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STEFANIE A. BRAND  
*Director*

May 1, 2012

**Via Overnight Delivery and Electronic Mail**

Honorable Kristi Izzo, Secretary  
New Jersey Board of Public Utilities  
44 South Clinton Avenue, 9<sup>th</sup> Floor  
P.O. Box 350  
Trenton, New Jersey 08625-0350

Re: **New Jersey Clean Energy Program - Draft Revisions  
to the July 2011 Protocols (issued April 2012)  
Comments of the New Jersey Division of Rate Counsel**

Dear Secretary Izzo:

Enclosed please find an original and ten copies of comments submitted on behalf of the New Jersey Division of Rate Counsel in connection with the above-captioned matters. Copies of the comments are being provided to all parties by electronic mail and hard copies will be provided upon request to our office.

We are enclosing one additional copy of the comments. Please stamp and date the extra copy as "filed" and return it in our self-addressed stamped envelope.


Honorable Kristi Izzo, Secretary  
May 1, 2012  
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Thank you for your consideration and assistance.

Respectfully submitted,

STEFANIE A. BRAND  
Director, Division of Rate Counsel

By:

  
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FTF/sm

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**New Jersey Clean Energy Program  
- Draft Revisions to the  
July 2011 Protocols (issued April 2012)**

**Comments of the New Jersey  
Division of Rate Counsel**

**May 1, 2012**

**Introduction**

The Division of Rate Counsel (“Rate Counsel”) would like to thank the Board of Public Utilities (“BPU” or “Board”) for the opportunity to present our comments on the proposed revisions (“Draft Protocols”) to the Clean Energy Program Protocols (“Protocols”) submitted in red-line form to stakeholders for comment by Applied Energy Group (“AEG”), the Market Coordinator for the Clean Energy Programs (“CEP”), on April 17, 2012.<sup>1</sup>

As noted below, certain source references are absent from the Draft Protocols. Rate Counsel reserves its right to provide further comments in response to the submission of source references as well as in response to other developments affecting the Draft Protocols.

**I. Background**

Presently, the Office of Clean Energy (“OCE”) and the Market Managers for CEP’s energy efficiency (“EE”) and Renewable Energy (“RE”) programs use the current version of the *Protocols to Measure Resource Savings* to track the energy and demand savings (and RE generation) resulting from participation in CEP programs. Energy and demand savings data submitted by the CEP Market Managers – calculated using the Protocols – is compiled by the OCE’s CEP Program Coordinator, who then prepares quarterly and annual reports on CEP activity and results to the Board.

In addition, the Protocols have been used by several utilities to estimate prospective energy savings associated with the EE measures and programs found in their energy efficiency economic stimulus (“E3”) programs initially approved by the Board in 2009.

**II. Substantive Comments on Recommendations Regarding the Protocols**

**A. Overall Comments**

Rate Counsel has three overall comments on the Draft Protocols. The first concerns the authors’ proffered use of the protocols to measure lost revenues. The second overall concern is the absence of any plan to develop protocols which would enable the CEP’s EE measures to

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<sup>1</sup> The draft of the Protocols was entitled: “New Jersey Board of Public Utilities, New Jersey Clean Energy Program, Protocols to Measure Resource Savings: Revisions to July 2011 Protocols, dated April 2012.”

benefit from PJM programs, such as the PJM capacity market, which could be a source of revenue to offset program costs for the benefit of ratepayers. The third involves the inconsistent provision of adequate references and descriptions of methodology and assumptions used to determine values for many of the Protocols.

In its comments on earlier versions of the Protocols, Rate Counsel objected to the inclusion of the calculation of lost revenues as one of the stated uses of the Protocols. Specifically, Rate Counsel objects to the inclusion of the following: "3. Calculate lost margin revenue recovery (as approved by the BPU)." Draft Protocols, page 1. Rate Counsel objects to the inclusion of this item for two reasons, as set forth below.

First and foremost, Point 3 presumptively considers Board approval of consideration of lost margin revenue, notwithstanding a Board Order in Docket No. ER09070460, dated August 7, 2009, which addresses this point. Therein, on pages 6-7 of the Order, the Board found that "...including a reference to the use of the Protocols to calculate lost margin revenues does not presume Board approval of such recovery," and that "in the event it approves such recovery [of lost margin revenue], it is not bound to use these Protocols in calculating any recovery." Nonetheless, Rate Counsel reiterates its objection to the inclusion of Point 3 in the Protocols.

Second, the use of the Protocols would be inappropriate for determining lost revenues from EE or RE measures even if there were provisions for lost revenue recovery. The basic reason is that the Protocols do not yet incorporate the effects of EE or RE measures attributable to factors other than EE or RE programs. This is further explained on page 2 of the Draft Protocols: "The protocols report gross savings and generation only. Free riders and free drivers are not addressed in these Protocols." Rate Counsel maintains that until the Protocols strive to identify the net savings in consumption of natural gas or grid-supplied electricity from EE or RE programs, compared to savings that would occur even in the absence of the programs, their use to identify lost revenues is inappropriate in principle.

Rate Counsel notes that the evaluation research referenced in the CEP 2010-2011 Evaluation Plan has not commenced, due to delays in issuing requests for proposals (which were still in draft form as of April 23, 2012). This means that the research necessary to identify current "net-to-gross ratios," accounting for changes to programs since the 2009 evaluation report and including new or unevaluated programs (such as Home Performance with ENERGY STAR, Direct Install, and the Large Energy Users pilot),<sup>2</sup> as just discussed, has also not commenced. Furthermore, it also means that research that would bear on several specific Protocol values has been delayed. For this reason, Rate Counsel's comments are limited to issues we can readily identify in the absence of pertinent new evaluation research findings.

In addition, the Draft Protocols do not discuss whether and how the Protocols were revised to meet PJM's requirements so that EE resources could be bid into PJM's capacity market. Rate Counsel reiterates its position that the OCE and the utilities should actively pursue available PJM capacity market revenues to contribute toward funding energy efficiency

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<sup>2</sup>KEMA. New Jersey's Clean Energy Program Energy Impact Evaluation and Protocol Review: Summary Report. September 30, 2009.

programs, as is suggested by the final 2011 Energy Master Plan<sup>3</sup> and as is done in other states (including but not limited to Maryland, Pennsylvania, Virginia, Illinois, Massachusetts, Vermont, Rhode Island, and Maine). In 2011, demand savings attributable to CEP measures were estimated at 130 MW for installed measures, with another 145 MW associated with firm commitments for incentives to be paid upon project completion (excluding capacity associated with CEP-incentivized renewable energy).<sup>4</sup> This translates into millions of dollars per year in potential capacity market revenue that could be displacing or supplementing ratepayer funds. Moreover, ensuring consistency with PJM requirements would facilitate offering utility EE program savings into the capacity market, since some utilities are using the Protocols to measure savings from their EE programs. Offering energy efficiency resources into the capacity market also has the potential to reduce capacity clearing prices, reducing capacity payments and potentially impacting all New Jersey ratepayers.

Finally, Rate Counsel maintains that the methods, assumptions, and sources used to determine values for many of the Protocols should be highly transparent. Many of the protocols for individual measures do not include sources or explanations for the derivation of algorithm components. All references should be specific and include authors, dates, titles, and page numbers, as well as website addresses for key documents. Key assumptions should also be described, including who developed the assumption and the basis for the assumption. This comment applies to both the proposed modifications to the Protocols and pre-existing text.

Rate Counsel's specific comments on proposed modifications to the Protocols by Program Area are set forth in the following sections.

## **B. Residential Electric HVAC**

Regarding the capacity factor for solar domestic hot water ("CF<sub>SDHW</sub>") cited on page 17 in source number 21, the Protocols state that "Load shape and coincidence factors were developed by VEIC from ASHRAE hot water hourly consumption and NREL Red Book insulation data." Rate Counsel maintains that the exact data source should be clearly identified; e.g., does the calculation use ASHRAE's estimate of hot water hourly consumption from the 1995 ASHRAE Application Handbook or from the ASHRAE Standard 90.2 draw profiles? For greater transparency, Rate Counsel also requests that OCE provide VEIC's analysis.

The calculation for demand reduction from drain water heat recovery ("DWHR") systems ("DSav<sub>DWHR</sub>") referenced on page 15 of the Protocols and described under data source number 27 on page 18 of the Draft Protocols, seems to overstate the peak electric savings from this measure. The calculation attempts to adjust summer peak electric demand savings using the

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<sup>3</sup> "New Jersey must evaluate whether or not certain EE and DR programs, in particular, would clear the PJM capacity market without any financial support or, in the alternative, much less financial support than is embedded in the array of programs subsidized by New Jersey's four EDCs. In light of New Jersey's fiscal challenges, efforts must be made to strip away any largesse that constitutes a transfer of wealth from New Jersey's ratepayers to EE/DR program developers. While the Administration remains committed to increased EE/DR penetration to meet the State's planning goals, as discussed in Section 7.3 of this report, EE and DR programs are being evaluated to determine if PJM wholesale markets already provide adequate compensation to ensure program success, thereby obviating the need for continued State sponsorship and assistance." (2011 New Jersey Energy Master Plan, December 6, 2011, p. 55)

<sup>4</sup> "New Jersey's Clean Energy Program Report Submitted to the New Jersey Board of Public Utilities: Reporting Period Year-to-Date through Fourth Quarter 2011. Available at [http://www.njcleanenergy.com/files/file/Library/BPURpt4Q11\\_NJCEP\\_FINAL\\_UPDATED\\_20120312.pdf](http://www.njcleanenergy.com/files/file/Library/BPURpt4Q11_NJCEP_FINAL_UPDATED_20120312.pdf).

proportional difference in annual energy savings between solar domestic hot water (“SDHW”) systems and drain water heat recovery systems. This is not a fair comparison, because SDHW energy savings relative to the total hot water needs (also called the “solar fraction”) is higher during the spring, summer, and fall, when electricity demand is high, than the solar fraction based on annual average SDHW savings, which is assumed to be 70% in the Draft Protocols. In contrast, energy savings from the DWHR systems cover a relatively constant portion of hot water needs throughout the year. When adjusting SDHW demand reduction (in kW) for estimating DWHR demand reduction, the Protocol should apply average SDHW energy savings during the summer, when electricity use peaks (instead of the entire year). For example, the savings for SDHW systems during the summer might be about 90% instead of 70%, while the savings from the DWHR might be about 30%. In this example, the adjustment factor would be calculated as 30%/90%, or 0.33. Applying this adjustment factor to SDHW demand savings of 0.426 kW,  $DSav_{DWHR}$  becomes 0.142 kW rather than 0.18 kW. CEP should investigate this issue.

Of minor note, on page 13 of the Draft Protocols, “DSavPWHR” appears to contain a typo. It should read “DSavDWHR”.

### **C. Residential New Construction Program**

Full references, including study name, date, authors and page numbers, should be provided for notes 2, 3, 4 and 6 on page 33 of the Draft Protocols for Lighting and Appliances. Rate Counsel suggests that the source of the saturation rate for CFLs (note 3) is the CFL saturation rate for New York State per a 2010 NMR Group study titled, “Results of the Multistate CFL Modeling Effort”.

### **D. ENERGY STAR Products Program**

$CF_{APS}$  should be defined on the bottom of page 42, where the other capacity factors are defined.

Two terms that appear to mean the same thing, “CF” and “Light CF”, are used on pages 46 to 48. Terminology should be made consistent throughout the Draft Protocols.

Regarding source number 3 under ENERGY STAR lighting on pages 48 to 49 of the Draft Protocols, it appears the referenced source is incorrect. The full reference should be provided rather than “Ibid” for clarity.

### **E. Home Performance with ENERGY STAR Program**

Full references, including study name, date, authors and page number(s), should be provided for the “n-Factor Table” on page 61 of the Draft Protocols.

## **F. Commercial and Industrial (“C&I”) Energy Efficiency Construction**

The full data source, including study name, date, authors and page number(s) as applicable, should be provided for the 0.13 savings factor used in the algorithm for Fuel Use Economizers on page 81 and 96 of the Draft Protocols.

More explanation and the full reference should be provided for the factor 3412, referenced on page 86 of the Draft Protocols in the algorithm for Cooling Savings (kWh).

Regarding the table on page 87 for Kitchen Hoods with Variable Frequency Drives (“VFDs”):

- more explanation and the full reference should be provided for “Melink Analysis Sample”, used as the source for the Existing Motor Loading Factor (LF), referenced on page 86;
- more explanation should be provided for the value of 1.4, the ventilation rate oversize factor (OF) referenced on page 86, than “Estimated Typical Kitchen Design”;
- explanation should be provided for why the value of 0.8 is used for the baseline Efficiency of Heating System (“HEFF”), for both new and retrofit applications; and
- more explanation should be provided for the value of 2.93 for Efficiency of Cooling System (“CEFF”), as the efficiency of the baseline measures.

On page 88 of the Draft Protocols, full references should be provided for each of the following tables: “Facility-Specific Values Table”, “Modified Heating Degree Days Table”, and “Modified Cooling Degree Days Table”.

A definition should be provided for the variable  $CAPY_{Qi}$ , used in the infrared heaters gas savings algorithm on page 96.

The Fuel Use Economizer algorithm on page 96 of the Draft Protocols does not use factors for  $CAPY_{in}$ ,  $\Delta T$ , and  $HDD_{mod}$ , which are defined in the table following the algorithm on page 98. Variables that are no longer used in the algorithms should be deleted, or their relevance should be explained.

## **G. Direct Install Program**

References to data sources listed on pages 104 to 105 for Refrigeration Measures (described on page 103) should be consistent with the reference approach used throughout the Protocols.

The recommended default values in the Draft Protocols for several Direct Install measures, including electric and gas HVAC Mechanical System Efficiencies (pages 103 and 111) and Water Heating System Efficiencies (page 111-112), reference Table 303.7.1(3) of the Residential Energy Services Network (“RESNET”) 2006 Mortgage Industry National Home Energy Rating Systems Standards. The RESNET standards apply to residential buildings,

including “existing or proposed, site-constructed or manufactured, single- and multi-family residential buildings three stories or less in height excepting hotels and motels.”<sup>5</sup> If Direct Install participants’ existing HVAC and water heating systems are on average more efficient than residential ones, this protocol would overstate program savings. Although it appears that the efficiency of residential systems is similar to the efficiency of C&I systems, the Draft Protocols should include specific justification for applying a residential efficiency standard to C&I systems.

### **Conclusion**

As set forth above, Rate Counsel objects to the use of the proposed protocols to measure lost revenues and urges the OCE to develop protocols which would enable the CEP’s EE measures to benefit from PJM programs. In addition, Rate Counsel urges the OCE to address the numerous technical concerns set forth above. Finally, Rate Counsel reserves its right to provide further comments in response to the submission of source references as well as in response to other developments affecting the Draft Protocols.

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<sup>5</sup> RESNET.2006 Mortgage Industry National Home Energy Rating Systems Standards, Section 301.2.1. Available at [http://www.resnet.us/standards/RESNET\\_Mortgage\\_Industry\\_National\\_HERS\\_Standards.pdf](http://www.resnet.us/standards/RESNET_Mortgage_Industry_National_HERS_Standards.pdf).





May 1, 2012

Hon. Kristi Izzo, Secretary  
New Jersey Board of Public Utilities  
44 South Clinton Avenue  
Trenton, NJ 08625-0350

RE: Request for Comments regarding Proposed Modifications to the New Jersey Clean Energy Program Protocols to Measure Resource Savings  
*Via e-mail*

Dear Secretary Izzo:

New Jersey Natural Gas Company (NJNG or the Company) has reviewed Proposed Modifications to the New Jersey Clean Energy Program (NJCEP) Protocols to Measure Resource Savings circulated by Office of Clean Energy (OCE) on April 17, 2012. NJNG generally supports the proposed modifications and would like to share the following comments:

- **Comments relevant to Home Performance with ENERGY STAR (HPwES) Program policy implications –Full Fuel Cycle**
  - This section includes elements that address site-level parameters and calculations, as well as sections that address multiple fuel types. While NJNG is not proposing a specific modification or additional language at this time, the Company strongly believes that the New Jersey Board of Public Utilities (Board or BPU) should identify a forum to address the broader implications of site level measurement of energy usage and its impact on potential energy savings and emissions reductions. Through NJNG's experience with HPwES at the project level over the past few years, the Company has firsthand experience with the consequences of both the direct use of the Real Home Analyzer software for HPwES and conversations with participating contractors. Since the software assumes that some electrical equipment is 100% efficient, any replacement of such equipment with gas equipment is deemed automatically to be a loss from an energy-efficiency perspective. So when site measurement is the main criteria, a 20 year old electric water heater will erroneously appear more energy-efficient than even the highest efficiency natural gas water heater available today. The underlying assumption of the site levels of efficiency assumption for electric equipment often leads contractors

to package solutions that work best for reaching the energy savings targets so the customer can get the maximum rebate levels. As a result, the customers' options may be limited or the recommended package of equipment may be skewed toward electric equipment that is not likely to provide the highest level of savings. Consider this illustrative example from the American Gas Association's *Squeezing Every Btu* report<sup>1</sup>

Storage Water Heater Type	Site Efficiency (EF)	Installed Cost	Yearly Energy Cost	Life (Years)	Total Cost
Gas-Min eff.	.59	\$1,079	\$284	12	\$4,487
Gas High eff.	.65	\$1,591	\$251	12	\$4,603
Electric-Min eff.	.90	\$569	\$563	14	\$8,451
Electric High eff.	.95	\$711	\$533	14	\$8,173

Further, society may not receive the maximum emissions reductions possible for that retrofit project.

- o Similarly, the American Gas Association (AGA) issued a press release on April 30, 2012 that announced that 2012 residential space heating and water heating costs show natural gas will cost less to use in the coming year than other major home energy sources. As a reference point, their calculations show that a package of high efficiency natural gas furnace and a storage water heater would have operating costs that are less than half of what the operating costs for an electric heat pump and hot water heater. The calculated operating cost comparisons between natural gas and other fuels are based on the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy forecast, published in the April 26, 2012 Federal Register. Given the New Jersey Energy Master Plan's emphasis on reducing energy costs for consumers and businesses, it is critical to ensure that the underlying protocols for NJCEP don't lead to any unintended consequences. Refer to Attachment A for a copy of the referenced AGA press release.
- o NJNG would like to note that the September 2011 report from the National Petroleum Council<sup>2</sup> recommended that the federal government complete the development and adoption of methodologies for assessing full fuel cycle effects. Further, it also recommended that "As sound methodologies are established, regulators and other policymakers should use full fuel cycle analysis to inform regulatory decision and implementation of other policies where fuel and technology choice involve energy and environmental trade-offs". There are numerous other supporting references for such a move, including a 2009 recommendation from the National Academy of Sciences that, until DOE can complete a full transition to using full- fuel cycle

<sup>1</sup> See *Squeezing Every Btu. Natural Gas Direct Use Opportunities and Challenges*. American Gas Association. Richard Meyer. (dated January 17, 2012) at page 33.

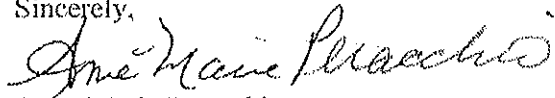
<sup>2</sup> See, *Prudent Development. Realizing the Potential of North America's Abundant Natural Gas and Oil Resources*. National Petroleum Council (dated September 2011) at pg 322.

measurement, at least an "extended site measurement should be used- "For appliances for which there is a choice of fuel, such as storage water heaters and heating equipment, efficiency ratings should be calculated using the extended site measure of energy consumption." Refer to Attachment B for an excerpt from the National Petroleum Council report that illustrates the Full Fuel Cycle for Water Heaters.

- NJNG recognizes that the Board has a significant workload regarding clean energy policy issues at this time with a pressing need to focus on the transition. NJNG respectfully suggests that the Office of Clean Energy, together with new Program Administrator be requested to identify issues related to this concern and make recommendations by March 31, 2013. Such a timeline would avoid any disruption to current year transition plans but establish a commitment to review this important area within a timely manner.
- **Comments relevant to HPwES Program technical issues** (starting at page 56 of the draft)
  - This section repeatedly references HomeCheck as the software product. This should be updated since NJCEP now uses Real Home Analyzer as the required software for the program.
  - The draft also references Stand Alone Home Seal-up which is no longer a component of the program. It may be appropriate to consider whether it is necessary to keep this within the protocol.
- **Comments relevant to Home Energy Reporting** (page 53 of the draft),
  - NJNG suggests that the description be modified to be more general since it is not always accurate that a report is sent shortly after a customer's regular bill. NJNG currently offers a Home Energy Report pilot but it does not offer monthly reports. The approved pilot for NJNG only included 6 letters per year, and due to the seasonality of natural gas usage, these letters are concentrated in the heating season.
  - NJNG also notes that the savings reflected in the protocol is based off one utility program from 2009 in the Pacific Northwest. We recognize that at the time this savings assumption was included, there may have been limited analysis available. However, given the increase in activity through both pilot and full utility scale programs, NJNG believes it is appropriate to review the current industry data available and refresh that energy savings value to reflect such updated information. While NJNG is not proposing a specific value through these comments, it is our understanding that OPOWER, the service provider NJNG uses for our pilot, intends to file comments in this proceeding that should assist Board Staff in considering this NJNG recommendation.

NJNG appreciates the opportunity to provide comments on these proposed modifications and can be available if you have any questions or need additional information.

Sincerely,



Anne-Marie Peracchio

Director- Conservation and Clean Energy Policy

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4/30/2012

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**NATURAL GAS IS THE BEST HEATING VALUE**  
Natural Gas is America's Best Home Value When Compared to Other Energy Sources

Washington, D.C. — The American Gas Association (AGA) today announced that 2012 residential space heating and water heating costs show natural gas will cost less to use in the coming year than other major home energy sources. The calculated operating cost comparisons between natural gas and other fuels are based on the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy forecast, published in the April 26, 2012 Federal Register.

"Natural gas offers tremendous value to the 177 million Americans who use it every day to heat their homes, warm their water and cook their food, and this forecast underscores the reality of that in dollars and cents," said Dave McCurdy, president and CEO of AGA. "At a time when prices at the pump are rising and many are still struggling, natural gas is a bright spot bringing consumers real savings."

A piece of equipment with a higher annual fuel utilization efficiency (AFUE) rating provides greater savings for customers. For example, a 96 percent AFUE natural gas furnace provides the lowest-cost space heating option for homeowners, followed by an 80 percent AFUE natural gas furnace. Both offer significant annual operating cost savings over comparable space heating options.

See below for a table listing home-heating and water-heating cost comparisons.

SPACE HEATING ANALYSIS SUMMARY: The space heating analysis is based on a 2,072 square foot house located in St. Louis and represents a 5,000 Heating Degree Day location. The house meets the energy conservation provisions in the 2012 *International Residential Code* and the space heating equipment is selected from the AHRI online directory. The 96% AFUE natural gas furnace provides the lowest annual operating cost followed by the 80% AFUE gas furnace.

2012 SPACE HEATING ANNUAL COST SUMMARY  
(Annual operating cost)

Heating Equipment Type	5000 Heating Degree Days
96% AFUE Gas Furnace	\$522
80% AFUE Gas Furnace	\$657
7.7 HSFP Electric Heat Pump	\$906
96% AFUE Propane Furnace	\$1,376
85% AFUE Oil Furnace	\$1,654
80% AFUE Propane Furnace	\$1,682
80% AFUE Oil Furnace	\$1,723
Electric Resistance Furnace	\$1,725

2011  
2010  
2009

AGA Touts Market  
Potential for Natural Gas  
Vehicles

**WATER HEATER ANALYSIS SUMMARY:** The water heater analysis is based on the equivalent First Hour Rating (FHR) national average energy usage and the 2012 energy costs as published by DOE. A natural gas 40-gallon and an electric 50-gallon, both conventional storage types, are chosen based on their FHR. The natural gas water heater would provide the lowest annual operating cost.

**2011 WATER HEATING ANNUAL COST SUMMARY**

(Annual operating cost)

Water Heater Type	Annual Cost
40 Gallon Natural Gas (FHR = 74 gallons)	\$252
50 Gallon Electric (FHR = 67 gallons)	\$550

**COMBINATION SPACE HEATING AND WATER HEATER INSTALLATION:** Based on the annual cost analysis for space heating and water heaters, the combination of a natural gas

96% AFUE furnace and storage water heater provides the lowest operating cost space/water heating package.

**2012 SPACE HEATING WITH WATER HEATER INSTALLATIONS**

(Annual operating cost)

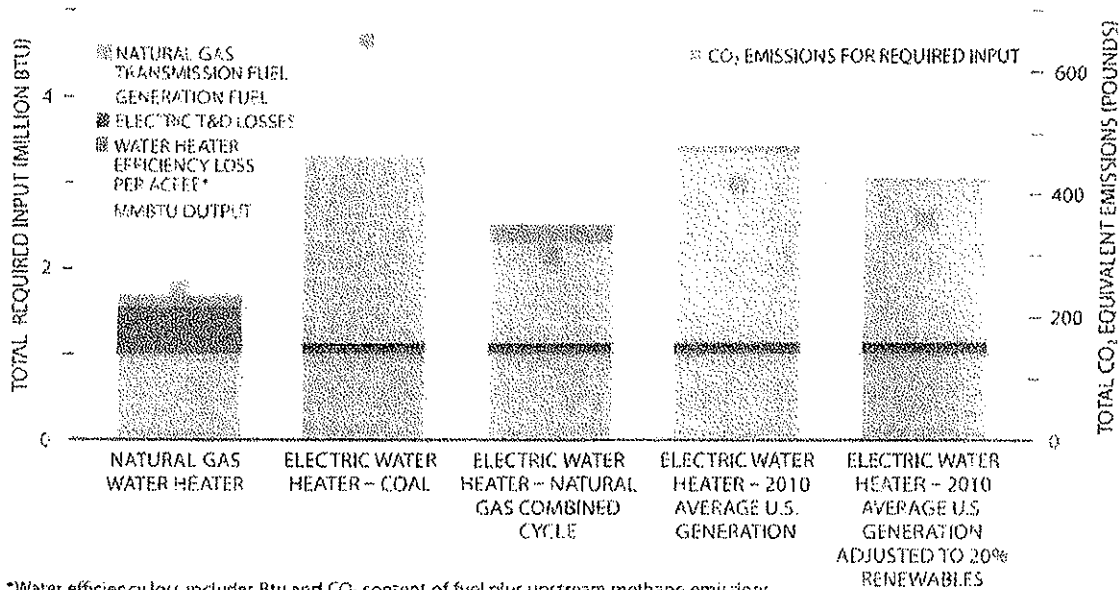
Space Heating/Water Heating Type	Annual Cost
Natural Gas: 96% AFUE Furnace & Water Heater	\$774
Natural Gas: 80% AFUE & Water Heater	\$909
Electric: Heat Pump & Water Heater	\$1,456

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The American Gas Association, founded in 1918, represents more than 200 local energy companies that deliver clean natural gas throughout the United States. There are more than 71 million residential, commercial and industrial natural gas customers in the U.S., of which 92 percent — more than 65 million customers — receive their gas from AGA members. Today, natural gas meets almost one-fourth of the United States' energy needs.

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400 North Capitol Street, N.W., Washington, DC 20001

Figure 3-45. Illustrative Full Fuel Cycle for Water Heaters



\*Water efficiency loss includes Btu and CO<sub>2</sub> content of fuel plus upstream methane emissions.  
ACEEE = American Council for an Energy Efficient Economy.

processing, pipeline, and distribution.<sup>70</sup> The electric value chain includes methane vented during mining, losses on converting Btu to kWh, and electric transmission and distribution losses. There are four variants on the electric water heater based on the mix of generation used:

- Electricity generated by an NGCC plant
- Electricity generated by a coal plant
- Electricity generation based on average U.S. 2010 generation mix
- Electricity generation based on U.S. 2010 generation adjusted to increase renewables from 9.5% of total generation to 20.0%. If it takes 10 years to achieve such an increase, then this case reflects a FFC analysis for the midpoint of a 20-year asset.

The FFC analysis shows that a natural gas water heater uses less total energy and emits less CO<sub>2</sub> than an electric water heater based on the four generation cases used.

<sup>70</sup> Production data on natural gas and coal-related methane emissions provided by the Emissions & Carbon Subgroup.

More than half of energy consumed in the United States is consumed in buildings when one includes the energy used to generate electricity and the fuel used or lost during transmission (delivery and distribution) – i.e., an FFC analysis. Historically, energy consumption was reported by site. For the purposes of analyzing energy choices, the FFC methodology more comprehensively assesses energy consumption, energy efficiency, and emissions.

The fuel mix used to generate electricity varies by region and will change over time (seasonally, daily, and even hourly) (see Figure 3-46). Over longer periods, the generation mix shifts as new plants are built and old ones retired. This complicates development of a national FFC analysis for electrical applications.<sup>71</sup> So comparing the FFC of an appliance with a 20-year life purchased in 2010 is subject to some uncertainty, as changes in the future mix of fuels and technologies used in generation will change.

<sup>71</sup> The DOE generally is limited by statute to developing only a national standard.



May 1, 2012

Hon. Kristi Izzo, Secretary  
New Jersey Board of Public Utilities  
44 South Clinton Avenue  
Trenton, NJ 08625-0350

Dear Secretary Izzo,

Opower, Inc. appreciates the opportunity to comment on the Proposed Modification to the New Jersey Clean Energy Program (NJCEP) Protocols to Measure Resource Savings circulated by Office of Clean Energy (OCE) on April 17, 2012. We are the service provider that New Jersey Natural Gas Company uses to implement the Home Energy Reporting System (the "HERS").

As indicated by New Jersey Natural Gas in their comments, we hope to provide more insight to our gas results and the measurement and verification process for our programs. Opower draws on experience measuring savings from this program—as well as other similar programs with over 70 utilities across the country—in providing comments on the protocol for measuring HERS savings.

Opower has two recommended changes for this HERS protocol:

1. Include a process for using randomized controlled trials (RCTs) to measure actual savings and, in turn, use these actual savings to change this assumed savings value for future years
2. Consider adjusting the assumed savings value based on the most recent independently verified results from an Opower gas deployment

**Recommendation 1: Include a process for using randomized controlled trials to adjust savings based on ex post measurement**

Opower recognizes the benefit of assuming a per-household savings value for this program. This approach creates greater certainty and is simpler to implement. However, the best practice for evaluating HERS savings is to set up a randomized controlled trial and statistical billing analysis to measure actual savings *ex post* as the difference in usage between the statistically equivalent control and treatment groups. This methodology allows for the unique characteristics of each program to be controlled, so that savings are sufficiently isolated. This precise and unbiased approach follows the protocol for Opower's program that was approved by the statewide evaluator in Pennsylvania, and is consistent with methodologies supported by the Department of Energy, Lawrence Berkeley National Laboratory, professors from MIT, Harvard, and



Yale, and leading industry consultants.<sup>1</sup>

Opower recommends that this protocol require randomized controlled trials and billing analysis on an annual or semi-annual basis to measure actual savings. As actual savings are measured, this assumed savings value should be adjusted for prospective program years. Such frequent measurement will ensure that savings claimed are the actual savings delivered, which is in the interest of ratepayers, utilities, and efficiency providers. Opower performs this billing analysis as part of reporting for the HERS program, and independent third parties can be contracted with to verify this analysis at the Board's discretion.

Opower recommends the following language be included in the protocol to reflect this change:

"Use of randomized controlled trials and statistical billing analysis to measure HERS savings *ex post* is best practice for evaluating the actual impact of a program in a given service territory. Under this approach, savings are measured with precision and without bias. For each HERS program, this protocol therefore requires that a randomized controlled trial design be deployed that includes at least the following key components:

- (i) Statistically equivalent and randomly assigned control and treatment groups
- (ii) Opt-out design
- (iii) *Ex-post* measurement; and
- (iv) Statistical billing analysis for comparison of usage between control and treatment groups.

In this methodology, the only difference between control and treatment groups is that the latter receive the HERS. Energy savings are therefore the difference in energy usage between the control and treatment groups. These savings can be estimated with over 90% statistical confidence.

These actual savings are used to verify the assumed savings value included in this protocol. If there is a difference between the actual and assumed savings value, the latter is adjusted accordingly. This adjusted savings value is then applied for prospective HERS program years."

This approach is consistent with best practice, preserves the certainty and simplicity of the assumed savings methodology, and ensures that this value will be most representative of this program's actual impact in New Jersey.

**Recommendation 2: Consider adjusting the assumed savings value based on the most recent independently verified results from an Opower gas deployment**

The assumed savings value in the current version of the protocol is from an independent evaluation conducted in 2009. Since this evaluation, the respected consulting firm KEMA evaluated results from an

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<sup>1</sup> See, e.g.: Allcott, Hunt, "Social Norms and Energy Conservation," October 2011, *The Journal of Public Economics*, available here: [http://opower.com/uploads/library/file/1/allcott\\_2011\\_jpubec\\_-](http://opower.com/uploads/library/file/1/allcott_2011_jpubec_-)

Opower gas program in the Pacific Northwest that had been deployed from November 2008 through June 2010.<sup>2</sup> In this report, KEMA calculates that households saved an average of 12.8 therms per year over the course of the 20 months the program was running prior to the evaluation, and 14 therms on average over the last 12 months. Due to the ramp up of the program in the first year of deployment, second year savings are typically greater than first year savings. Actual savings from a given program may vary due to different geographic characteristics.

Opower appreciates the chance to share these recommendations, and welcome the opportunity to discuss these recommendations further at the Board's discretion and convenience.

Sincerely,

A handwritten signature in black ink, appearing to read 'JK' or similar initials, with a stylized flourish at the end.

Jim Kapsis  
Sr. Director for Market Development  
Opower

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<sup>2</sup> "Puget Sound Energy's Home Energy Reports Program: 20 Month Impact Evaluation," 26 October 2010, produced by KEMA Consulting