ACT 129 PHASE TWO DOCKET NO. M-2012-2289411 COMMENT FILING

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April 16, 2012

Policy Filing

U.S. Department of Energy
Mid-Atlantic Clean Energy Application Center
Promoting CHP, District Energy, and Waste Heat Recovery

NOTICES AND ACKNOWLEDGEMENTS

Acknowledgment: This material is based upon work supported by the Department of Energy's National Energy Technology Laboratory under Award Number DE-EE0001109.

Confidentiality: This filing is considered public information

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Purpose: The purpose of this filing is to provide comment in response to Act 129 Energy Efficiency and Conservation Program Phase Two, Docket Number M-2012-2289411 and to support the adoption of combined heat and power (CHP) systems in Pennsylvania.

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COMMENTS

We appreciate the opportunity to provide comments on Docket number M-2012-2289411 relating to Act 129 Energy Efficiency and Conservation Program Phase Two. These comments relate to the implementation of combined heat and power, district energy and waste heat recovery both in Pennsylvania as well as throughout the Mid-Atlantic region.

Introduction

Act 129, enacted October 15, 2008, requires Pennsylvania utilities to develop energy efficiency programs that reduce their electric load by 1% by May 31, 2011 and by 3% by May 31, 2013. It also requires a total peak demand reduction of 4.5% by May 31, 2014. "As of the end of the second program year, Act 129 efficiency programs have already lowered the state's electric load by 2,073 GWh, 41% higher than the goal set by Act 129. This represents $278 million in annual savings for electric ratepayers, or a present value $2.3 billion over the expected lives of the efficiency measures, for an upfront cost of $281 million. This is a present value of about $8 in ratepayer savings for every dollar spent on the program. The efficiency achieved to date will also create a lifetime emissions reduction of 23 million tons of carbon dioxide equivalent, equal to taking 4 million cars off the road for a year, and create over 4,000 jobs[1]."

The initial topic addressed by the Public Service Commission at the Stakeholder meeting was whether or not the stakeholders supported the continuance of Act 129 to a potential Phase Two. Should the Commonwealth wish to build on the energy, economic and environment success of the Phase One effort, the question is what, if anything should be changed with respect to the original program.

One transformative issue that has emerged since the inception of Act 129 is the enormous impact of Marcellus shale gas. The Commonwealth of Pennsylvania currently benefits from low natural gas and electricity prices and an abundance of clean natural gas in Pennsylvania will continue to suppress energy prices for the foreseeable future. Our assessment with respect to mid-term and long-term electric price, in particular, is one of moderately increasing prices. One could argue that energy supply and demand are no longer an urgent matter in the Commonwealth. However, given current chemical/petrochemical economic activity[2] in the Commonwealth a bright future in the manufacturing sector is on the horizon which will inevitably increase electric demand. Economic growth coupled with increasing EPA emission regulations will continue to add pressure to the electric grid in the mid and long-term. Continuing to address mid and long-term energy issues, as was done with Phase One of Act 129, will be necessary for the economic future of the Commonwealth. As stated by Chairman Robert F. Powelson:

> "Throughout my tenure on the Commission, I have championed the programs resulting from Act 129 and I remain a strong supporter of energy efficiency and demand response. It is essential, however, that any future Act 129 programs are effective uses of consumers' money.[3]"

Should the Commonwealth move forward with Act 129 Phase Two, or any other energy efficiency measure, Combined Heat and Power "CHP" technologies should be considered for addition to the portfolio of solutions. CHP addresses energy issues important to Pennsylvania by efficiently and effectively using Marcellus shale gas[4], lowering consumer power costs, increasing power reliability, creating jobs and

[1] "Pennsylvania 2013 – 2018 Energy Efficiency Goals" Prepared for PennFuture, Optimal Energy, Inc. December 19, 2011

[2] Royal Dutch Shell said March 15, 2012 it has selected a site in Western Pennsylvania for a proposed ethane cracker that would utilize natural gas from the Marcellus Shale field, Industry Week, By Jonathan Katz, March 15, 2012

[3] PUC Seeks Comment on Future of Energy Efficiency, Conservation Programs, March 01, 2012, http://www.puc.state.pa.us/general/press_releases/Press_Releases.aspx?ShowPR=2937

[4] See Governor's Marcellus Shale Advisory Commission Report, 7/22/2011.

stimulating private investment while also providing a low cost means of reducing greenhouse gas (GHG) emissions as a byproduct.

Background

CHP is the sequential production of heat and electricity or electricity and heat from a single fuel source. CHP systems save energy by recovering heat during the power generation process and using it, on site, for heating, drying, cooling, refrigeration and/or humidity control and thus improving the efficiency of the fuel used to power the plant. CHP systems are located at a host site (such as an industrial plant, university or hospital) to which they provide thermal energy (heat and/or cooling) and electricity to the host customer. Meeting the host's electricity requirements often requires additional purchases of electricity from or sales to the utility grid, while additional thermal needs can be resolved by augmenting with a conventional technology. In many applications, CHP results in a significant improvement in efficiency of energy use, which translates into lower operating costs.

Delivered fuel use efficiency of the electric grid has been about 34%[5] for several decades. CHP can achieve fuel use efficiency[6] over 65% and as high as 85% in some cases. This high fuel use efficiency provides significant energy cost savings, primary energy savings and CO_2 emissions reduction. In addition, development of in-state CHP systems may reduce or defer the cost of otherwise required transmission infrastructure, creates jobs and improves Pennsylvania's competitiveness. Further, use of the shale gas resource base with high efficiency CHP extends the life of this valuable natural resource for Pennsylvania's citizens.

The Commonwealth's Electric Future

The combined electric utility forecast of the Commonwealth's electric utilities peak load projects an increase from 27,597 MW in 2009 to 29,550 MW in 2014 at an average annual growth rate of 1.4 percent[7].

The PUC concluded in its 2010 report[8] *"[t]he fuel mix of generating units in the RFC region is 15.0 percent nuclear, 3.0 percent conventional and pumped storage hydro, 47.0 percent coal, 6.0 percent oil, 28.0 percent gas, and 1.0 percent wind and other. Since there currently are no adverse conditions affecting the resources within the RFC region, the RFC assessment assumes that any future adverse weather or fuel supply issues would be temporary in duration and limited in impact on resource availability, and will not affect the long-term assessment.*

Within the PJM footprint, the capacity mix is likely to shift to more natural gas-fired combined cycle and combustion turbine capacity. Continued reliance on steam (mainly coal) appears likely, although potential changes in environmental regulations may have an impact on coal units throughout the footprint."

The Pennsylvania PUC rightly concluded that "…the capacity mix is likely to shift to more natural gas-fired combined cycle and combustion turbine capacity."

CHP is an important Marcellus gas utilization strategy to generate new local jobs, retain existing jobs, reduce energy costs, improve the economy and enhance the environment.

Electric Energy Cost

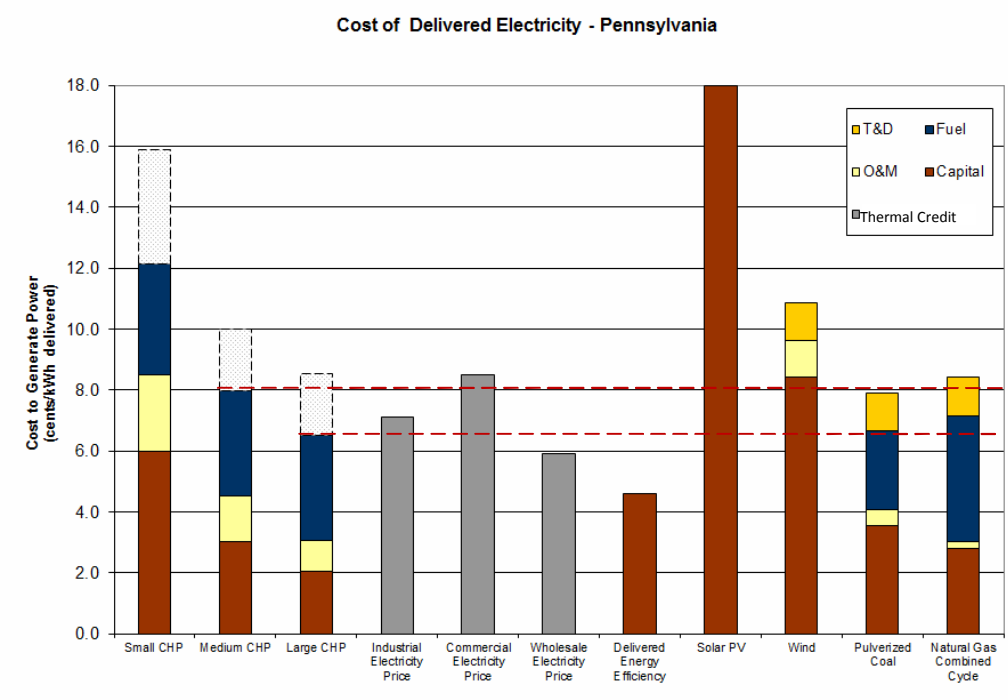
[5] Includes all extraction, conversion and delivery losses and is measured in Higher Heating Value.

[6] Fuel use efficiency (aka overall CHP efficiency) is defined by ASHRAE as the delivered power in Btu / (fuel used by the CHP system less the fuel that would have been required to produce the thermal energy provided by the CHP system)

[7] ELECTRIC POWER OUTLOOK FOR PENNSYLVANIA 2009–2014, Pennsylvania Public Utility Commission, July 2010

[8] Ibid

Our analysis shows that CHP in Pennsylvania is the lowest supply cost means of providing additional power generation, as shown in **Error! Reference source not found.** Medium and large scale CHP[9], including the thermal credit[10], provides power at close to the wholesale power price from the grid, lower than new coal or natural gas central station power plants and lower than onshore wind and solar photovoltaic (PV) systems[11]. The conclusion from Figure 1 is that large CHP is the least cost new electricity supply option for retail ratepayers in Pennsylvania today, and medium sized CHP shows an equivalent cost to new pulverized coal plants and less than new natural gas combined cycle power plants.



Source: ICF for DOE

Figure 1: Cost for Electric Power Production

CHP not only provides operating savings for the user, but also represents a cost-effective supply of new power generation capacity. As an example, Figure 1 compares the cost of electricity generated from small, medium, and large sized CHP projects with delivered electricity costs in Pennsylvania and the cost of electricity from new central power generation. The light shaded area at the top of the CHP bars shows the savings in the costs of displaced on-site boiler fuel from capturing and using the waste heat from CHP at the site. The net cost of power from large and medium CHP systems are below both the industrial and commercial delivered retail electricity rates indicating that CHP can generate savings for the end-user. The net costs of large and medium CHP power are also at or below the delivered costs of new coal and natural gas central station generation as well as utility-based renewable options, indicating that CHP represents a cost-effective source of new generation capacity for the state as a whole.

[9] CHP in large and medium sizes ≥ 1MW in capacity with HHV efficiency of 36% and 37% respectively and using natural gas priced at $5.29 per million Btu's.

[10] Thermal credit applies the cost of generating the recovered (free) thermal energy from the CHP plant to reducing the power generation production cost. The credit is shown as a white column with dashed outline.

[11] Onshore wind has a production cost of 10.87¢/kWh. Offshore wind is expected to be higher but the calculation unknowns are quite large at this point. Utility based solar PV is about 22 ¢/kWh and non-utility scale plants are about 32¢/kWh

Figure 1 shows that the optimum cost-based grid loading order for new electricity production in Pennsylvania, based on economic dispatch and without accounting for societal benefits, is:

1. Energy efficiency
2. Large CHP
3. New pulverized coal
4. Medium CHP[12]
5. New combined cycle combustions turbines.

The energy cost data (Figure 1), indicate that CHP can be an important economic means of delivering cost effective electricity in Pennsylvania. The additional societal benefits of lower emissions, increased grid stability and reliability, and reduced transmission requirements offered by CHP provide further reasons to more fully utilize CHP as an in-state power supply resource.

Environmental Impact

The environmental impact of energy supply is critical when constructing public policy options. CHP does not emit the hazardous pollutants of the other fossil-based grid power it displaces. Figure 2 compares a 1 MW CHP system to a 1 MW PV system, the natural gas CHP system[13]:

- produces over 400% more kWh (due to longer operating hours) than PV,
- uses 1.5% of the physical space required by PV,
- costs 52% of the of installed cost of PV,
- results in 183% greater primary energy savings than PV, and
- reduces carbon emissions by 269% more than PV because of longer operating hours

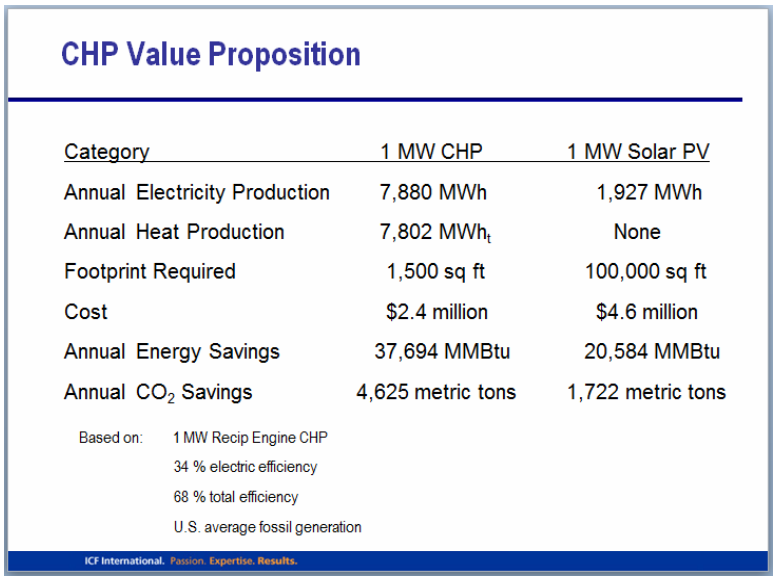


Figure 2. CHP vs Solar PV Impact

Natural gas based CHP can be considered an effective tool to reduce carbon emissions within the Commonwealth. According to McKinsey and Company[14] , CHP provides carbon abatement at a negative cost as it provides cheaper power than the higher carbon emitting plants it replaces.

[12] 3 MW was modeled

[13] ICF International

[14] December 2007 report titled "Reducing U.S. greenhouse gas emissions: How much at what cost?"

Technical Potential for CHP

CHP technical potential is calculated in terms of CHP electrical capacity that could be installed at existing and new industrial and commercial facilities based on the estimated electric and thermal needs of the site.

Figure 3 summarizes the technical potential for additional CHP in the state by market segment. The estimate includes both additional CHP potential at existing businesses and CHP potential from the expected growth in new facilities over the next 10 years.

Figure 3 shows that the CHP potential in the industrial sector that is able to economically sell the excess electricity from the CHP system to the electric grid is 3,723 MW. The CHP potential for the industrial sector that does not sell excess electricity is 3,623 MW. CHP that is sized to meet thermal loads on site may result in excess electric generating capacity, particularly in industrial sectors with very large thermal needs such as the chemical industry. Traditionally this excess power has been exported to the grid to serve other customers. Today, the marginal cost of this excess electric power is near to or lower than the average wholesale electric price. In Pennsylvania today this is not the case. No CHP export potential was assumed to come from commercial or institutional facilities.

The total technical potential is close to 11,000 MW. Most of this potential is in industrial and commercial facilities that exist today; only a small portion is due to the growth in new businesses.

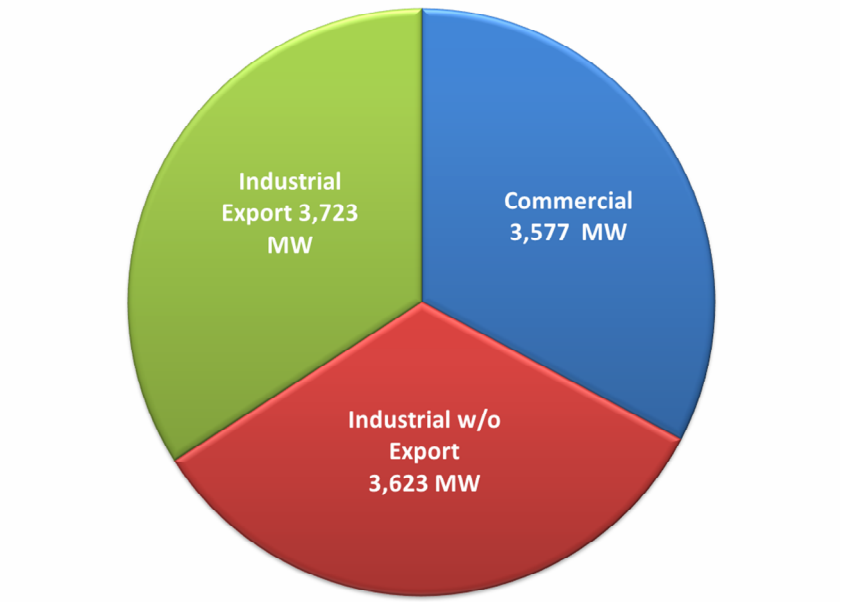


Figure 3. Technical Pennsylvania CHP Market Potential in MW by Application

Conclusions

CHP can be an important energy efficiency and economic development consideration for Pennsylvania's future. The Commission could look to neighboring states that have recognized the value of CHP in reducing grid demand and grid power costs, as well as providing societal benefits. In order to spur the market to obtain these benefits, these states have set up CHP-specific programs that are funded in a variety of ways.

- New Jersey: Capital grant program specifically for CHP[15] and low interest loan program for clean energy projects.[16]
- New York: Capital grant pay for performance program.[17]
- Massachusetts: Capital grant program plus production based portfolio standard certificates.[18]

It should be noted that nine Pennsylvania CHP projects were awarded in 2009 using American Recovery and Reinvestment Act through Pennsylvania's "Green Energy Works!" grant program. These projects were due to go online in 2011. This one time stimulus program quickly moved the market at an average incentive of slightly over $700/kW. A sustained, consistent policy and support, at a lower State investment level than the "Green Energy Works!" CHP grant, would spur the installation of a significant amount of CHP system.[19]

Should the Commission proceed with Phase Two, the Total Resource Cost test, as anticipated in Act 129 Phase 2, can be used to evaluate discrete CHP energy efficiency programs[20]. Further, a fixed valuation of the benefit CHP offers would provide guaranteed cofunding from the program only if an applicant were successful. The program requirements and funding amounts would need to be transparent and of sufficient duration to allow the industry to react to such a new program for the State. Funding can be based on performance so that the ratepayer is assured their money is invested wisely. One benefit such a CHP program offers is that the results can be easily demonstrated and measured

FOLLOW UP

The Mid-Atlantic Clean Energy Application Center is available to discuss any of the above issues and will continue to support Pennsylvania in its efforts to develop a clean, cost effective and reliable power market through effective utilization of CHP in line with the Pennsylvania's Public Utility Commission's and U.S. Department of Energy's goals.

[15] See NJ BPU Office of Clean Energy C&I Programs http://www.njcleanenergy.com/commercial-industrial/programs/combined-heat-power/combined-heat-power

[16] See NJ Economic Development Authority CESSI program. http://www.njeda.com/web/Aspx_pg/Templates/Pic_Text.aspx?Doc_Id=1080&topid=722&midid=1357

[17] See NYSERDA CHP Program http://www.nyserda.ny.gov/en/Page-Sections/Research-and-Development/Combined-Heat-and-Power.aspx

[18] See MA Department of Environmental Resources Green Communities Program http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/gc-grant-program/

[19] See DOE's Mid-Atlantic Clean Energy Application Center PA CHP Market Report http://www.maceac.psu.edu/states_pa.html

[20] Act 129 requires the Commission to use the TRC test to evaluate a utility's Energy Efficiency and Conservation Plan