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STATE OF NEW HAMPSHIRE

Inter-Department Communication

DATE: July 9, 2013
AT (OFFICE)

FROM: James. J. Cunningham, Jr.

SUBJECT: 2013-2014 CORE Electric Energy Efficiency Programs and Natural as Energy Efficiency Programs Docket No. DE 12-262
Staff Recommendation on CHP Pilot Project

TO: Debra Howland, Executive Director and Secretary
Commissioners

Background:

On May 14, 2013, Unitil Energy Systems ("Unitil") filed a motion for expedited approval of its proposed Combined Heat and Power (CHP) Pilot project.

In the 2013-2014 CORE Settlement Agreement, the settling parties agreed that Unitil would withdraw its Combined Heat and Power ("CHP") Pilot proposal, provide Commission Staff and the parties with additional information regarding the Pilot, and would determine whether it would seek Commission approval for the Pilot by April 30, 2013.[1]

On March 22, Staff and the parties met at Department of Environmental Services to discuss the status of the CHP Pilot proposal. At that time, Mr. Thomas Palma provided a slide presentation describing CHP. Subsequently, on April 8, 2013, Unitil provided responses to informal discovery questions clarifying a number of key issues. On April 29, 2013, Staff and the parties held a conference call to address several follow-up questions.

Explanation of Combined Heat and Power Technology:

CHP is an established technology used for energy efficiency. EPA provides a good resource[2] that explains how CHP works, and provides an example of the economic analysis.[3] In addition, specific information about the proposed CHP Pilot can be found in the 2013-2014 CORE filing[4] (page 60).

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[1] On April 29, 2013, the Commission granted a two-week extension requested by Staff and the parties.
[2] http://www.epa.gov/chp/basic/index.html
[3] http://www.epa.gov/chp/basic/economics.html
[4] http://www.puc.nh.gov/Regulatory/Docketbk/2012/12-262/TRANSCRIPTS-OFFICIAL%20EXHIBITS-CLERKS%20REPORT/12-262%202012-12-21%20EXH%202%20PSNH%20MERGED%20ATTACHMENT%20A%20AND%20B%20TO%20SETTLEMENT%20AND%20UPDATED%20TO%20INCLUDE%20LATEST%20CORRECTIONS.PDF

Summary of the Salient Issues In This Case:

The proposed budget for the CHP Pilot project is $100,000. Approximately $25,000 is currently anticipated to be spent in 2013, with the remaining portion spent in 2014. A summary of the salient issues that have been examined by Staff and the parties are as follows:

- TRC B/C: The Company intends to calculate the Total Resource Cost (TRC) Benefit Cost (B/C) for the CHP Pilot project as a stand-alone analysis, consistent with the recommendations contained in the New Hampshire Energy Efficiency Working Group Report.[5] Unitil has performed an illustrative engineering analysis of CHP that indicates a TRC B/C in the vicinity of 1.5.[6] In addition, there are other benefits provided by CHP as follows:
    - On-site generation of electrical and/or mechanical power, with energy savings when compared to conventional, separately purchased power.[7]
    - Waste-heat recovery for heating, cooling, dehumidification, or process applications, with related energy savings for of onsite thermal energy systems.[8]

- Performance Incentive: The CHP Pilot incorporates the standard performance incentive (PI). Given that the budget is modest and the main objective of the program is to reduce electricity usage, the standard performance incentive is considered by Staff and the parties to be reasonable. Also, pursuant to the Commission's approved formula, PI is not calculated for the stand-alone CHP project; rather, it is calculated for all costs at the C&I sector level.[9] Therefore the CHP Pilot project cost is part and parcel of all costs in the C&I sector for purposes of calculating the PI.[10]

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[5] For specific information about the TRC B/C test, please refer to the New Hampshire Energy Efficiency Working Group Report, approved by the Commission in Order No. 23,574.

[6] Please see Attachment No. 1 for the engineering analysis provided by UES in response to informal discovery, question 7, provided on April 8, 2013. The engineering analysis is described in detail by the company; and, it includes a summary of the inputs for the TRC of approximately 1.5 at the end of the response.

[7] Op. cit. http://www.epa.gov/chp/basic/index.html

[8] Op. cit. http://www.epa.gov/chp/basic/economics.html

[9] The Commission approved an exception to the sector level formula for the HPwES program. PI was limited to the costs to achieve electric savings, with zero PI for the costs to achieve non-electric savings. However, in this case the savings is expected to be all electric savings.

[10] For specific information about the PI formula, please refer to the New Hampshire Energy Efficiency Working Group Report, approved by the Commission in Order No. 23,574, at page 19 and Appendix 6. Staff notes that the recent update to the PI formula, filed on July 1, 2013, provides for a PI in the range of 7.5% baseline to 10% maximum. Staff expects that PI for the costs associated with the CHP program will earn PI within this range.

- Savings: Reduction in electric usage is the main objective of the CHP Pilot.[11]

- Cooling Load: Air conditioning and cooling load reduction will be encouraged, if cost effective.[12]

- Rebates: Rebates for the Pilot are designed to cover the lesser of a one year payback or up to 35% of equipment and installation costs. This mirrors the existing Commission approved rebate for the C&I retrofit programs approved by the Commission in Docket No. DE 12-262, Order No. 25,462.[13]

- Transparency: The Pilot provides for transparency in the selection criteria; and provides that any Unitil C&I customer is eligible to participate regardless of the fuel they use.[14]

Staff Recommendation:

Staff and the interested parties have thoroughly examined Unitil's proposed CHP Pilot measure. We believe that the budget for the Pilot is modest and that the project is cost effective, with an expected TRC B/C of greater than 1.0. The Pilot targets the reduction in electric usage as its major objective; and, provides for the standard Commission authorized performance incentive for electric savings. Also, the Pilot encourages air conditioning and cooling load reduction, where cost effective. Further, it provides for rebates that are aligned with existing Commission approved rebates. Finally, the design of the Pilot is open and transparent and has the support of numerous parties including the Office of Consumer Advocate (OCA), the Office of Energy Planning (OEP), the Department of Environmental Services (DES), the Jordan Institute, Liberty Utilities and PSNH.

Based on the above, Staff recommends that the Commission approve Unitil's proposed CHP Pilot project.

Copy: DE 10-188 Docket-Related Service List

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[11] If the Commission would like additional information about the savings calculations, Staff will be happy to provide copies of Unitil's responses.

[12] Unitil notes that in order to reduce the cooling load, a CHP system would need to include the addition of an absorption chiller at some added cost.

[13] The limitation of rebates to 35% is explained in the 2013-2014 Core filing, at pages 38-42.

[14] With respect ot transparency, the company indicates that any UES C&I customer will be eligible to participate regardless of the fuel they use or the source from which that fuel is procured. Those who do not have access to natural gas will be eligible to participate, but they will still have to meet other criteria, including cost effectiveness of their project.

Notes:

1. Typically fuel usage increases with a CHP system versus heating with standard heating equipment such as a boiler, therefore, the Net Thermal Savings is typically a negative number.

2. Usage and savings modeling will be conducted using existing hourly kW load data and hourly heat load data if available.

Engineering modeling must be completed to capture the anticipated savings and fuel usage. A post-installation evaluation will capture actual savings and fuel usage over a period of 6-12 months (including one heating season) via meters.

In comparison to the CHP equation above, a lighting measure savings would be calculated by multiplying the kW saved x annual operating hours:

kW savings x operating hours

<u>Issue 5: Payback and Rebates</u>

Question 7: GDS data, provided by UES on March 4, indicates a simple payback of 11.72 years for a Capstone CHP. The Simonds Partner Project, provided by UES on March 4, had a 2.9 year payback.

- **Please elaborate on this relatively long 11.72 year payback.**
- **How does UES propose to overcome this relatively long payback?**
- **Are smaller CHP units likely to have longer paybacks than larger CHP units?**
- **Simonds CHP utilized generators rated at 1800 kW capacity; what is your expected kW capacity?**
- **Given the relatively long payback of a smaller CHP unit, did UES consider a larger CHP unit? Please explain.**
- **Given the relatively long payback, would rebates have to be increased to persuade a customer to participate?**
- **Given the relatively long payback, would it be more appropriate to implement other shorter payback energy efficiency measures before proposing a pilot for longer payback measures?**

UES Response:
The payback in the slides presented on March 22, 2013 compared a) a micro-turbine to b) a customer installed boiler and generator. In the meeting on March 22, it was suggested that a more appropriate comparison would be between 1) a microturbine; and 2) a standard HVAC system with grid-provided electricity and gas. Using information supplied by GDS Associates, this second comparison is presented below as an example:

Customer is purchasing a 60 kW micro-turbine to operate in its factory at an installed cost of $235,000 (turnkey installation). The recovered heat will be used to provide service hot water. An engineering analysis of the customer's needs determines the following:

a) *The unit will operate 6,132 hours per year in thermal leading, and consume 38,110 therms of natural gas per year*
b) *The unit will produce 346,458 kWh of electricity and 3,317 MMBtu (33,172 therms) of heat.*
c) *An annual maintenance contract will cost Customer an additional $0.02/kWh.*

Selected Generator Unit(s)

Manufacturer:	**Capstone**	
Model:	**C60-ICHP**	
Technology:	**NG Microturbine**	
Fuel:	**Natural Gas**	
Heat Rate:	**11,000**	btu/kWh
Waste Heat Available:	**9,016**	btu/min/unit
Waste Heat Utilized:	**9,016**	btu/min/unit
Installed Cost (each):	**$235,000**	per unit
Unit Capacity (each):	**56.5**	kW per unit
Number of Units:	**1**	
Total Generator Capacity:	**56.5**	kW

Electric Rate:	***0.104***	$/kWh
Natural Gas Rate:	***0.909***	$/therm

Electric price is for Large Customers average from May 2012 to March 2013
Gas price is for March 2013 for Large Customers

Generator Performance & Economics

Total Generation:	***346,458***	kWh/yr
Electric Savings:	***$36,032***	$/yr
Heat Displaced:	***33,172***	therms/yr
Heat Savings:	***$30,153***	$/yr
Total Generator Fuel Usage:	***38,110***	units/year
Total Fuel Cost:	***$34,642***	$/yr
Variable O & M Costs:	***0.02***	$/kWh
O & M Costs:	***$6,929***	$/yr
Electric and Heat Savings:	***$66,185***	$/yr
Fuel and O&M Savings / (Cost):	*($41,571)*	$/yr
Total Savings:	***$24,613***	$/yr

Total Installed Cost:	***$235,000***
Buy Down Incentive:	***$75,000***
Customer Co-pay	***$160,000***

Simple Payback - Estimated # of Years

Electric & Thermal:	***6.5***	years

*allows $25,000 for a third party review and an evaluation

The following are inputs for the TRC B/C Dual Fuel Screening Tool:

Measure Life: 15 years
Total Resource Cost: $235,000
Gross Annual kWh Saved: 346,458
Winter Peak Energy: 43%
Winter Off-Peak Energy: 57%
Summer Peak Energy: 0%
Summer Off-Peak Energy: 0%
Winter Peak Demand: 30kW (assumes operating 50% of the time during peak period)
Summer Peak Demand: 0kW
Annual Fuel Type: C&I Gas Heating
Annual Fossil Fuel Savings (MMBtu/Year): - 493.8 (heat output minus fuel usage)
Annual Non-Resource Benefit (base year dollars): - $6,929 (maintenance cost)

TRC B/C = 1.51

We anticipate project(s) will have a capacity of between 20kW and 75kW, but a successful project could be as large as 100kW. UES has not considered rebating any *actually proposed* CHP units in New Hampshire at this point in time; therefore, the Company can only speculate about the size of projects that customers will propose. It is true that larger projects often have shorter paybacks. Anecdotally, it appears that companies are interested in efficiency measures which have 6-12 year paybacks – whether those measures are in the form of CHP or other efficiency installations. In addition, the pay back considered in UES' presentation and the one set forth above do not include federal incentives (e.g., federal tax credits, MACRS depreciation) which may make a particular project less expensive for a customer.

The purpose of offering a CHP measure as a pilot is to gather information about the demand for the technology in New Hampshire, including system size. We believe that by offering a rebate for CHP units between 20 kW to 100 kW units we will effectively balance the need for a reasonably sized rebate, given the scale of our overall C&I program, with the need for the project to meet the cost effectiveness test requirements.

UES is proposing a specific rebate of 35% of the installed cost, as is used in other custom retrofit projects in our C&I programs. One of the questions to be addressed by the evaluation will be whether the 35% rebate is sufficient to incent customers to participate.

Across the country, CHP is increasingly being viewed as providing an excellent opportunity *in the right circumstances* of reducing both kW and kWh at a low cost per kWh. The CORE C&I Programs include multiple measures, including custom measures, some of which prove to be more cost-effective and with shorter paybacks than others, yet the programs are designed to incent customers with various needs to invest in energy efficiency, not to provide incentives only for those measures with the shortest paybacks. We feel it is appropriate and timely to begin offering CHP systems to our customers in New Hampshire, and to evaluate the market demand for these systems and the role of incentives in encouraging adoption and market transformation.

Question 8: CHP is a fuel-neutral program that provides electric and non-electric savings. What are the expected electric kWh savings? What are the expected non-electric MMBtu savings?

UES Response
As discussed above, the CHP proposal is a measure which would be included in already-existing programs. The Large and Small C&I Programs have fuel neutral measures. The main objective of installing CHP is to reduce electric usage.

Please refer to the example provided in the UES Response to Issue #5, which highlights the electric savings.

It is speculative to provide a single and definitive answer to what the electric and non-electric savings or MMBtu savings would be for an individual installation as no project has yet been identified for the proposed CHP measure.

The potential for kW and kWh savings is significant, but depends entirely on the site-specific details of the proposed project. With respect to kWh savings, a CHP system is significantly more efficient than electricity that is obtained from the grid, as all the transmission and distribution