercial/industrial/institutional peak load reduction program; implementation and program support contractors serving a nonresidential energy efficiency program; and participants in a pilot commercial dishwasher sprayer pilot program. Interviewed program staff, and program applicants and non-applicants for a process evaluation of a renewable energy open solicitation program targeting commercial, industrial, and institutional customers.
- ➔ **Residential - Survey Implementation:** Surveyed participants in a pilot residential ductless heat pump program; participants in a low-income residential home performance and energy efficiency education program; participants in residential heat pump, solar electric, and solar hot water programs; residential customers before and after they received a home energy audit through a program that linked the audits to incented energy efficiency improvements; nonparticipants in a program that



provided on-bill financing for residential energy efficiency improvements; and realtors about the market for energy efficiency in new and existing homes.

Market Characterization and Market Research

- ➔ **Needs Assessments:** Edited survey instruments and conducted extensive primary research with union and trade association representatives for a national energy efficiency workforce study. Conducted telephone interviews with utility energy efficiency program managers to assess Northwest utilities' perceptions of a regional commercial energy efficiency program.

SELF-EMPLOYED

Freelance Writer and Editor

(1976-2009)

- ➔ Provided copy writing and editing services. Selected clients: City of Portland Office of Sustainable Development, ECONorthwest, Energy Market Innovations, Energy Trust of Oregon, Franklin Institute, Kaiser Permanente, Nike, Northeast Energy Efficiency Partnerships, Northwest Energy Efficiency Alliance, Oregon Department of Fish and Wildlife, Oregon Health & Sciences University, Oregon Museum of Science and Industry, Organic Valley, Organically Grown Company, Portland Brownfields Initiative, Portland Community College, Portland Public Schools, Reed College, Research Into Action, Rural Development Initiatives, Solar Energy Association of Oregon, The Climate Trust, and Willamette Valley Livability Forum.

Freelance Journalist

(1976-2009)

- ➔ Author of more than 400 articles with special emphasis on energy conservation and energy efficiency, renewable energy, resource conservation, "green"/sustainable businesses, cutting-edge environmental and consumer products and services, natural science, organic agriculture, economic development, recreation, travel, and the food industry. Selected publications in which her articles have appeared include: *BioCycle*, *Horizon Air*, *InBusiness*, *National Geographic Traveler*, *Natural Foods Merchandiser*, *Oregon Business Magazine*, *Oregonian*, *Organic Gardening*, *Popular Science*, and *Solar Today*

ORGANICALLY GROWN IN OREGON

Founder and Executive Director

(1988-1993)

SELF-EMPLOYED

Organic Farmer

(1981-1989)

PORTLAND SUN

Co-Founder and Business Manager

(1978-1981)

WILLAMETTE WEEK NEWSPAPER

Circulation and Promotion Manager

(1974-1978)

Additional experience and publications are available upon request.



APPENDIX B

GDS Team List of Related Projects

IMPACT EVALUATION QUALIFICATIONS

Since GDS's inception, our team has been engaged in multi-phase impact evaluations of program energy and peak demand savings. GDS is currently the lead contractor in two impact evaluations: one for the New York State Energy Research and Development Authority (NYSERDA) where key GDS staff are quantifying the energy savings associated with NYSEDA's Focus on Institutions and Commercial Real Estate Programs, and the other for the Vermont Department of Public Service (VDPS) where GDS is leading a combined impact, process and market assessment evaluation of Efficiency Vermont's Home Performance with ENERGY STAR Program and Vermont Gas System's Home Retrofit Program. GDS is also currently under contract (as a subcontractor to West Hill Energy) for a two-year project entitled "Energy Efficiency Measurement and Verification: Electric Demand Metering and Analysis to Assess Impacts for Forward Capacity Market Participation" which has the goal to verify that Efficiency Vermont (EVT) and Burlington Electric Department (BED) winter and summer kW reductions meet the New England ISO standards established for the Forward Capacity Market (FCM). This project involves pre and post inspection sampling for 80 energy efficiency projects.

Recently, GDS was retained as a subcontractor to develop and implement an EM&V framework for impact evaluations for energy efficiency and renewable energy programs. This project is expected to last into 2013. The proposed approach includes developing the Framework for the Annual Savings M&V and designing an EM&V Plan which ensures that the District Department of Environment (DDOE) and DC SEU program staff receive the information they need at the individual program level. The GDS Team's strategic evaluation examines the organizational structure developed to deliver the programs, the role each program plays in the total portfolio, and the possible interactions between these programs and others that may target the same markets.

Austin Energy retained GDS in the summer of 2011 to conduct comprehensive impact evaluations for several of this utility's energy efficiency and demand response programs. GDS completed impact evaluations on the Home Performance with Energy Star Program (HPwES), the Multi-Family Program, the Weatherization Assistance Program (WAP), and the AE's commercial and industrial demand response programs.

Earlier in 2012, GDS completed an impact evaluation of NYSEDA's residential new construction program. Key elements of this evaluation included: database assessment; engineering review; statistical billing analysis impact evaluation; customer surveys, site visits; and assessment of impact issues. Results may be used to modify initial energy savings estimates for NYSEDA's future energy efficiency programs. As part of this contract, GDS was responsible for performing surveys of market actors (e.g. builders, non-participating builders, homeowners of ENERGY STAR Homes) as well as conducting on-site inspections of work performed as part of the program.

In 2008, GDS assisted the Vermont Department of Public Service (as a subcontractor to West Hill Energy) with the verification of Efficiency Vermont's (EVT) savings and the ongoing review of prescriptive and non-prescriptive savings. GDS' focus is primarily on verifying the energy and demand savings associated with non-prescriptive custom commercial projects. This involves a thorough review of program files and analytical tools used to estimate savings as well as discussions with EVT program staff to address outstanding issues and fill in missing information.

GDS provided consulting services to NYSEDA's Large Impact Savers program in 2008. GDS conducted Measurement and Verification work of Georgia-Pacific and Rockland County Sewer Technical Assistance reports and any resulting projects.

In 2008, GDS assisted the Vermont Department of Public Service (as a subcontractor to West Hill Energy) with the verification of Efficiency Vermont's (EVT) savings and the ongoing review of prescriptive and non-prescriptive savings. GDS' focus is primarily on verifying the energy and demand savings associated

with non-prescriptive custom commercial projects. This involves a thorough review of program files and analytical tools used to estimate savings as well as discussions with EVT program staff to address outstanding issues and fill in missing information.

From 2007 to December 2009, GDS provided impact evaluation services as part of a broader contract with the New York State Energy Research and Development Authority (NYSERDA). GDS was hired to assist with cost-effectiveness analyses on all quantifiable energy efficiency and renewable resource programs being delivered through their New York Energy SmartSM portfolio of programs.

From June 2005 to December 2005, GDS completed an impact evaluation of New Hampshire's Home Energy Assistance Program. GDS was hired to conduct an impact evaluation of New Hampshire Electric Utilities' Home Energy Assistance Program that serves income-eligible residential customers throughout New Hampshire. GDS' role involved a statistical billing analysis of all program participants, a comprehensive engineering review of energy savings estimates and associated methodologies and software. GDS also conducted on-site assessments of a sampling of participants.

GDS was retained (as a subcontractor to Megdal & Associates) to complete a statistical billing analysis of the energy savings in LIPA's residential low-income energy efficiency program. GDS prepared all of the data for inclusion in the analysis and conducted all regressions necessary to draw conclusions. In 2004 GDS was retained to complete a detailed engineering analysis of the electric and natural gas energy savings in KeySpan Energy delivery's residential low income energy efficiency program. In 2003 GDS was also retained to complete a statistical billing analysis of the electric and natural gas energy savings in KeySpan Energy Delivery's residential weatherization and insulation program.

In 2002 GDS was hired by Northeast Utilities to perform an impact evaluation of its 2000 Municipal Buildings program. Key elements of this evaluation included: sample design; on-site monitoring and verification of installed measures; verification of tracking system accuracy; engineering review of savings algorithms; impact evaluation; customer surveys; and assessment of impact issues. Results from the analysis were used to reconcile actual program results under Connecticut and Massachusetts regulatory reporting requirements. In addition, results were used to modify initial energy savings estimates for Northeast Utilities' municipal sector energy efficiency programs.

In 1999, GDS was hired (as a subcontractor to Megdal & Associates) by NSTAR to perform an impact evaluation of its 1999 Residential High Use energy efficiency program. Key elements of this impact evaluation included: database assessment; engineering review; statistical billing analysis impact evaluation; customer surveys, site visits; and assessment of impact and process issues. Results from the analysis were used to reconcile actual program results with Massachusetts DTE-approved performance incentive metrics as well as for use as the basis for other regulatory reporting requirements. In addition, results were used to modify initial energy savings estimates for the Company's future energy efficiency programs. As part of this contract, GDS was responsible for performing an engineering review of NSTAR's program as well as conducting on-site inspections of work performed as part of the program.

The engineering review was conducted as a process of understanding, documenting, and comparing the available gross savings estimates of measure savings from the NSTAR tracking system to documented savings estimates for similar efforts. The primary elements included in the review were:

- Algorithms used by the implementation contractors and NSTAR;
- Tracking system information;
- Comparison with algorithms in similar efforts;
- Documented and measured savings from similar efforts; and,
- Input from the participant telephone survey on usage and occupant characteristics into the NSTAR algorithms.

The site visits were conducted to fulfill three primary purposes: 1) to examine and verify quality of installation; 2) to check and assess potential lost opportunities (measures that would have been cost-effective had they been identified and implemented); and 3) to investigate customers with anomalous billing data as found through a billing analysis.

In 1997 and 1998, GDS completed a detailed impact evaluation of the peak demand savings of the residential air conditioning and electric water heating cycling programs of the East Texas Electric Cooperative (ETEC). GDS performed all tasks on this evaluation, including development of the research approach, design of survey instruments, development of sampling plans, end use metering, data analysis and report writing.

PROCESS EVALUATIONS AND MARKET ASSESSMENTS

GDS has wide-ranging experience in process evaluations and market assessments. Recent work highlights GDS's breadth of experience and capabilities in these aspects of Demand-Side Management and Energy Efficiency. This year, GDS was hired, as part of a larger project evaluation team, to provide logic model and other requested support for process evaluation and market assessment and characterization services for the Systems Benefit Charge (SBC) New York Energy Smart Program, the Energy Efficiency Portfolio Standard (EEPS), Regional Greenhouse Gas Initiative (RGGI), Green Jobs Green New York (GJGNY), Statutory Research and Development, and other program portfolios (possibly including the five-year technology and market development [T&MD] portfolio recently approved by the Public Service Commission). These varied portfolios all seek to reduce the energy consumption in New York household, business, and government- and nonprofit-sector buildings. The work requested will help NYSERDA by: 1) reviewing the delivery and operations of these programs; 2) assessing and making recommendations to improve satisfaction with the programs; 3) providing input to improve the efficiency and effectiveness of the programs; 4) characterizing the market in which the programs operate and for the technologies offered; 5) clarifying and documenting the program theories and logics; 6) assessing the market and how customer and market actors respond to the programs; and 7) tracking program progress indicators. GDS's responsibilities in these efforts will focus on continued program theories and logic modeling support and provision of market characterization and assessment support where needed.

In April to July 2007, GDS was retained by the Bonneville Power Administration to conduct an assessment of their Non-Wires Solutions initiative development process and the current state of the initiative. The BPA Non Wires Solutions Program assesses the feasibility of energy efficiency and demand response programs as an alternative to building new electric transmission lines in the BPA service area. GDS reviewed program materials and reports, designed an interview guide and conducted in-depth, interviews with key BPA staff. Our analysis identified program strengths, weaknesses and potential improvements in key program areas including design, implementation, planning, cost impact & allocation and resources.

In 2006-2007, GDS was a lead contractor hired to assist the New England State Program Working Group to develop consistent and/or common regional measurement and verification (M&V) protocols for energy efficiency resources to be used as input to the development of M&V Standards for the ISO-NE Forward Capacity Market Measurement and Verification Manual. Key Tasks included: development of common M&V methods, development of common values/consistent approaches for measuring peak demand reduction values, and development of default measure life values for select residential and commercial/industrial energy efficiency measures. A final report was published by GDS in the summer of 2007.

Between March 2004 and June 2007, GDS was part of a five-organization (Aspen Systems, GDS Associates, LK Goldfarb Associates, Vreeland, APT) team that designed and implemented the MPUC's Efficiency Maine Residential Lighting Program. In April and May of 2004, GDS completed a series of four

focus groups with non-participants in this program to learn more about market barriers that prevent homeowners from installing energy efficient lighting in their homes in Maine. The final focus group report for this project was completed in May 2004. GDS developed a Quality Assurance Plan for all data collection and analysis for this program.

GDS also conducted the evaluation of residential retail lighting product promotions in Connecticut, Massachusetts, Rhode Island, and Vermont. The evaluation was conducted for the Energy Conservation Management Board (ECMB) as well as the United Illuminating Company (UI) and Connecticut Power and Light (CL&P) in Connecticut; the Cape Light Compact, NSTAR, National Grid, and Unitil in Massachusetts; National Grid in Rhode Island; and Efficiency Vermont in Vermont. The evaluation was conducted by a team led by Nexus Market Research, Inc. (NMR) with RLW, Inc. (RLW), and GDS Associates (GDS) serving as subcontractors. Project tasks assigned to GDS included: on-site surveys and data collection, including installing time-of-use lighting loggers and analyzing metered data to assess energy savings during a full year as well as summer and winter demand savings coincident with the ISO period.

In 2008, GDS completed a detailed market assessment and baseline study for Efficiency Maine for the residential new construction market. In 2007 GDS completed a detailed market assessment and baseline study for the Maine residential lighting market for Efficiency Maine.

Between 2000-2003 GDS conducted work for the Vermont Department of Public Service (DPS), evaluating a statewide portfolio of energy efficiency programs targeted to the Commercial and Industrial market sectors. A detailed market characterization and baseline assessment report was developed as a key deliverable for this project and included recommendations (and baseline values) for a number of key indicators for tracking continued program success. Other tasks in this project included: secondary research on C&I program activities and regulations in VT; and market characterization and assessment interviews.

GDS subsidiary was retained by the Massachusetts Gas DSM Collaborative (Bay State Gas, Berkshire Gas, Boston Gas, Colonial Gas, COM/Gas, Essex Gas, Fall River Gas) to develop market assessment and baseline characteristics for four market transformation programs in the Boston Gas service area. For this project, GDS conducted site surveys, a mail survey of purchasers of new homes and gas heating equipment, depth interviews by phone with market actors, and conducted content analysis of newspaper and business to business publications. GDS created over 270 indicators of market transformation for the four programs and has completed baseline and Year 2 measurements. GDS was the prime contractor, managed a large research budget, and managed a team of several subcontractors, including Aspen Systems, B&B Resources, Burrelles, CMP International, Data Star, ERS, Shel Feldman Management Consulting, and Megdal & Associates. This was a large project having multiple tasks and multiple subcontractors, covering residential and commercial market segments.

Between 1998 and 1999, GDS was hired by Boston Edison Company to estimate the future market penetration and market effects of energy efficient residential clothes washers and commercial/industrial/institutional premium efficient motor installations using a Delphi survey technique. Primary activities included: identification and recruitment of 8 expert panelists for each technology; development of base case technology descriptions, moderate and aggressive intervention scenarios for each technology; design of survey questionnaires; implementation and compilation of survey results; and final report preparation.

In the fall of 1997 GDS was hired by Boston Gas Company to develop market assessment plans for the Company's new market transformation programs, to develop an overall evaluation plan for these programs, and to develop rigorous indicators of market effects. This work was completed in the fall of 1997. GDS was the prime contractor. Boston Gas Company then retained GDS to track and report on these indicators in 1998, 1999, and 2000. GDS completed this work and reported results to the Company

in a series of technical reports, and presented the results at the ACEEE summer Study on Building Energy Efficiency.

Impact and Process Evaluations

GDS has solid experience evaluating program energy and peak demand savings and cost-effectiveness of energy efficiency measures/programs and demand response programs. GDS has been serving since 2009 as the prime contractor for the Statewide Evaluation of Pennsylvania's Act 129 energy efficiency programs being implemented by seven investor-owned utilities in Pennsylvania. As the Statewide Evaluator, the GDS Team is providing a review of utility process and impact evaluations and verifying the accuracy of kWh and kW savings report by seven electric distribution companies in the State. The GDS Team is also providing a assessment of the methodologies being used by each EDC, and a review of cost-effectiveness calculations. The GDS Team is providing quarterly process updates as well as biannual improvement workshops with the EDCs. The annual reports produced provide the Commission with recommendations for EE&C plan and program improvements. Additionally, the GDS Team has provided a public web accessible database and reporting system for the Commission's website so that the general public may be kept abreast of the impacts of the EE&C by program and sector. As the statewide Contractor the GDS Team will also produce in 2012 an accurate assessment of the future potential for energy savings through a market assessment study. While all of these tasks are related, they each have distinct goals:

- Impact evaluation reviews seek to quantify the energy, demand, and possible non-energy impacts that have resulted from demand-side management (DSM) program operations;
- Process evaluations seek to describe how well those programs operate and to characterize their efficiency and effectiveness; and
- Market Characterization and Assessment seeks to determine the attitude and awareness of market actors, measure market indicators and identify barriers to market penetration.

The Maryland Energy Administration retained GDS for the period 2010 to 2013 to conduct ongoing impact evaluations of each Maryland Energy Administration energy efficiency program from both a process and impact standpoint. GDS is responsible for determining and reporting program impacts (demand and energy savings) and cost-effectiveness according to the Total Resource Cost Test (TRC). The GDS Team also provides biannual improvement and education workshops for the MEA staff and program implementation contractors. These workshops focus on improvements made to the EM&V Plan and "lessons learned" from the impact and process evaluations conducted by the GDS Team. The annual reports produced will provide MEA with recommendations for EM&V Plan and program best practices.

In January 2012, GDS was hired as lead contractor of a larger team to perform a multifaceted evaluation of Vermont's residential (existing single-family homes) energy efficiency retrofit programs. In addition to an impact evaluation component to assess both thermal (regulated and unregulated fuels) and electric energy savings, this project includes important process evaluation and market assessment activities. Through a combined effort under this single project, two separate programs are being evaluated: The Vermont Gas System's Home Retrofit (HR) Program, and Efficiency Vermont/Burlington Electric Department's (EVT/BED's) Home Performance with ENERGY STAR® (HPwES) program. GDS expects to complete this project in December 2012.

In 2002, GDS was retained to perform a process, market, and impact evaluation of NEEP's Building Operator Certification (BOC) program. Key elements of GDS' role in this evaluation included: database and document review; survey instrument design; sample selection; and savings impact analysis.

As part of a larger contract with Fitchburg Gas and Electric in Massachusetts, GDS led the design and implementation of a process, awareness, and quality verification assessment of the Company's ongoing Small Commercial and Industrial and low income electric energy efficiency program.

Logic Model Development

Starting in May 2007 through the present time (and continuing until 2015 as part of a new program evaluation team), GDS has been retained by NYSEERDA to assist their in-house program evaluation staff in the following areas: (1) characterizing markets, (2) developing market studies to attribute effects to NYSEERDA's programs, (3) collecting market information as it affects customer response to programs, (4) tracking market progress indicators and (5) developing logic models and design matrices. A key component of this effort includes identification of key program activities, inputs and potential external influences, along with specification of anticipated outputs, short-, intermediate- and long-term outcomes and associated measurement indicators from which progress toward key goals can be assessed.

In 2005, GDS was retained by the Florida Public Service Commission to develop program logic models for a portfolio of proposed residential and commercial gas energy efficiency programs. Work included: identification of key program elements (inputs, activities, anticipated outputs, short, intermediate and long-term outcomes, and potential external influences) based on gas utility programs being implemented in Massachusetts and New Hampshire. Following Program Design and Implementation staff review, logic model diagrams were developed and vetted. Finally, key measurement indicators were identified for potential prioritization and use in future evaluation activities to help assess progress being made toward achievement of key program outcomes and goals. Similar work was conducted for Union and Enbridge Gas companies in Canada in 2009 and 2010.

In 2003, GDS led the design and implementation of a process, awareness, and quality verification assessment of Fitchburg Gas and Electric Light Company's ongoing Small C&I and Low-Income energy efficiency programs. Key project deliverables for process work included: performance and completion of secondary program and database research; draft and final interview guides for depth interviews with program design and implementation staff; summary of program design including results from depth interviews and flow diagram showing program logic and key delivery mechanisms. For awareness work, deliverables included: draft and final telephone survey guides and completed assessment of participation and customer satisfaction. Quality control deliverables included: draft and final site-visit survey guides and write-up of methodology and results/findings from on-site inspections.

Technical Assistance and Regulatory Support for Evaluation, Measurement and Verification

GDS's experience also encompasses technical assistance and regulatory support for state-wide regulatory agencies and other organizations that oversee utilities' activities. The GDS Team has provided evaluation, measurement, and verification services for these organizations. Some of GDS' most recent M&V work demonstrates our company's capacity to apply our expertise to prescriptive and non-prescriptive programs.

GDS Consultants are familiar with International Performance Measurement & Verification Protocol (IPMVP). GDS Principal, Joe Danes, and GDS Project Engineer, Richard Beard are accredited as Certified Measurement and Verification Professionals and along with other GDS staff hold strong working knowledge of the IPMVP guidelines. GDS has solid experience in developing and reviewing M & V protocols/plans, the development of Technical Reference Manuals for major efficiency programs and a thorough understanding of deemed savings methodology. GDS consultants and staff have a strong working knowledge and familiarity with the California DEER and NYSEERDA Deemed Savings Database tools, as well as Efficiency Maine and Efficiency Vermont's Technical Reference Manuals and the State of Connecticut Program Savings Document.

In 2012, The North Carolina Utilities Commission retained GDS to provide technical and regulatory support for evaluation, measurement and verification oversight of the EM&V studies produced by Duke

Energy and Progress Energy. GDS is responsible for reviewing and critiquing all of the evaluation plans and evaluation studies produced by these two investor-owned utilities between 2012 and 2013.

Texas Municipal Utility Austin Energy retained GDS Associates in March 2011 to provide technical demand-side management consulting services. In an effort to maximize Austin Energy's resources in delivering the energy efficiency, demand side management, renewable energy, smart grid, demand response, and the associated carbon reduction and other environmental benefits, Austin Energy's staff will, from time-to-time, require specific consulting services. The services GDS is providing will assist Austin Energy to plan, evaluate, justify, and propose programs and strategies to achieve Austin Energy's goals.

As a research grant, GDS began providing We Energy services in 2011 related to the measurement and verification of small wind energy systems. The project is testing site assessment procedures and findings against actual wind speed measurement and actual energy production. The project utilizes GDS's weather normalization technique and wind turbine analysis software to compare site assessment best practices with real world results.

The Georgia Public Service Commission retained GDS in 2009 to provide technical and regulatory EM&V support for the review and critique of program evaluation plans, quarterly progress reports and program impact and process evaluations produced by Georgia Power Company during the period from 2010 through December 2012. GDS is responsible for reviewing and critiquing all of the evaluation plans and evaluation studies produced by Georgia Power Company.

In 2010, The Missouri Department of Natural Resources retained GDS to provide technical and regulatory support for evaluation, measurement and verification oversight of the integrated resource plans and EM&V studies produced by investor-owned utilities in Missouri. GDS is responsible for reviewing and critiquing all of the IRPs, evaluation plans and evaluation studies produced by these investor-owned utilities in Missouri.

The Florida Public Service Commission retained GDS to review, assess and critique the technical, economic, and achievable potential studies performed by Itron for the seven Florida electric utilities regulated by the Florida Energy Efficiency and Conservation Act of the Florida legislature. GDS did a detailed review of these seven studies as well as a combined statewide technical potential study and prepared comprehensive recommendations on the energy efficiency cost-effectiveness tests that are consistent with the revised FEECA statute and that should be utilized by the Commission in this proceeding to establish new energy conservation goals for the FEECA utilities. GDS also developed recommendations for revisions to the energy efficiency goals proposed by each of the FEECA utilities; made policy recommendations pertaining to the implementation of the changes to the FEECA statutes made in the 2008 legislative session; addressed the need for utility performance incentives or penalties relating to demand-side management (DSM); and addressed whether the Florida utilities needed to have goals for efficiency investments on the supply-side of their operations (across generation, transmission, and distribution systems). GDS also examined the appropriate mechanism for increasing the development of demand-side renewable energy resources. GDS developed direct testimony on all of these issues and presented expert witness testimony before the Commission on these issues in August 2009.

In 2006-2007, GDS provided technical assistance to National Grid to support the implementation and evaluation of energy efficiency projects. Services include field measurement, review and independent verification of energy efficiency measure recommendations and associated savings estimates for multiple commercial and industrial facility projects being implemented throughout National Grid's service territory.

From 2007 through 2011, the New Hampshire Business Resource Center retained GDS to provide technical assistance for its business clients to carry out comprehensive energy audits, provide recommendations for energy conservation opportunities, evaluate existing technologies, provide consultation and professional evaluations of emerging technologies for renewable and alternative energy sources and bio energy products, and to assist with USDA energy efficiency grant applications.

GDS was responsible for providing data collection, analysis, and report writing services to NYSERDA in support of their overall evaluation efforts for the first 3 years of the New York Energy SmartSM program effort (1999 through 2001). The GDS Team continued to help NYSERDA for the period July 2001 through the present date, in a number of critical evaluation areas associated with their portfolio of state-wide energy efficiency, renewable resource and research & development programs including: design and performance of key process and impact evaluations, market characterization and baseline assessments; program-specific survey instrument review and modifications; savings methodology reviews; measure, program, and portfolio-level benefit/cost model design and analysis; coincident peak demand reduction assessments; data needs identification and collection support; program progress and initial causality assessment; other data analysis and annual program status and evaluation report development support. GDS remains part of a project team that will continue to provide these, and related services for NYSERDA through the year 2015 and beyond.

Development of Technical Reference Manuals

From 2007 to 2011, GDS developed the Technical Reference Manual for Efficiency Maine's energy efficiency programs. This detailed manual provides documentation for the costs, energy savings and useful lives of all energy efficiency measures offered in Efficiency Maine programs. GDS is now responsible for updating this manual on an ongoing basis. In 2008, GDS also developed a Technical Resource Manual for Ameren Illinois.

Other

The GDS Team has engaged in other projects that complement our experience with impact and process evaluations, market assessments, logic model development, and evaluation, measurement and verification assistance and support.

GDS Associates is part of a team that has been designing and implementing state-wide energy efficiency programs for the commercial, agriculture, and industrial sectors in Ameren Illinois service territory since 2008. GDS is providing technical services to businesses facilities in Illinois relating to the economic feasibility and energy savings of energy efficiency measures. GDS provides program design, on-the-ground program implementation, data tracking, call center and administrative support for the various programs.

In 2007, GDS conducted a review of Demand Resource qualification packages for completeness and compliance with the Market Rules and the ISO-New England Manuals for ISO-New England. Each qualification package reviewed included assessment of the following items: Project description; Source of funding; Measurement and Verification Plan; Customer acquisition plan (including the resource's critical path schedule); and Capacity Commitment Period election.

From May 2004 to December 2006, GDS was hired by PSNH to assist in delivering targeted engineering services to commercial and industrial (C&I) customers in conjunction with PSNH's energy efficiency programs. The range of technical assistance includes conducting scoping studies, focused feasibility studies, comprehensive facility services and whole building assessments. In addition, GDS provides quality assurance services, energy efficient project implementation assistance, and additional technical assistance and engineering services as needed.

The Massachusetts JMC retained GDS in 2005 to conduct 90 on-site inspections of newly constructed homes in Massachusetts for the purposes of collecting energy efficiency characteristics of new homes. This information has been used to adjust the definition of the user defined reference home which is instrumental to the delivery of the Massachusetts ENERGY STAR Home Program.

BC Hydro retained GDS in February 2002 to conduct a comprehensive assessment of the appropriateness and reasonableness of the proposed program plans, processes, and procedures included in the BC Hydro DSM Ten-Year Plan. BC Hydro's plan called for spending CAD \$600 million over ten years to achieve annual savings of 3,500 GWh and over 400 MW of capacity by the year 2012. GDS reviewed program implementation and evaluation plans, marketing strategies, benefit/cost analyses, monitoring and verification protocols, staffing plans, program budgets and financial and energy savings reporting systems and made recommendations on items needing improvement.

In May 2003, BC Hydro retained GDS to update the 2002 study done by GDS that examined the appropriateness and reasonableness of the proposed program plans, processes, and procedures included in the BC Hydro DSM Ten-Year Plan. GDS reviewed BC Hydro's compliance with recommendations made in its 2002 audit report and examined BC Hydro's latest benefit/cost analyses for the PowerSmart Ten Year Plan. An updated report with findings and recommendations was submitted to BC Hydro senior management in late June 2003.

GDS has been designing and implementing state-wide energy efficiency programs for the commercial, production agriculture, and industrial (biofuels) sectors in Wisconsin since 1999 for the Focus on Energy Program. Since 2001, GDS has provided the Wisconsin Focus on Energy Business Program with technical services to businesses and production agriculture facilities in Wisconsin relating to the economic feasibility and energy savings of energy efficiency measures. GDS provides program design, on-the-ground program implementation, marketing, incentive processing, energy audits, and administrative support for the various programs.

In 1999-2000 GDS was hired by Public Service of New Hampshire, Granite State Electric Company, and the ECS to conduct a baseline study on commercial construction practices to assist in determining whether New Hampshire's current commercial energy code is ripe for upgrading to promote more up-to-date practices. Services performed included: developing a profile of the concentrations of commercial and industrial construction activity in the State by location and building type; reviewing plans and prints to determine baseline standards for specification; inspecting a subset of buildings to determine what is actually being constructed and what equipment is actually being installed; interviewing equipment suppliers to assess standard efficiencies of measures being purchased for installation; reviewing existing baseline studies; synthesizing results into a series of bulleted tentative findings about standard commercial design and construction practices in New Hampshire; testing these findings in round table discussion groups; interviewing building officials in jurisdictions where new construction is most active; and producing a final report.

In 1998-1999 GDS was retained by the Massachusetts Electric Company and eight other electric utilities to develop market assessment and baseline characteristics for the residential new construction market in southern New England. Primary research tools were a mail survey, site surveys of new homes, in depth market research interviews by phone, and content analyses. One sub element of this project was the development of a Market Progress Report, completed in June, 1999.

GDS has calculated, tracked and reported the reduced power plant emissions (SOX, NOX, CO2, and particulates) for the energy efficiency programs of Efficiency Maine, Wisconsin Focus on Energy and for other GDS clients. Our work in this area has included calculating the electricity savings for energy efficiency programs and determining the proper conversion factors to use for emissions reductions for SOX, NOX, CO2 and particulates. For a sample of the work GDS has completed on avoided emissions

calculations, see the annual report for the Efficiency Maine programs located on the Efficiency Maine web site (www.energymaine.com).

NEXANT

EVALUATION PROJECTS

PENNSYLVANIA PUBLIC UTILITIES COMMISSION

PA ACT 129 STATEWIDE EVALUATOR - EVALUATION OF PENNSYLVANIA ELECTRIC DISTRIBUTION COMPANIES' ENERGY EFFICIENCY AND CONSERVATION PROGRAMS (2009-PRESENT)

Nexant is conducting impact evaluations of the Energy Efficiency and Conservation (EE&C) Programs of the large Pennsylvania Electric Distribution Companies (EDC) as a subcontractor to GDS Associates, Inc. Under the direction of the Commission, an evaluation process has been established that monitors and verifies data collection, quality assurance, and the results of each EDC plan and the program as a whole, in accordance with the Total Resource Cost Test (TRC). Nexant and GDS have conducted an evaluation of each EDC plan and the entire energy efficiency and conservation program as a whole. The evaluation includes an analysis of each plan from both a process and impact standpoint, program impacts (demand and energy savings), and cost-effectiveness according to the TRC.

The team has created an Audit Plan to guide the utility EM&V contractors in the development of data collection sampling and protocols; clarified and updated the current Technical Resource Manual; developed QA/QC procedures to be followed in the field; and as statewide evaluator, developed in the Audit Plan a menu of approaches, depending on type of program and total impact of the program for achieving savings, for verifying impact and process activities performed by the utility EM&V contractors. An in-depth analysis and review of the current Technical Resource Manual for the State of Pennsylvania is also being conducted. Nexant is working on a collaborative basis through technical working groups to provide clarity and updates to various measures. Additional measures that are currently not in the TRM are being identified to develop guidelines for EM&V that can be followed as these measures are integrated under various programs.

WISCONSIN PUBLIC SERVICE COMMISSION - IMPACT EVALUATION OF FOCUS ON ENERGY PORTFOLIO (2011-PRESENT)

Nexant is currently conducting a multi-year impact evaluation for the Wisconsin Focus on Energy portfolio of energy efficiency programs. The project includes an evaluation of three portfolios of programs, namely the Mass Markets (MM) programs, Targeted Markets (TM) programs, and legacy programs. The MM portfolio contains seven generally residential measure-based programs while the TM portfolio contains six generally non-residential end-user-based programs, including programs for commercial, industrial, and agricultural customers. The evaluation coincided with Focus on Energy's transition from the previous program administrator to the current program administrator, resulting in the need to evaluate legacy programs prior to the rollout of new programs. Our responsibilities include developing Strategic Evaluation Plans for each portfolio, developing Program Specific Evaluation Plans for each program, developing a special evaluation plan for the legacy programs, performing engineering analysis and review, conducting on-site data collection inspections, deploying logging and monitoring devices, conducting database review, performing measure research, and performing other data analysis. Cross-cutting activities and analysis are being performed to enable reporting at both the measure and program levels. In addition to impact evaluation activities, Nexant is also conducting a multi-year baseline study in both the residential and non-residential sectors to assess the current standard market practices in Wisconsin and ascertain the level of free-ridership in a jurisdiction where programs have been running for many years.

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL - EM&V OF DELAWARE ENERGY EFFICIENCY AND DEMAND RESPONSE PROGRAMS (2011-PRESENT)

Nexant currently serves as a subcontractor to Opinion Dynamics Corporation to support the Delaware Department of Natural Resources and Environmental Control's (DNREC) request to develop an EM&V Framework and a Delaware-specific TRM, as well as provide EM&V for Delaware's Sustainable Energy Utility's (SEU) state-wide energy efficiency programs. Nexant helped facilitate the stakeholder process for developing the EM&V Framework and played a central role to educate DNREC and inform the Framework on PJM Capacity Market participation. Nexant supported the efforts to adapt the Mid-Atlantic TRM to a Delaware-specific TRM through review of commercial measures and commercial baseline assumptions relevant to Delaware. Both the Framework and TRM will inform future program EM&V throughout the state. Nexant is also conducting program evaluations of ARRA-funded residential and non-residential state-wide programs administered by Delaware's SEU. Specifically, Nexant is conducting an impact and process evaluation of a commercial prescriptive and custom rebate program focused largely on lighting and HVAC measures. Nexant is also evaluating a new residential "green" construction program to assess the energy impacts of the program. This evaluation includes constructing a baseline of current Delaware building practices and assessment of jurisdiction code implementation of the 2009 IECC energy code. In addition to EM&V efforts, Nexant is implementing baseline studies on behalf of DNREC for both the residential and the commercial & industrial (C&I) sectors. Nexant is performing all site visits for the residential baseline study, as well as all site visits and analysis for the C&I baseline study. The results of the program EM&V, baseline studies, and development of the Framework and TRM will serve to inform DNREC of appropriate policy and program strategies to meet the state's impending EERS mandates.

GEORGIA POWER COMPANY – EVALUATION OF 2011 CERTIFIED DSM PROGRAMS (2011-PRESENT)

Nexant and its' subcontractors, the Cadmus Group and abt SRBI, are conducting a process and impact evaluation of Georgia Power Company's seven certified Demand Side Management programs, including residential water heating, residential home energy improvement, residential high efficiency new homes, residential lighting and appliance, residential refrigerator recycling, commercial prescriptive and commercial custom programs for the 2011 program year. The evaluation project includes the formation of key program questions, planning, stakeholder interviews, customer surveys, on-site inspections, measurement of key measure parameters and cost-effectiveness analysis. Evaluation key questions, plans and cost-effectiveness procedures are developed considering input from stakeholder groups, including the Georgia Public Service Commission. Each program will be evaluated independently, with results reported at measure, program and portfolio levels. Target precision and confidence intervals for process and impact surveys are established for each unique program to balance sample rigor with program impacts and budgets. Measurement and verification approaches are customized to each specific energy efficiency measure, considering expected uncertainty and impact magnitude.

ONTARIO POWER AUTHORITY – CROSS CUTTING EVALUATION OF BUSINESS INCENTIVE PROGRAMS FOR THE ONTARIO POWER AUTHORITY (2009-PRESENT)

Nexant's team completed the impact and process evaluations for the Ontario Power Authority's (OPA) large commercial and institutional business incentive initiative for program years 2008 - 2010. Nexant's primary responsibilities included: 1) auditing selected projects, 2) verifying energy and demand savings, 3) estimating net savings, 4) developing measure-level 8760 load shape analyses, and 5) reviewing prescriptive input assumptions. To perform these tasks we established appropriate strata and drew a random sample of representative projects. We reviewed application documents and conducted site inspections to obtain information about the representative projects. We used engineering calculations and the information obtained onsite to develop program realization rates that adjusted the OPA's reported savings. We reviewed current M&V methods and processes used in OPA programs. The goal of this task was to study M&V procedures to identify gaps and make recommendations for improvement. To conduct the process evaluation, we teamed up with Research Into Action, a highly regarded leader in

process evaluation and market research. Our team interviewed program staff and other third-party evaluators to understand the current M&V practices used in individual programs. We then compared the feedback to the observations from the impact evaluation of project samples. Recommendations were then refined by comparing program methods with the best practices of other jurisdictions.

Nexant's team is currently completing the impact and process evaluation and cost effective analysis of this initiative for program years 2011-2012. These initiatives include the Retrofit, Audit Funding and Existing Building Commissioning Incentive Initiatives. Continuing this work has allowed the evaluation to build off the previous evaluation work in a more seamless and cost effective manner.

ONTARIO POWER AUTHORITY – EVALUATION OF THE 2011-2012 CONSUMER PROGRAM (2012-PRESENT)

Nexant's team is conducting process and impact evaluations of Ontario Power Authority's (OPA) Consumer Program portfolio for the 2011 and 2012 program years. The portfolio consists of four programs: HVAC Incentives, Midstream Incentives (pool pumps and TVs and set-top boxes), Appliance Retirement/Appliance Exchange, and the Instant Coupon Booklet / Bi-Annual Retailer Events. This evaluation involves close coordination of data collection, analysis, and reporting in order to address program-specific and cross-program and marketing effects. Nexant is the responsible for completing the cost effectiveness analyses for all four initiatives and the impact evaluations for the HVAC, Appliance and Midstream initiatives. Our impact evaluation approach for these three initiatives involves a variety of techniques that demonstrate Nexant's breadth of expertise.

The HVAC impact evaluation will include verification site visits with spot measurements, as necessary, for furnaces and 2011 central air conditioners. For 2012 central air conditioner projects a metering approach will be used to more accurately update the prescriptive assumptions used to calculate savings for these measures.

The impact evaluation of the Appliance Initiative will follow a calculated analysis approach based on parameter performance. This will be conducted using a combination of site measurement and verification with a statistical modeling approach based on an analysis of the current program tracking data and telephone surveys of sampled participants. We will also update the Unit-Energy-Consumption (UECs) estimates, part-use factors, and NTG ratios used in previous OPA evaluations.

The two elements of the Midstream Initiative, the Pool Pumps; and TVs and Set-Top Box efforts, require taking two different approaches to estimating energy and demand savings. We proposed an M&V approach for Pool Pumps and a modeling approach for TVs and Set-Top Boxes.

ONTARIO POWER AUTHORITY – EVALUATION OF THE SMALL BUSINESS LIGHTING PROGRAM (2010-PRESENT)

Nexant's team conducted an impact and process evaluation for the Ontario Power Authority's (OPA) Small Commercial Direct Install initiative for program years 2009-10. Nexant's primary responsibility was to verify the net energy (kWh) and demand (kW) impacts and assess the cost effectiveness of the program. To conduct the process evaluation, we teamed up with Research Into Action, a highly regarded leader in process evaluation and market research. Our team designed a survey to assess free-ridership and spillover for each facility. We used this information to develop program realization rates and net-to-gross ratios that adjusted the OPA's reported savings. Nexant was also tasked with updating the OPA's prescriptive savings assumptions for each measure based on our site visits and secondary market research. Our evaluation team integrated process-related data collection into several of the onsite impact evaluation tasks to avoid over-burdening OPA's commercial customers.

Nexant's team is currently completing the impact and process evaluation and cost effective analysis of the OPA's Small Business Lighting Program initiative, the next iteration of the Small Commercial Direct

Install initiative, for program years 2011-2012. This evaluation will greatly benefit from the combined knowledge and experience of Nexant's team and will allow an enhanced level of reporting that would not be possible for the same budget.

CPS ENERGY – MARKET POTENTIAL AND DEMAND RESPONSE EVALUATIONS, PROGRAM DESIGN, AND MEASUREMENT AND VERIFICATION, CITY OF SAN ANTONIO, TX (2008-PRESENT)

Nexant is currently providing a variety of support services as the principal advisor for CPS Energy's 10-year \$1 billion portfolio of DSM initiatives. Initially, Nexant conducted a comprehensive energy efficiency market potential study across CPS Energy's residential, commercial, and industrial customer segments. Utilizing the identified market potential, Nexant reviewed CPS Energy's existing DSM programs and provided recommendations and detailed program designs to enhance and supplement the existing programs. Currently, Nexant provides annual program design review, recommendations for program updates and new offerings, and ongoing program implementation support for a comprehensive suite of programs targeting all customer segments. Nexant is also providing annual measurement and verification of CPS Energy's DSM programs and began providing retro-commissioning implementation services in commercial customer segments this year.

In 2010, Nexant completed a demand response impact evaluation for CPS Energy's Peak Saver Program. The program offers an incentive to participants in exchange for the right to cycle their air conditioner during times of peak energy demand. Our primary objective was to quantify the ex-post load impacts (kW reduction) during different cycling strategies and temperature conditions. A generalized least-squares regression model was used to characterize air-conditioning use for each customer in the evaluation sample. The regression-estimated coefficients generated by this model were then used to create a reference load, or the load which would have occurred had a cycling event not taken place. The regression-estimated actual load was then subtracted to estimate demand reduction.

LAWRENCE BERKELEY NATIONAL LABORATORY – EVALUATION OF US DEPARTMENT OF ENERGY'S BETTER BUILDINGS PROGRAM (2012-2014)

In 2011, Nexant, acting as a subcontractor to Research Into Action, began a four-year evaluation for the Lawrence Berkeley National Laboratory of the U.S. Department of Energy's Better Buildings Program. The program invests American Recovery and Reinvestment Act (ARRA) funds to: 1) initiate projects that achieve energy savings in sectors where this has proved difficult, 2) demonstrate a sustainable business model for providing cost-effective energy upgrades for a large percentage of the residential, commercial, and/or public buildings in a specific community, and 3) identify and spread the most effective approaches supporting the development of a robust retrofit industry in the U.S. More than 40 grantees provide diverse programs throughout the U.S. Our team is developing and will employ a quasi-experimental design to assess how well the overall Better Buildings program has achieved its objectives. Evaluation activities include process and market effects assessments and energy impact evaluations, including M&V and billing analysis. Nexant is leading the impact evaluation and M&V analysis and will conduct approximately 800 project reviews across the 41 BBNP Grantees. Our team's goal is to quantify the energy savings resulting from the program activities, to fully understand the various program activities, explain the theory and logic of how they address the Better Buildings objectives, and identify which programs and program elements were most successful and which can be successfully replicated.

OKLAHOMA DEPARTMENT OF COMMERCE - ARRA IMPACT EVALUATION (2011-PRESENT)

Nexant is conducting an impact evaluation of the Oklahoma Department of Commerce's (ODOC) allocation of American Recovery and Reinvestment Act funds. The project is a portfolio evaluation of more than 60 projects within the ODOC's State Energy Program (SEP) and Energy Efficiency and Conservation Block Grant (EECBG), spending almost \$50 million over two years. The evaluation will analyze each of the two program tracks with 90/10 confidence/precision target. The project types are

very heterogeneous and span all sectors (residential, commercial and industrial), energy efficiency measure types (direct and indirect) and renewable energy sources (wind, solar PV, solar thermal, bio-gas, etc.). The project involves developing stratified statistical sampling algorithms, reviewing M&V methods, on-site inspections, and calculating gross and net impacts.

CONSOLIDATED EDISON COMPANY OF NEW YORK - EVALUATION OF SYSTEM-WIDE DEMAND REDUCTION PROGRAM (2006 – 2010)

Nexant lead a team of specialty contractors to provide comprehensive evaluation services for the Con Edison System-Wide Demand Reduction Program (SWP) operated by the New York State Energy Research and Development Authority (NYSERDA). The team supported NYSEDA in providing reports to both Con Edison and the Department of Public Service that documented the demand reductions and energy savings realized as a result of the program's operations. The team's evaluation results were used to support lost revenue claims to be filed by Con Edison. Our primary task was the continuous evaluation of NYSEDA's SWP-funded energy efficiency programs, with an emphasis on the measurement and verification of coincident peak demand performance for chillers, HVAC equipment, lighting equipment, photovoltaic installations, and new construction applications. Our basic approach was to draw a random sample of representative projects and to calculate program realization rates, gross impacts for kWh, fuel reductions, and coincident peak kW reductions. For each project in our sample, we inspected installations to ensure that the energy efficient equipment that had received incentive money from NYSEDA is operating as designed. While onsite, we developed load shapes, conducted time-of-use analysis, and conducted an energy audit to identify potential energy savings and demand reduction for the project, by quantifying new equipment performance and identifying the baseline conditions. Onsite activities included: interviewing facility managers; witnessing equipment operation; collecting systems information; and taking spot measurements of power, temperature, flow, or other parameters. Based on our findings, we determined the verified gross level project savings.

We also conducted NTG and BC analyses for all programs. The activities under the cost-effectiveness analysis included quantifying the program and participant costs and performing energy bill analyses. Other activities included designing unique sampling and variance analysis strategies, regression modeling, and market surveys.

NEW YORK STATE ENERGY RESEARCH AND DEVELOPMENT AUTHORITY - MEASUREMENT & VERIFICATION EVALUATION OF NEW YORK ENERGY \$SMART PROGRAM (2003-2007) - EXTENDED FOR THE CON EDISON GAS EFFICIENCY PROGRAM THROUGH 2009

Nexant was the measurement and verification (M&V) evaluation contractor for New York Energy Research and Development Authority's (NYSERDA) New York Energy \$smart portfolio of forty three energy efficiency, market transformation and research programs, all funded through the State's system benefit charge. Our primary responsibility under this multi-year contract was to independently verify the gross energy (kWh) and demand (kW) impacts that result from the operation of the Program. Using our broad engineering experience with energy using systems found in commercial, residential, and industrial sectors, we reviewed project files to check that accepted savings calculation methodologies are used and correctly applied. Our basic approach was to draw a random sample of representative projects and to calculate program realization rates that adjust NYSEDA's reported savings to match actual conditions found in the field. For each project in our sample we inspected installations to ensure that energy efficient equipment that has received incentive money from NYSEDA was operating as designed. On site activities included interviews with facility managers, witnessing equipment operation, collecting systems information, and taking spot measurements of power, temperature, flow, or other parameters. Based on our findings we determined the verified project savings and applied the results to the sponsoring program. Nexant's M&V evaluation results were used to quantify benefits that were credited to the operation of the New York Energy \$smart Program.

RESEARCH INTO ACTION RELEVANT RECENT PROJECTS

STATEWIDE EVALUATIONS

CALIFORNIA

2009-2011 California Statewide Low Income Energy Efficiency Program Process Evaluation: Pacific Gas & Electric (2010-2011)

In 2010 and 2011, Research Into Action led a mixed-methods process evaluation of the Low Income Energy Efficiency (LIEE) Program for the four California investor-owned utilities: Pacific Gas & Electric (PG&E), Southern California Edison, San Diego Gas and Electric (SDG&E), and Southern California Gas. PG&E administered the project. Our team included APPRISE, Inc., and Abt SRBI, Inc. Our evaluation sought to identify which program processes were and were not working, and how to effectively achieve or exceed goals and objectives for the program. We explored administration, communication and coordination, delivery and implementation, and customer response. Our approach involved: 1) interviews with key contacts at the four utilities and contracted implementation, outreach, and marketing organizations; 2) surveys of participants who participated through standard LIEE program activities and targeted recruitment activities; 3) focus groups with PG&E and SDG&E staff; 4) ride-along observations of field crews in each of the four utility territories, including two days with audit/education crews, two days with inspection crews, and one day with implementation crews; and 5) interviews with the marketing, outreach, and implementation organizations contracted to the utilities. We presented our evaluation design and findings at public workshops.

Process Evaluations of the Statewide Home Energy Efficiency Rebate (HEER) and Statewide Business and Consumer Electronics Programs: Southern California Edison and PG&E (2011-2012)

In 2011-2012, Research Into Action led the evaluation of the Statewide Home Energy Efficiency Rebate (HEER) and Statewide Business and Consumer Electronics (BCE) programs for Southern California Edison and Pacific Gas & Electric. The project included a process evaluation of the HEER program, a market characterization for end-use appliances included in the HEER program, an assessment of program opportunities for miscellaneous plug loads, and a general population survey of residential customers' attitudes, knowledge, awareness, and behavior (AKAB). The combination of these four study areas provided a comprehensive look at the program designs working in this market, as well as potential future program designs. This research was timely because the role of utility programs in residential markets was shifting dramatically, and this project informed the development of the 2014-2016 programs.

Evaluation of the California Building Operators' Certification Training Program: Pacific Gas & Electric, Southern California Edison, Southern California Gas, San Diego Gas & Electric (2003-2007)

Research Into Action conducted process evaluations of the California Statewide Building Operator Certification and Training Program (BOC). The program taught commercial and industrial facility staff how to operate and maintain building systems for energy efficiency, optimal performance and occupant comfort. The program was sponsored by Pacific Gas & Electric Company, Southern California Edison, Southern California Gas Company, and San Diego Gas and Electric Company. Our evaluations of the California programs were informed by our previous evaluations of the BOC courses taught in the Pacific Northwest and the Northeast. The evaluation activities included interviews with utility staff, implementation contractors, program participants and their supervisors, and nonparticipants. The first evaluation focused on the first year and one-half of program implementation; it sought to document participants' and employers' satisfaction with the Level I training program, document changes in their energy-efficiency behaviors attributable to the program, assess participants' and course implementers' recommendations for program improvements, assess the program's appeal to nonparticipants, and

recommend modifications to the program. The second evaluation focused on satisfaction with the Level II training and effect of the training on operation and maintenance behavior; the value of, and barriers to, O&M training; the second year of implementation; and market research findings from nonparticipants. We interviewed 20 of the 37 BOC students and 6 of their supervisors; 62 of 700 building operations and maintenance (O&M) staff who had received program marketing materials, but had not sent staff to the BOC training (nonparticipants) to assess their interest in staff training to improve building operations; three utility BOC program managers; and five Northwest Energy Efficiency Council staff (BOC instructors and managers). In the third evaluation, we focused on the seven-course Level I training. We interviewed 58 participants and 25 supervisors to assess their satisfaction with the training and its impacts on students' O&M behaviors, and determine current O&M practices. We also interviewed 58 nonparticipants to assess their interest in staff training to improve building operations, assess market barriers to such training, and determine current O&M practices. Finally, we interviewed three utility program managers, two BOC staff, and ten BOC instructors to assess implementation activities and explore instructors' teaching objectives.

NEW YORK

New York Energy Smart Process Assessment and Evaluation: New York State Energy Research and Development Authority (2003-2014)

Research Into Action has led comprehensive process evaluations of New York State Energy Research and Development Authority's (NYSERDA) residential, business and institutional, and research and development (R&D) programs since 2003. In addition, as the evaluation oversight contractor from 2007 to 2011, we ensured the integration of process, market, and impact evaluations. For our process evaluation work, we begin each year by prioritizing the programs and developing an action plan. In 2003, we focused on programs for low-income multifamily housing, distributed generation, technical assistance and commercial new construction. We also assisted in the development of a cycle-time tracking process. In 2004, we evaluated the ENERGY STAR products, ENERGY STAR Labeled Home, Home Performance with ENERGY STAR, and the Commercial/Industrial programs, and conducted a cross-cutting evaluation of nine business-sector programs targeted at mid-market actors. In 2005, we evaluated several residential- and commercial-sector programs, including continuation of the ENERGY STAR Products and cross-cutting business-sector programs, and examined the coordination of business and institutional programs. In 2007 and 2008, we provided an evaluation of the Enhanced Commercial/Industrial Performance, Multi-Family Building Performance, Single-Family Home Performance, EmPower New York, Energy Smart Communities, Residential Loan Fund and Financing, and Clean Energy Photovoltaic programs. In 2009 and 2010, we conducted a portfolio review of the R&D Solicitation Process, and process evaluations of the following programs: Commercial New Construction; EmPower; Industrial Project; Focus on Energy and Business Partners; FlexTech; CFLs; and Environmental Monitoring, Evaluation and Protection. In 2011-2012, we surveyed participants and nonparticipants in the Multifamily Performance Program and conducted process evaluations of the Agriculture Disaster Energy Efficiency Program, Distributed Generation-Combined Heat and Power (DG-CHP) Demonstration Program for 2005-2010, the Existing Facilities Program (commercial and industrial), Industrial Process Efficiency, New Construction Program (commercial), Upstream HVAC Partners Program, and Workforce Development Program. NYSERDA recently awarded us the contract to continue this work through 2014.

NORTHWEST

Various Projects: Bonneville Power Administration (1997-present)

The Bonneville Power Administration serves more than 120 utilities throughout the Pacific Northwest. We have conducted more than 24 projects for BPA since 1997. Our most recent projects for BPA are: the the update of BPA's Measurement and Verification (M&V) Protocols (2009-2010); Residential and

Commercial Lighting Program Assessment (2009-2010); Residential Performance Tested Comfort Systems (PTCS) and HVAC Research (2010); Evaluation Strategy for Custom Projects and M&V (2010-2011); process evaluation of the Energy Smart Industrial Program (2011-2012); and the Analysis of the Residential Building Stock Assessment Database (2012-2013). We also compiled data on measure costs and energy savings for a list of target measures to inform the Northwest Power and Conservation Council's Sixth Power Plan.

Northwest Energy Efficiency Alliance (2001 – Present)

The Northwest Energy Efficiency Alliance (NEEA) drives efforts to transform the energy efficiency market in the Northwest. NEEA works in collaboration with BPA, Energy Trust of Oregon, and over 100 utilities on behalf of more than 12 million energy consumers. We have conducted more than 38 projects for NEEA since its inception, including 18 program process evaluations. In particular, we have led five Market Progress Evaluation Reports (MPER) of NEEA's BetterBricks commercial-sector initiative and seven MPERs of the Building Operator Certification (BOC) initiative. Currently, we are leading the evaluations of NEEA's BOC Expansion initiative (2012-2015), and Consumer Electronics (2012-2013). In 2011, we evaluated the kW Crackdown commercial office energy savings competition, Residential Economizer Pilot Program, and Residential Ductless Heat Pump.

OREGON

Energy Trust of Oregon (2002 – Present)

The Energy Trust of Oregon is a nonprofit organization that invests systems benefit charges paid by Oregon electric and gas IOU ratepayers in energy efficiency and renewable energy projects that benefit those ratepayers. Since its inception, we have conducted more than 30 projects for Energy Trust, including 17 process evaluations, market research, organizational research, and special investigations. Currently, we are evaluating the Production Efficiency industrial program and Existing Buildings (commercial and small industrial) program.

Ontario

Ontario Power Authority

Research Into Action has conducted six process evaluations for the Ontario Power Authority (OPA) since 2008. Currently, we are evaluating the Business Incentive Programs (2011-2013), 2011-2012 Small Business Lighting Incentive Program (2012-2013), and Consumer Program (2012-2013). Prior work included: the cross-cutting evaluation of OPA's 2009-2010 Large Commercial and Industrial Retrofit Incentive Initiatives (2010-2011), evaluation of the Chilled Water Plant Ongoing Commissioning – Phase I (2008-2010), and Small Commercial Direct Install Program (2010-2011).

STAKEHOLDERS/COLLABORATIVES

2009-2011 California Statewide Low Income Energy Efficiency Program Process Evaluation: Pacific Gas & Electric (2010-2011)

In 2010 and 2011, Research Into Action led a mixed-methods process evaluation of the Low Income Energy Efficiency (LIEE) Program for the four California investor-owned utilities: Pacific Gas & Electric (PG&E), Southern California Edison, San Diego Gas and Electric (SDG&E), and Southern California Gas. PG&E administered the project. Our team included APPRISE, Inc., and Abt SRBI, Inc. Our evaluation sought to identify which program processes were and were not working, and how to effectively achieve or exceed goals and objectives for the program. We explored administration, communication and coordination, delivery and implementation, and customer response. Our approach involved: 1) interviews with key contacts at the four utilities and contracted implementation, outreach, and marketing organizations; 2) surveys of participants who participated through standard LIEE program activities and targeted recruitment activities; 3) focus groups with PG&E and SDG&E staff; 4) ride-along observations of field crews in each of the four utility territories, including two days with audit/education crews, two days with inspection crews, and one day with implementation crews; and 5) interviews with the marketing, outreach, and implementation organizations contracted to the utilities. We presented our evaluation design and findings at public workshops.

Better Buildings Program Assessment: Lawrence Berkeley National Laboratory (2012-2014)

In 2011, Research Into Action began a four-year evaluation for the Lawrence Berkeley National Laboratory of the U.S. Department of Energy's Better Buildings Program. The program invests American Recovery and Reinvestment Act (ARRA) funds to: 1) initiate projects that achieve energy savings in sectors where this has proved difficult, 2) demonstrate a sustainable business model for providing cost-effective energy upgrades for a large percentage of the residential, commercial, and/or public buildings in a specific community, and 3) identify and spread the most effective approaches supporting the development of a robust retrofit industry in the U.S. More than 40 grantees provide diverse programs throughout the U.S. Our team will develop and employ a quasi-experimental design to assess how well the overall Better Buildings program has achieved its objectives. Evaluation activities will include process and market effects assessments and energy impact evaluations, including M&V and billing analysis. We seek to fully understand the various program activities, explain the theory and logic of how they address the Better Buildings objectives, and identify which programs and program elements were most successful and which can be successfully replicated.

Best Practices

Research Into Action has conducted leading-edge best practice research projects since 1997, both as the focus of our work, and to inform our program evaluations, market effects studies, market evaluations, market research, market and needs assessments, and behavioral impact evaluations. Jane S. Peters, President, and Principals Marjorie McRae and Bobbi Tannenbaum, each has more than 25 years' experience leading best practice research in the energy industry. The sample projects listed below demonstrate Research Into Action's deep experience providing the services requested in this RFP.

Research Into Action conducted its first best practice research – case studies of successful utility efforts to promote sales of efficient residential HVAC equipment for the Consortium for Energy Efficiency – in 1997. We continued best practice work with our summary of the "best of the best" community energy programs (Energy Center of Wisconsin, 1998), Energy Smart Services Commercial New Construction Services (Seattle City Light, 2004), the California Energy Efficiency Loan Fund (California Public Utilities Commission/KEMA/Itron, 2005), demand-side management programs (NorthWestern Energy, 2007), medical energy efficiency programs (PG&E, 2008), Chilled Water Plant Ongoing Commissioning (Ontario Power Authority, 2008-2010), Residential Performance Tested Comfort Systems and HVAC programs

(Bonneville Power Administration, 2010), and 5-Year Plan for Energy Efficiency/Demand Response/Distributed Generation for the Tennessee Valley Authority (2011-2012).

5-Year Plan for Energy Efficiency/Demand Response/Distributed Generation: Tennessee Valley Authority (2011-2012)

As part of a team, led by Energy Market Innovations (EMI), in 2011 we provided comparative research and best practice analysis to support the development of the Tennessee Valley Authority's (TVA) 5-Year Plan for Energy Efficiency/Demand Response/Distributed Generation. Our analysis allowed the planning team to consider the experiences of other program administrators when developing the components of TVA's program portfolio.

Residential Portfolio Process Evaluations: Snohomish County PUD (2010-2011)

Research Into Action conducted process evaluations of Snohomish County Public Utility District's residential portfolio. Evaluation tasks included: identification of best practices through comparisons with other utilities' programs throughout the United States; drafting program process maps to assess program costs; understanding market players' perceptions of the program; identification of barriers to participation by customers and contractors; and providing recommendations to improve program administration, quality assurance/M&V, program/customer requirements, and program participation.

Three Best Practices Projects for the Bonneville Power Administration (2009-2010)

Residential Performance Tested Comfort Systems and HVAC Research (2010)

In 2010, Research Into Action led a team that conducted an evaluation of Bonneville Power Administration's (BPA) Performance Tested Comfort Systems (PTCS) protocols. PTCS is a certification program targeting residential heat pumps and duct systems. PTCS installation contractors receive training and submit each job to a registry maintained by the Program Contractor. Through the evaluation, BPA sought information that could help increase PTCS measure activity and stakeholders' satisfaction with the program, reduce program costs, mitigate program barriers, and improve the evaluability of the program and the program functionality for contractors. To achieve these goals, we: 1) reviewed BPA's PTCS program and other HVAC offerings, its program data and documentation, and best practices used by national and regional utilities in their duct sealing and heat pump programs; 2) interviewed program stakeholders and BPA customer utility stakeholders about their approach to HVAC offerings, how the PTCS program fit into their efficiency program portfolio, and the PTCS program's strengths and opportunities for improvement; 3) surveyed trade allies about their experience with the program; and 4) estimated the program's cost-effectiveness.

Update of Bonneville Power Administration Measurement and Verification Protocols (2009-2010)

In 2009-2010, Research Into Action led a team that reviewed and, as warranted revised, BPA's existing measurement and verification (M&V) protocols, which were developed between 1999 and 2003. In its review, the team considered: Are the types of assessments that BPA needs covered by the existing protocols? Are the existing protocols consistent with best practices? Do any of the protocols need to provide more information to guide practitioners so that the assessment is consistent with the protocol? The team recommended the consolidation of several protocols into single, more comprehensive protocols, and a rewrite of all the protocols requiring post-installation measurements to be consistent with International Performance Measurement and Verification Protocol (IPMVP) standards. The team then launched the rewrite of the protocols, and created two "light" protocols for smaller projects for which post-installation measurement is not cost-effective. The team developed examples to illustrate the protocol from development of a plan through final analysis and resource guides in the areas of sampling of data points and regression modeling. The team trained BPA energy efficiency engineers in using the revised protocols. The project addressed issues such as data and personnel training

requirements, cost, cost-effectiveness, and accuracy that users must consider when deciding which M&V practices to use, as well as the opportunities offered by advances in metering to conduct measurements that previously were not cost-effective.

Residential and Commercial Lighting Program Assessment (2009-2010)

In 2009-2010, Research Into Action conducted an assessment of BPA's residential and commercial lighting programs. BPA specifically sought information that would be useful in establishing program parameters for their 140+ customer utilities. These utilities are responsible for delivering retail efficiency programs, but BPA supports that effort by providing effective guidelines. BPA wanted to provide practical and effective – actionable – advice supported by best practice research.

For the residential programs, we: 1) reviewed national best practices for direct-mail and direct-installation programs, 2) reviewed BPA customer utilities' direct-mail and direct-installation approaches, 3) determined the maximum number of bulbs BPA should allow its customer utilities to direct-mail, and 4) identified if there were a difference in self-reported installation among utilities that direct-mailed different numbers or varieties of bulbs. For the commercial sector, we conducted a process evaluation to determine: 1) if the Trade Ally Network (TAN) were operating as designed, 2) if the TAN were providing value to utility customers, 3) the strengths and weaknesses of the TAN, and 4) how to improve the TAN to increase energy savings. For both projects, our methodology included a review of program literature and best practice information, and surveys of approximately 30 utility program staff. For the residential program assessment, we conducted phone interviews with 200 residential customers to assess their satisfaction with and installation of direct-mailed bulbs. For the commercial assessment, we interviewed 30 trade allies and other TAN stakeholders.

Benchmarking and Best Practices: Puget Sound Energy (2008-2009)

In 2008 and 2009, in an effort to increase the impact of its investments in energy efficiency, Puget Sound Energy (PSE) contracted with Research Into Action to gather data on the budgets, goals, and accomplishments of West Coast utilities with strong energy conservation programs. After carefully reconciling data gathered from publicly available sources as well as contacts at five utilities, Research Into Action outlined a set of best practices that allowed PSE to better manage its energy efficiency programs.

National Energy Efficiency Best Practices Study: California Public Utilities Commission (2003-2007)

Research Into Action was a key member of the team that produced the National Energy Efficiency Best Practices Study between 2003 and 2007 for the California Public Utilities Commission (CPUC). The studies sought to identify best practices for 18 different energy-efficiency program types. The team developed and implemented a method to identify and communicate excellent programmatic practices in order to enhance the design of energy-efficiency programs in California. For the best practices research, Research Into Action assisted with the identification and selection of over 100 programs for screening and in-depth interviews, and then conducted the screening and interviews for six to ten programs in four program areas: residential lighting, comprehensive residential single-family weatherization, multifamily weatherization, and education and training services for trade allies. We developed the profiles and wrote a discussion of the best practices for program components for each of the four program areas. We identified additional programs for review, recommended a final set of programs for benchmarking, collected data for each program selected, summarized findings, and prepared draft and final reports for each assigned area.

2008-2012 Energy Conservation Plan: Seattle City Light (2007)

Research Into Action contributed to an innovative and effective management development plan and five-year (2008-2012) energy conservation plan for Seattle City Light. Our team chose a three-pronged

approach: technical/economic analysis, market analysis, and organizational analysis. Our participation included benchmarking Seattle City Light against the efficiency efforts of comparable utilities, and providing a process evaluation and Best Practices Gap Analysis of the utility's programs.

Best Practices Study: Energy Trust of Oregon (2002)

In 2002, Research Into Action conducted structured interviews with representatives of 62 programs recommended by energy-efficiency experts in order to identify best practices in organizational structure and program delivery. We provided summaries of these best practices to the Energy Trust of Oregon, which used them to guide the development of its organizational structure and conduct efficiency programs. Each summary described the program or practice and the participation and savings attributed to them. The summaries also included key lessons learned that led to the development of the best practice and an assessment of the potential to transfer the practice to Energy Trust of Oregon.

LOGIC MODELS

Research Into Action helped pioneer the development and use of logic models to provide clear, accurate, and useful descriptions of how a program actually works. We create logic models for many of the programs we evaluate, and have trained our clients to develop and use these tools to improve their programs' performance.

Program Analysis and Logic Modeling: NYSERDA (2009, 2007)

Research Into Action led the development of logic models and program theory and analyses for 16 New York Energy \$mart programs serving businesses and institutions. Our team met with staff for each program, developed a graphical logic model of the program theory, and then analyzed the program in the context of findings for similar programs and in comparison to theories of change in social science. From 2003-2005, we led development of logic models and program theory and analyses for 16 New York Energy \$mart programs serving businesses and institutions. In addition, 2002, we also developed and conducted an interactive two-day workshop to train NYSERDA evaluation staff to develop useful draft logic models for two of the NYSERDA Energy \$mart programs.

SCE Partnership Logic Models: Southern California Edison (2008-2009)

In 2008 and 2009, Research Into Action worked with Southern California Edison (SCE) to develop logic models and elaborate program theory and process flows for two of its partnership programs. One program focused on building energy-saving partnerships with local governments, and the other on building partnerships with large institutions. We reviewed program documentation and met with program staff to create models and theory statements to help SCE develop its program processes and flow documentation.