



National Fuel

December 21, 2018

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
P.O. Box 3265
North Office Building
Harrisburg, Pennsylvania 17105-3265

Re: National Fuel Gas Distribution Corporation
Delta Fund for Research and Development Projects Report

Dear Secretary Chiavetta;

Pursuant to R-00061493 Settlement paragraph 18 A.3 "Distribution will file with the Commission and serve upon other Parties on or before December 31 an annual report for the preceding twelve month period ended September 30, setting forth revenues for the Delta Fund for research and development projects and expenditures for such projects. In addition, Distribution will describe in the annual report projects that have been funded". The enclosed report is submitted under this settlement agreement.

Acknowledgement hereof is desired and duplicate letter is enclosed with a self-addressed, stamped envelope for that purpose.

Very truly yours,

Maureen G. Krowicki
General Manager
Rates and Regulatory Affairs

Encl.

Cc: Office of Special Assistants
Office of Consumer Advocate
Office of Small Business Advocate

The provisions of R-00061493 Settlement paragraph 18 A.3 were adopted on November 30, 2006 and effective January 1, 2007. Paragraph 18 A.3 states:

“3. The Joint Petitioners agree to \$526,466 to fund the Delta research and development program pursuant to the Statement of Scott E. Swartzfager No. 14. The deferral treatment and review process outlined in R-00049656 will continue. The company will not expend these dollars on additional customer outreach for enhanced energy efficiency.

Distribution will be permitted to record a regulatory asset or liability for differences between the annual rate allowance and annual expenditures. However, Distribution will not be permitted to retroactively recover in a future proceeding any expenditures in excess of the annual rate allowance and any deferred balance from the previous year’s Delta funding. Distribution will provide for review of research projects as described in its testimony. In order to implement this Settlement, the Joint Petitioners request that the Commission’s Final Order in this proceeding include the following language to allow Distribution to qualify for deferred accounting under SFAS 71:

“National Fuel Gas Distribution Corporation’s accounting policies conform to the Statement of Financial Accounting Standards No. 71 ‘Accounting for the Effect of Certain Type of Regulations’ which are in accordance with the accounting requirements and ratemaking practices of regulatory authorities. The application of these accounting policies allows the Company to defer expenses and income on the balance sheet as regulatory assets and liabilities when it is probable that those expenses and income will be allowed in the rate-setting process in a period different from the period in which they would have been reflected in the income statement by an unregulated Company.

“Because research and development projects often require a commitment over multiple years and because the expenditures for such projects may not match on an annual basis revenues for funding of research and development projects, deferred accounting is appropriate and is approved. The regulatory deferral treatment sought for the Research and Development expenditures and rate relief requested in the case are in accordance with SFAS No. 71.

“The Company will manage the costs of the Research and Development expenditures to match revenues deferred pursuant to this Order to eliminate any differences between deferred costs and deferred revenues at the end of a five-year period commencing on the day after the R-00049656 Order was entered.”

Distribution will file with the Commission and serve upon other Parties on or before December 31 an annual report for the preceding twelve month period ended September 30, setting forth revenues for the Delta Fund for research and development projects and expenditures for such projects. In addition, Distribution will describe in the annual report projects that have been funded.”

The provisions of R-00049656 Settlement paragraph 44 were adopted on March 23, 2005 and effective April 15, 2005. Paragraph 44 states:

"44. Distribution's proposal to fund the Delta research and development program pursuant to the Supplemental Statement of Ruth Friedrich-Alf No. 102 S2 is approved. Increased rates in this proceeding provide for recovery of \$526,466 in Delta research funds. Distribution will be permitted to record a regulatory asset or liability for differences between the annual rate allowance and annual expenditures. However, Distribution will not be permitted to retroactively recover in a future proceeding any expenditures in excess of the annual rate allowance and any deferred balance from the previous year's Delta funding. Distribution will provide for review of research projects as described in its testimony. In order to implement this agreement, the Parties request that the Commission's Final Order in this proceeding include the following language to allow Distribution to qualify for deferred accounting under SFAS 71:

'National Fuel Gas Distribution Corporation's accounting policies conform to the Statement of Financial Accounting Standards No. 71 'Accounting for the Effect of Certain Type of Regulations' which are in accordance with the accounting requirements and ratemaking practices of regulatory authorities. The application of these accounting policies allows the Company to defer expenses and income on the balance sheet as regulatory assets and liabilities when it is probable that those expenses and income will be allowed in the rate-setting process in a period different from the period in which they would have been reflected in the income statement by an unregulated Company.

'Because research and development projects often require a commitment over multiple years and because the expenditures for such projects may not match on an annual basis revenues for funding of research and development projects, deferred accounting is appropriate and is approved. The regulatory deferral treatment sought for the Research and Development expenditures and rate relief requested in the case are in accordance with SFAS No. 71.

'The Company will manage the costs of the Research and Development expenditures to match revenues deferred pursuant to this Order to eliminate any differences between deferred costs and deferred revenues at the end of a five-year period commencing on the day after this Order is entered.'

Distribution will file with the Commission and serve upon other Parties on or before December 31 an annual report for the preceding twelve month period ended September 30, setting forth revenues for the Delta Fund for research and development projects and expenditures for such projects. In addition, Distribution will describe in the annual report projects that have been funded."

As presented in R-00049656 Statement No. 102 (page 15);

“On an annual basis coming off of September 30, a reconciliation of revenues and expenditures with a description of projects funded will be on file on or before December 31 with the Office of Trial Staff, Office of Consumer Advocate and the office of Small Business Advocate. At the fifth reconciliation, Distribution will file a five year report.”

As presented in R-00049656 Statement No. 102 S2 (page 7)

“Annual revenues will be deferred to offset the costs of the Research and Development expenditures (expenses) to both the Gas Technology Institute (“GTI”) fund and local projects.

The Company will manage the cost of the Research and Development expenditures to match revenues deferred pursuant to this Order to eliminate any differences between deferred costs and deferred revenues at the end of a five-year period commencing on the day after this Order is entered.”

It is under these guidelines and agreements that Distribution files the following report for the period ended September 30, 2018.

National Fuel Gas Distribution Corporation
Pennsylvania Division

Annual Filing of Delta Fund Revenues and Expenditures
For the period ended September 30, 2018

Year Ended	Annual		Cumulative		Balance
	Expenditures	Revenues	Expenditures	Revenues	
Sept. 2005	\$92,300	\$113,927	\$92,300	\$113,927	(\$21,627)
Sept. 2006	\$376,800	\$526,466	\$469,100	\$640,393	(\$171,293)
Sept. 2007	\$596,800	\$526,466	\$1,065,900	\$1,166,859	(\$100,959)
Sept. 2008	\$526,493	\$526,466	\$1,592,393	\$1,693,325	(\$100,932)
Sept. 2009	\$376,368	\$526,466	\$1,968,761	\$2,219,791	(\$251,030)
Sept. 2010	\$455,911	\$526,466	\$2,424,672	\$2,746,257	(\$321,585)
Sept. 2011	\$721,800	\$526,466	\$3,146,472	\$3,272,723	(\$126,251)
Sept. 2012	\$280,300	\$526,466	\$3,426,772	\$3,799,189	(\$372,417)
Sept. 2013	\$626,800	\$526,466	\$4,053,572	\$4,325,655	(\$272,083)
Sept. 2014	\$278,891	\$526,466	\$4,332,463	\$4,852,121	(\$519,658)
Sept. 2015	\$276,800	\$526,466	\$4,609,263	\$5,378,587	(\$769,325)
Sept. 2016	\$458,404	\$526,466	\$5,067,667	\$5,905,053	(\$837,386)
Sept. 2017	\$500,530	\$526,466	\$5,568,197	\$6,431,519	(\$863,322)
Sept. 2018	\$362,547	\$526,466	\$5,930,744	\$6,431,519	(\$1,027,241)

Note 1: Rates were effective April 15, 2005 therefore the report ended September 30, 2005 does not represent a 12 month period of revenue collection.

DESCRIPTION OF ACTUAL EXPENDITURES - PERIOD ENDED SEPTEMBER 2018

GTI Utilization Technology Development Program

\$129,500 was submitted to Utilization Technology Development, NFP (UTD) for the April 1, 2018 through March 31, 2019 dues. \$150,242 has been allocated to specific projects as listed below.

UTD Payments, Fees, Credits, Carryover

Payments to UTD	\$129,500
Administration Fees	-\$12,950
Carryover of Unallocated Funds from Prior Year	\$37,700
Funds Available for Allocation	\$154,250

Allocations to Projects

Residential/Commercial Space Conditioning

1.12.U.2 Refund	\$170.71
1.12.U.3 Gas HP Modeling - Phase 3	-\$4,440.00
1.13.D.5 Codes and Standards for Advanced Gas Technologies - Phase 5	-\$967.18
1.13.D.6 RCSC Codes and Standards Support - Phase 6	-\$5,920.00
1.13.F.2 Gas Absorption Heat Pump for Space Conditioning - Phase 2	-\$700.78

1.13.F.3 Gas Absorption Heat Pump for Space Conditioning - Phase 3	-\$2,310.35
1.15.C.2 Next Generation Residential Gas Clothes Dryers - Phase 2	-\$3,700.00
1.15.E Gas-fired High-Efficient Liquid Desiccant Air Conditioning and Humidity Control – Commercial	-\$85.47
1.15.E.2 Gas-fired High-Efficient Liquid Desiccant Air Conditioning and Humidity Control – Phase 2	-\$2,960.00
1.16.C.2 High Performance Building Initiative - Phase 2	-\$1,717.91
1.16.C.3 High Performance Building Initiative - Phase 3	-\$1,480.00
1.16.D Refund	\$15.63
1.16.E.2 Low Capacity Heating Systems Portfolio - Phase 2	-\$3,171.27
1.16.H.2 EnergyPlus Models and Market Analysis for Advanced Residential Heating Systems - Phase 2	-\$2,960.00
1.17.F Thermolift Comb. Heating/Cooling System Techn Support - Alpha Prototype	-\$2,205.20
1.17.G Yanmar 3-Pipe Gas Engine HP Field Study	-\$2,643.28
1.18.G Integrating Gas Heating and Cooling in Advanced Gas/Renewable Homes	-\$2,960.00
1.18.H Economical High-Efficiency Res. Gas Absorption HP with Integrated Cooling	-\$2,220.00
1.18.I Gas Heat Pump RTU Cold Climate Performance Assessment	-\$7,400.00

Residential/Commercial Water Heating

1.09.C Refund	\$47.10
1.11.H.4 Residential Gas Absorption HPWH - Six 4th Gen. Field Demos	-\$614.57
1.12.Q Refund	\$2.76
1.14.K.2 Advanced Systems for Self Powered Water Heating - Phase 2	-\$2,627.00
1.16.I.2 Commercial Gas-Fired Heat Pump Water Heater - Phase 2	-\$3,496.50
1.16.L.2 SuperPerm Burner for Water Heaters - Phase 2	-\$534.28
1.17.C Gas Heat Pump Combination Space Water Heating System Design	-\$1,332.00
1.17.E Emerging Combination FAU Laboratory Evaluations	-\$673.40
1.18.C Advanced Nozzle Burner for Commercial Water Heaters	-\$4,440.00
1.18.D Integrating Thermal Energy Storage in Advanced Gas/Renewable Homes	-\$3,700.00
1.18.F Methane Emissions from Tankless Water Heaters	-\$1,110.00

Commercial Food Service

1.14.A.4 Next Generation of CFS Burners - Phase 4	-\$481.00
1.14.A.5 Next Generation of CFS Burners - Phase 5	-\$1,480.00
1.16.B.3 CFS Codes and Standards - Phase 3	-\$2,220.00
1.18.B Warewasher Life Cost Analysis, Energy Efficiency and Environmental Impact Analysis	-\$2,960.00

Distributed Generation/Combined Cooling Heating and Power

2.12.F.5 Address Regulatory Barriers in Natural Gas Emergency Power Supply Systems Phase 2	-\$629.00
2.12.F.6 Reliability of Natural Gas for Backup Power Gen - EPSS Phase 3	-\$2,960.00
2.15.M Refund	\$0.18
2.16.H Test and Demonstrate M-Trigen Micro-CHP System	-\$6,859.80
2.16.I Refund	\$0.48
2.17.D iGEN Self-Powered Furnace Lab Testing	-\$2,183.00

2.17.E Long-Term Perf. and Reliab. Assessment of CHP and DG Systems	-\$1,480.00
2.17.F CHP System With Integrated Innovative Particle Thermal Storage	-\$3,075.81
2.18.E Capstone C200S Microturbine Lab Evaluation	-\$2,220.00
2.18.F Ultra-High Efficiency Natural Gas-fired Combustion Systems for mCHP	-\$6,660.00
2.18.G Integrating Micro-CHP and PV in Advanced Gas/Renewable Homes	-\$3,700.00
2.18.H MicroCHP Characterization and Demonstration	-\$3,700.00

Industrial Commercial Solutions

2.14.O.2 Gas Quality Sensor Validation - Phase 2	-\$2,220.00
2.15.A.2 On-site Electrical Generation - Phase 2	-\$2,960.00
2.17.A.2 Water Recovery From Humid Exhaust Gas - Field Demonstration - Phase 2	-\$1,850.00
2.17.B High Efficiency Food Processing Dryer - Field Demonstration	-\$986.79
2.17.C High Efficiency Commercial Clothes Dryer - Bench Scale Evaluation	-\$925.00
2.17.I High Efficiency Commercial Boiler Field Demo, Development and Deployment	-\$1,414.88
2.18.A Cost Optimization of 3D Printing of Advanced Burners for CHP and DG	-\$3,700.00
2.18.B Advanced Immersion Tube Burner	-\$2,960.00
2.18.C Sheet Metal Surface Burner Evaluation	-\$2,960.00

Transportation

2.13.I Refund	\$18.36
2.14.F.2 Free Piston Linear Motor CNG Compressor - Phase 2	-\$5,365.00
2.14.H Refund	\$11.89
2.14.I Refund	\$10.82
2.14.I.2 CNG Fueling Station Best Practices - Phase 2: Electronic Maintenance Log Application	-\$4,070.00
2.14.K.3 Design of Mitigation Solutions for CNG Contamination - Phase 3	-\$721.50
2.16.L Refund	\$33.64
2.16.N.3 NGV Codes and Standards Participation, Monitoring, and Support - Phase 3	-\$3,330.00
2.16.O.3 NGV America Technology Committee Participation and Rep - Phase 3	-\$2,960.00
2.17.H CNG Station Methane Release and Measurement Investigations	-\$388.50
2.18.I Cost Effective CNG Pre-Cooling Technologies	-\$2,960.00
2.18.J Virtual Pipeline Market Study and Technical Assessment	-\$2,960.00

Memberships/Other

1.10.A Web Program Upkeep	-\$185.00
6.GHPR Gas Heat Pump Roadmap Collaborative	-\$2,960.00

Adjustments and Miscellaneous Refunds

Board Designated Net Assets 2018	\$1,408.27
G&A Refund 2018	\$892.96

Funds Allocated to Projects -\$150,241.67

Unallocated Funds \$4,007.92

GTI Operations Technology Development Program

\$184,500 was submitted to Operations Technology Development, NFP (OTD) for the 2018 membership fee. \$182,665 has been allocated to specific projects as listed below.

Payments to OTD, Fees, Carryover

Payments to OTD	\$184,500
Administration Fees	-\$13,837.50
Carryover of Unallocated Funds from Prior Year	\$43,727.11
Funds Available for Allocation	\$214,389.61

Allocations to Projects

(1) Pipe and Leak Location

1.08.a.3 GPS EEN: Black Box Reference Device Enhancements, Phase 3	-\$4,188.52
1.15.a.2 Cross Bores – Sewer System Cleanout Safeguard Device – Phase 2	-\$922.50
1.15.c.1a Pipeline Defense with Combined Vibration, Earth Movement, and Current, Phase 1a	-\$1,107.00

(2) Pipe Materials, Repair, and Rehabilitation

2.13.b Refund	\$181.72
2.14.a.2 Composite Repair Wrap for Polyethylene (PE) Systems, Phase 2	\$262.73
2.14.c.2 Assessment of Squeeze-off Location for Small Diameter Polyethylene (PE) Pipe and Tubing, Phase 2	-\$3,485.94
2.14.e Refund	\$0.08
2.7.d Refund	\$287.25

(4) Inspection and Verification

4.12.c.2 Demonstration of Above Ground Pipe and Coating Assessment Tool, Phase 2	-\$1,109.27
4.13.c.2a PHMSA EMAT Sensor for Small Diameter and Unpiggable Pipe Phase 3 - Prototype and Testing	-\$2,583.00
4.13.c.3a EMAT Sensor - Measure Remaining Wall Thickness, Phase 2	-\$2,583.00
4.14.c.2 Validating Non-Destructive Tools for Surface to Bulk Correlations of Yield Strength, Toughness, and Chemistry, Phase 2	-\$2,952.00
4.15.a Refund	\$43.21
4.17.a Develop a Long-Term Enhancement of Direct Assessment (DA)	-\$1,686.16
4.17.d MAOP and Materials Verification	-\$670.84

(5) Construction/ Infrastructure Techniques

5.07.p (GTI) GNSS (GPS) Consortium	-\$5,535.00
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5.09.h Refund	\$1,083.26
5.10.d Refund	\$2.65
5.12.a.3 Development of an Integrated Intelligent Safety System (IISS) for Commercial and Industrial Customers, Phase 3	-\$1,180.56
5.13.b.2 Refund	\$221.34
5.13.b.3 GPS-based GIS Conflation System, Phase 3 - Pilot Project	-\$5,535.00
5.14.d.4b Pipeline Steel Material Traceability JIP-Additional Demos	-\$3,264.23
5.14.d.4c Steel Material Traceability JIP, Phase 2: Components	-\$5,535.00
5.14.d.5 Transmission Tracking and Traceability - Bizagi Platform, Phase 5	-\$2,102.93
5.15.a.2 Cybersecurity Collaborative - Phase 2	-\$3,690.00
5.15.c Refund	\$645.33
5.15.d.2 Development of a "Tee Antenna" for Fitting Protection, Phase 2	-\$1,193.82
5.15.f.2 No Stub Service Lateral Retirement Phase 2	-\$369.00
5.16.d.2 Remote Emergency Main Shutoff, Phase 2: Stopping Off L.P. Mains with No Excavation (No Access Points)	-\$1,845.00
5.16.k.2 ORFEUS Obstacle Detection Technology for Horizontal Directional Drilling, Phase 2	-\$2,583.00
5.17.g Material-Supplier Quality Assurance Program	-\$3,354.58
5.17.h Investigation of Drilling Mud Permeation in PE Pipe	-\$1,065.30
5.17.k Protect Tracer Wires from Corrosion - Best Practices and New Methods	-\$5,320.24
5.17.n Survey of Plastic Pipe Locating Technology and Locating Practices	-\$1,705.52
5.17.p Field Test NeverWet and Other Nano-Tech Coatings to Reduce Aboveground Corrosion	-\$1,281.54
5.18.a Spray-On Leak Seal for Meter Set Joints	-\$1,845.00
5.18.b Advanced Cross-Bore Detection Using Visual and Sensing Technologies	-\$1,845.00
5.18.c Insertable Excess Flow Valves (EFV) for Existing PE Service Lines	-\$676.01
5.18.e In-Service Welding Qualification Test Rig Guidelines	-\$1,107.00
5.18.f Compact Gas Meters	-\$2,583.00
5.18.h Low Cost Non-Corrosive Anodeless Risers	-\$1,845.00
5.18.k Improved Tools to Locate Buried Pipelines in a Congested Underground	-\$2,583.00
5.18.m Uniform Frequency Code	-\$1,845.00
5.18.n Performance, Durability, and Service Life of Residential Gas Regulators	-\$1,845.00
5.18.p Noncamera-Based Technology to Detect Cross Bores	-\$1,107.00
5.18.s Thermally Activated Gas Shut-Off Devices	-\$1,845.00
5.18.t Virtual Reality (VR) Training: Emergency Response Situations	-\$1,845.00
(6) Memberships/Other	
6.08.a Carbon Management Information Center (CMIC)	-\$9,225.00
6.11.a PRCI Membership	-\$1,686.70
6.14.a Quality Audit Program	-\$7,380.00
6.16.a Center for Methane Research	-\$9,225.00
6.a Sustaining Membership Program (SMP)	-\$36,900.00

(7) Methane Emissions/Detection and Gas Quality

7.15.b.2 Refund	\$899.19
7.15.b.3 Remote Gas Sensing and Monitoring Phase 3	-\$1,035.78
7.16.e.2 On-Line Biomethane Gas Quality Monitoring, Phase II: Trace Sensors	-\$1,845.00
7.18.b Biomethane Justification Study for Improved/ Accepted Gas Quality Standards	-\$1,845.00
7.18.c Robot for Remote Methane Detection, Phase 1	-\$3,690.00
7.18.g Impact of RNG on End Use Applications	-\$1,845.00

(8) Intelligent Utilities

8.16.a Intelligent Field Data Collection Platforms	-\$267.74
8.16.a Refund	\$1.24
8.16.b.1.5 Remote QA/QC: Fusions, Phase 1.5: AI	-\$3,690.00
8.17.b Tracking and Traceability Marking Standard for Natural Gas Transmission Components	-\$1,823.96
8.17.c GNSS Smart Automations for Field Data Collection	-\$3,647.93
8.17.e Integrity Management Module and GIS Platform for Mobile Data Collection	-\$1,623.23
8.17.g Supporting Technology for ASTM F2897	-\$1,934.30
8.18.a Component Marking and Laser Etching Development	-\$1,845.00
8.18.c Microsoft HoloLens Platform Enhancement	-\$3,690.00

(9) Risk and Decision Analysis/Models

9.16.a.2 Determining Data Quality Implications, Phase 2	-\$3,690.00
9.18.a Knowledge Management System, Phase 1	-\$1,845.00
9.18.b Modernize Tools to Assess Third-Party Damage Risk	-\$5,535.00
9.18.c Risk Model for Locates	-\$1,845.00

Adjustments and Miscellaneous Refunds

Board Designated Net Assets 2018	\$6,628.10
G&A Refund	\$1,013.27

Funds Allocated to Projects

-\$182,665.24

Unallocated Funds

\$31,724.38

Local Opportunity Projects

\$39,317 was expended for Local Opportunity Projects in 2018.

SUMMARY OF EXPENDITURES - 2018

Utilization Technology Development Program - GTI	\$ 129,500
Operations Technology Development Program - GTI	\$ 184,500
Emerging Technology Program - GTI	\$ 9,230
Local Opportunity Projects	<u>\$ 39,317</u>
Total Pennsylvania Delta Funds Program Expenditures	\$ 362,547

PROJECTED EXPENDITURES - PERIOD ENDING SEPTEMBER 2019

Expenditures for National Fuel Gas Distribution Corporation's Pennsylvania Delta Funds RD&D Program are projected to be \$605,730 in 2019 consisting of the following planned charges:

1. **Utilization Technology Development (UTD)** membership fees of approximately \$129,500. Specific projects to be determined.
2. **Operations Technology Development (OTD)** membership fees of approximately \$184,500. Specific projects to be determined.
3. **Emerging Technology Program (ETP)** membership fees of approximately \$9,230.
4. **Local Opportunity Projects** spending estimate of \$282,500 (see below). Funds not used for the development of qualified local technology projects in National Fuel territory may be allocated to the national Gas Technology Institute programs described above.
 - 1) \$62,500 – IGS CNG Services (already in-process; final payment)
 - 2) \$45,000 – CHP Assessments (3 @ \$15,000 each)
 - 3) \$100,000 – Small Scale LNG Project (\$50,000 in-process, \$50,000 anticipated)
 - 4) \$25,000 – Hotel Technology Study
 - 5) \$50,000 – Potential virtual pipeline project

STATUS UPDATE OF LOCAL OPPORTUNITY PROJECTS - 2018

Funding of gas industry research through the Gas Technology Institute (GTI), as an example, returns many benefits, including insuring continued improvement and availability of energy-efficient, low emissions and cost-effective gas technologies; while leveraging the funding resources of gas utilities across North America. The Local Opportunity Projects portion of this program intends to identify projects for direct local support offering equal, or better, benefits than GTI. This is challenging but National Fuel endeavors to identify and develop these opportunities. Funds available through this portion of the program, beyond the minimum commitments to GTI, may be used for qualified local projects. Funds not used locally are sent to GTI to be allocated to suitable projects, as shown in the previous supported project listings.

Summaries for six Local Opportunity Projects active or completed in 2018 are provided below.

1. **Multi-Family Gas Retrofit – Phase I.** This project is intended to serve as a case study demonstrating the relative ease, and cost-effectiveness of converting all-electric multi-family residences to natural gas heating. A belief exists among many building owners that the cost of natural gas infrastructure, equipment, and ducting/venting outweighs the many benefits of natural

gas heating. This project will document the costs, and modifications required to convert thirty two three bedroom townhouses from all-electric, to natural gas forced air heating. A successful project will prove to other multi-family building owners in National Fuel's territory that converting to gas heating can be done at a reasonable cost, lowering energy bills and increasing both tenant satisfaction, and unit occupancy rates. As of September 30th, all thirty two units were converted successfully. Existing PTAC units were removed, new gas furnaces and ducting were installed, and all necessary carpentry was able to be completed at a rate of two units per week. Additionally, work was able to be completed in occupied units, with only minimal disruption. Utility bills for past heating seasons have been gathered and will be compared with gas bills from the post-conversion heating seasons as part of a final project report. Other factors such as occupancy rate impacts and design/construction hurdles will also be considered.

2. **Multi-Family Gas Retrofit – Phase II.** This project supports a similar retrofit of an all-electric apartment multi-tenant building to natural gas forced air heating. In this second phase however, an identical building was recently upgraded from electric resistance heat to ductless mini-split heat pumps. This situation provides the opportunity for a case study directly comparing installed cost, operating cost, energy use, and tenant satisfaction between ductless mini-splits and natural gas heating. It is expected that a successful case study will capture the necessary data and information to evaluate the two competitive technologies under identical conditions and in identical building design and construction. One specific element of interest will be evaluating the performance of the heat pump system in real-world operation and whether there is significant performance degradation in our comparatively colder climate in comparison to a natural gas forced air system.
3. **Public CNG Station Investment.** Construction of a commercial public CNG station was nearly complete during this Delta Fund project year. Upon completion in the first part of FY2019, it will be the first to offer public CNG fueling in the vicinity of Erie, Pennsylvania. In addition to serving commercial traffic across Interstate 90, the project is expected to ignite local fleet interest in converting diesel/gasoline vehicles to natural gas to capture the economic and environmental benefits. It is also expected to serve as critical backup fueling for existing fleets with private CNG fueling infrastructure, thus enhancing resiliency in the event of equipment failure. Support from National Fuel's Delta Fund program was a critical factor in the developer's decision to construct a public CNG fueling station at this location.
4. **CNG Maintenance Garage Study.** There are specific codes related to building construction, equipment specifications, ventilation, etc. where differing types of maintenance and repair on CNG vehicles is to be conducted. There is also some confusion as to where and under what conditions some of the specifications are required and where they are not. As a complement to a Pennsylvania PennDOT P3 project to install CNG fueling at a local public transit operation, the Delta program was utilized to fund a study to assist the transit authority to clarify and understand the codes as it relates to their new maintenance and repair building and to develop prospective costs for various building and equipment options. This report will also serve as additional guidance and information for other similarly situated fleets.
5. **CHP Preliminary Assessments.** National Fuel continues to implement an active prospecting initiative to identify candidates for CHP project development. Following pre-screening, formal preliminary feasibility assessments were conducted utilizing the services of an engineering firm associated with the Gas Institute of Technology and expert in CHP technology and project development. Four assessments have been completed to date, with four more currently in process. One of the four completed assessments has resulted in the customer contracting for detailed engineering and design to make a final determination on whether to move forward with implementation.
6. **Small-Scale LNG Production.** The goal of this project is to develop, test, and demonstrate a small-scale LNG liquefaction plant. If successful, the plant design would allow for cost-effective production of liquefied natural gas using distribution pipelines as the source. Once plant

construction and testing is completed, the plant will be relocated and sited permanently at an existing CNG fueling station. The plant design itself is novel in that it would be coupled with existing CNG station equipment. This allows for cost reduction as existing CNG compressor capacity can augment that which would be required for LNG production. Also, existing compressors would see less idle time, as they would be used during off-peak hours for LNG production. The plant, as designed, is estimated to produce 6,000-20,000 LNG gallons per week. During 2018 the initial prototype project location was identified and site preparation is partially complete. All necessary permits have been acquired. Critical equipment/vendor selection and construction of the CNG trailer that will feed the LNG system are underway.

PROSPECTIVE LOCAL OPPORTUNITY PROJECTS – 2019

1. **Multi-Family Gas Retrofits – Phases 1 & 2.** Continuing on the work done in prior years, collection of data and information will continue for both Phase I and Phase II facilities. Such data and information shall permit performance analysis, both technical and financial, with the intent of providing comparative information that will inform other potential multi-family conversion opportunities throughout the service territory. Upon completion of data collection and analysis over a period of years, the resulting report will be utilized to educate customers and home builders with regard to the impact of differing equipment selection alternatives.
2. **Hotel Energy Technology Assessment.** Historically, the hotel/motel market has typically specified natural gas systems for common area within facilities and for process loads. However, space heating for individual rooms has generally been electric, despite the significant cost differential per equivalent unit of energy. Lack of knowledge related to natural gas equipment options and performance capabilities in comparison to alternatives is believed to be contributing to the historical under-representation. This project is proposed to develop a hotel building model with which varying alternative systems will be evaluated in multiple system simulations. Conclusions will be utilized to proactively educate and inform project developers and key specifiers regarding the impacts of differing system choices.
3. **Public CNG Station Support.** Construction and commissioning of the Erie area station is to be completed by the end of October 2018. The station will undergo a “soft” opening during late calendar 2018 and into early calendar 2019. The project developer and National Fuel will jointly participate in the promotion of the station and educate local fleet operators regarding the potential benefits of utilizing CNG as an alternative fuel. Direct fleet-specific outreach as well as general technology and economic assessment workshop forums will be utilized in assisting local fleets evaluate CNG vehicle options.
4. **Small-Scale LNG Production.** Continuing to build on the prior work toward the development, testing, and demonstration of a small-scale LNG liquefaction plant. Expected progress in FY2019 includes the selection of a vendor and finalization of a LNG liquifaction system design.
5. **Virtual Pipeline.** As a sidebar discussion of the Small-Scale LNG Production project, it has been posed that the technology being developed under that project may potentially serve a broader market than initially anticipated. Beyond the typical long-haul trucking, marine applications, and mother/daughter CNG transportation fueling, among others, the prospective benefits of utilizing the plant to support the development of a virtual pipeline service was raised. A project is under discussion to identify a pilot to construct and place virtual pipeline equipment to serve natural gas load where uneconomic to extend traditional natural gas infrastructure. The purpose of the project would be to evaluate the financial viability as well as the technical equipment and operational requirements to serve a market in such a manner. Potential host sites are currently being identified as candidates.

6. **CHP Feasibility Assessments.** In accordance with the PUC CHP Policy Statement and as an extension of previous initiatives in support of market development for CHP, National Fuel will continue to implement an active prospecting program to identify prospective candidates for siting of CHP technology. Following initial pre-screening activities, it is strongly anticipated that Delta funds will support formal technical and economic feasibility assessment studies for those projects that demonstrate initial attractive deployment opportunities. Four preliminary assessments are currently in-process and should be completed by the end of calendar 2018. Identification and preliminary evaluation of additional candidates is underway.

National Fuel intends to continue efforts to identify other beneficial Local Opportunity Projects for development which may provide direct benefit to our Pennsylvania consumers, businesses, and industries.