Mid-Atlantic CHP Update and Impact of Wider CHP Adoption in Pennsylvania

Mid-Atlantic CHP Update

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CHP Technical Potential

Source: ICF International

CHP Mid-Atlantic Update

New Jersey Programs and Regulations

• NJ BPU OCE CHP/Fuel Cell Grant Program
• NJ BPU ‘REIP’ Grant Program for Biofuelled CHP
• No SUT (7% sales tax) on Natural Gas for CHP
• Permit sales of electricity and thermal energy among non-affiliated entities for sale of electricity, the CHP plant must supply thermal to customer
• Air Permit by Rule adopted (up to ~5 MW)
• Utility Standby Rates currently under review
• NJ HUD Funded ‘Energy Resiliency Bank’
NJ BPU CHP/FC Grant Program

<table>
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<tr>
<th>Eligible Technology</th>
<th>Size Installed Rated (Capacity)</th>
<th>Incentive ($/Watt)</th>
<th>P4P Bonus ($/Watt)</th>
<th>% of Total Cost</th>
<th>Cap per project (cap $250,000)</th>
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| Combined Heat & Power | ≤ 500 kW | $2.00 | $0.25 | 30-40% | $2 million | Powered by non-renewable fuel source
| Gas Internal Combustion Engine | >500 kW - 1 MW | $1.00 | | | |
| Gas Combined Turbine | >1 MW - 3 MW | $0.55 | | | |
| Microturbine | >3 MW | $0.35 | | | |
| Fuel Cells | ≤ 1 MW w/ waste heat | $4.00 | | 60% | $2 million | Powered by non-renewable fuel source. Incentives available for systems both with and without waste heat recovery.
| ≤ 1 MW | $3.00 | | | |
| >1 MW w/ waste heat | $2.00 | | | |
| Heat Recovery | ≤ 1 MW | $1.00 | | 30% | $2 million | Powered by non-renewable fuel source. Heat recovery or other mechanical recovery from existing equipment utilizing new electric generation equipment (e.g. steam turbines)
| >1 MW | $0.50 | | |

New Jersey CHP Status

- During this period program consistency was an issue
- Inconsistent funding
- Economic Turmoil
- Program terminations and restarts

Source: NJ EDA, TRC and BPU

Maryland CHP Program

- CHP Program
  - Applications run through utilities $20MM in first round with additional $200MM approved
  - Provides incentives up to $2 million
  - Design incentive ($75/kW)
  - Installation incentive ($175/kW)
  - Design and installation capped at $1 million
  - Production incentive ($0.07/kWh for 18 months): Three payments subsequent to review of metering data at the end of the 6th, 12th and 18th months. (capped at $1 million)
  - A minimum of 65% efficiency (Higher Heating Value) on an annual basis
  - Must not export electricity to the grid
  - Projects must be pre-approved by December 31, 2014
  - All projects must be commissioned and operational by December 31, 2016

BGE Results

- BGE initially received 16 proposals
- CHP program in April 2012 and received Commission approval in June 2012
- BGE ($10.3 million)
- Proposals were solicited through a RFP process with bids due in December 2012
- 11 projects initially passed the technical and engineering reviews
- Gas service upgrades were required on several projects but upgrade costs to customers have been minimum
- In August 2013 received Commission approval to increase its CHP budget by $10.7 million and provide incentives for projects approved by BGE by 2014 and completed by 2016
- Twelve (of 18) CHP proposals making progress towards implementation
Lessons Learned

- Electric Grid Interconnection, Standby Tariff and No Recognition by PJM as Capacity Resource
- Expansion of existing Standard Interconnection to greater than 5 MW (Maryland is 10 MW and FERC is 20 MW)
- Standby Tariff Review and Assessment
- Need alignment of multiple state constituents on PJM issues
- Lack of CHP Industry Infrastructure
  - Long-term outlook is main industry consideration
  - Requires clear policy signals
  - Owner benefits alone are not sufficient
  - Developers and support industry need to see opportunity

Lessons Learned

- Capital Investment Requirements and Load Risk
- BGE and other experience shows incentives move the market typically require 30% CapX support
- Smaller size (<1 MW) CHP plants require higher incentives
- CFA Grants have been available but not predictable
- Act 129 EE measures can include CHP but not prescriptive like PV. If 1% of Pennsylvania’s electric consumption (1,459,433 MWh) came from CHP this would reduce grid energy use by 1,459,433 MWh and reduce grid peak demand by 196 MW.
- Long-Term (multi year), Transparent & Consistent metrics
- Poor Recognition of ‘Externalities’ or Societal Benefits and Emissions
- Cost/Benefit Analysis including Externalities (Societal Cost Test)
- Better Outreach to all Stakeholders
- Permit-by-Rule for CHP

Lessons Learned

- The PUC can address regulatory hurdles that might exist, via standardized interconnection requirements, timelines, the equity of standby rates and other matters at the utility, on-site generator interface.
- The State can review air permitting, and other codes and siting issues, and can encourage CHP in its own capital facilities
- The State can provide Capital Expenditure or procurement incentives that can compensate CHP for the suite of utility system, economic development environmental and societal benefits that the investment provides.
Chemical Industry, MS and CHP
Keeping Pennsylvania Competitive

- Potential U.S. chemical industry investment linked to plentiful and affordable natural gas has topped $100 billion. These projects—new factories, expansions, and process changes to increase capacity—could lead to $81 billion per year in new chemical industry output and 637,000 permanent new jobs across the economy by 2023.

- "The American Chemistry Council welcomes today's Executive Order that recognizes the important contribution of CHP in improving energy efficiency and easing the major transition underway in America's electricity sector. The President's CHP goal is ambitious, and represents about a 50 percent increase in deployed CHP capacity. Expansion of CHP capacity can make American manufacturers more competitive in the global economy and can stretch our nation's natural gas supplies that benefit a wide variety of industries across the country."

Marcellus Shale Gas Utilization & CHP

- Expanding the PA gas grid to deliver Marcellus Shale gas to the market, particularly PA residents, businesses and industry would benefit from CHP end-use.

- High-load factor CHP can help to offset connection costs for low load factor applications such as residences and space conditioning only applications. Furthermore, connecting stranded communities to Marcellus gas could be justified and/or accelerated with CHP end-use. This not only allows local resources to be used but also increases local disposable income through reduction of energy bills.

- Combining low energy prices (Marcellus Shale Gas) with low operating costs (using CHP) will place Pennsylvania in a leading position to attract the next wave of petrochemical development in the US.