New Jersey Natural Gas

May 31, 2018

VIA ELECTRONIC MAIL (publiccomments@njcleanenergy.com)

Honorable Aida Camacho-Welch, Secretary
New Jersey Board of Public Utilities
44 South Clinton Avenue, 3rd Floor
Suite 314
P.O. Box 350
Trenton, NJ 08625-0350

RE: Proposed Revisions to NJCEP Protocols

Dear Secretary Camacho-Welch:

New Jersey Natural Gas Company ("NJNG") has reviewed the New Jersey's Clean Energy Program's™ (NJCEP's) Protocols to Measure Resource Savings which were released on May 10, 2018 by the Staff of the New Jersey Board of Public Utilities ("BPU" or "Board"). NJNG appreciates the Board's continued refinement of the protocols and the extended effort to accept stakeholder feedback with the accommodation of significant input since the original drafts were released in October 2017. Through this letter, NJNG is providing input on one important remaining issue we identified during our final review.

The existing Protocols contains a methodology that addresses the case of a gas boiler or furnace replacing electric resistance heating and a gas water heater replacing an electric water heater. The approach used addresses the overall fuel cycle efficiency of electric heat by determining the amount of energy, in BTUs, it takes to create a kWh of electricity (see note 7 on page 26 of the Protocols). This results in an Annual Fuel Utilization Efficiency ($AFUE_b$) value of 35% for resistance heating and is then used to determine the overall quantity of therms saved by replacing electric resistance heating with natural gas heating. In the proposed update to the Protocols, the $AFUE_b$ value for resistance heating has been removed with no explanation or justification given. NJNG strongly believes that, because of the significant cost and fuel resource savings, an $AFUE_b$ value for resistance heating should be retained in the proposed Protocols.

NJNG appreciates the opportunity to provide comments on these topics. Please feel free to contact me if you need any additional information regarding this issue.

Respectfully submitted,

Anne-Marie Peracchio

Anne-Marie Peracchio
Director - Conservation and Clean Energy

MaGrann ASSOCIATES
Building Science for a Better Environment
701 East Gate Drive • Mount Laurel, NJ 08054 • 1-888-MAGRANN • www.magrann.com
New Jersey • Pennsylvania • Washington DC • New York • Kentucky • Ohio • Hawaii

May 29, 2018

Via Email: publiccomments@njcleanenergy.com

Re: NJCEP Protocols to Measure Resource Savings

Thank you for this opportunity to provide stakeholder input on the updated revisions to the NJCEP Protocols to Measure Resource Savings document. We appreciate the significant revisions to the **Residential New Construction** section and have no further comments at this time.

Regarding the **Commercial & Industrial** section, it appears some previous comments related to multifamily building retrofits that fall under C&I were addressed while others were not. We believe the protocols should still provide guidance for those that were not – in particular the protocols for water heating that do not include typical older multifamily configurations:

- How would the protocols be applied to a system with a boiler & storage tank or an indirect water heater? Neither the Stand Alone Storage Water Heaters (pg.139) section nor the Instantaneous Gas Water Heaters (pg.142) section appears to apply.
- Particularly, if considering an indirect system, would the efficiency of the combustion equipment be de-rated for the heat exchange process, and if so what would be the protocol for de-rating?
- Is there an approved methodology for de-rating the efficiency of existing equipment that is significantly older than the assumed baseline of ASHARE 901-2007?

Thank you again for the modifications already made and for this opportunity to provide additional review. Our team at MaGrann would be happy to provide any additional information or clarification that would be helpful in evaluation of these comments.

Sincerely,

Ben Adams
Vice President, Program Development

NATIONAL FUEL CELL RESEARCH CENTER

University of California, Irvine
Irvine, California 92697-3550
(949) 824-1999

May 31, 2018

VIA ELECTRONIC FILING

Aida Camacho-Welch, Secretary of the Board
Board of Public Utilities
44 South Clinton Avenue, 9th Floor
Post Office Box 350
Trenton, New Jersey 08625-0350
Email: publiccomments@njcleanenergy.com

Re: Proposed NJCEP FY 2019 Programs

Dear Aida Camacho-Welch:

Please accept these comments on behalf of the National Fuel Cell Research Center in response to the New Jersey Board of Public Utilities Notices requesting comments on the following documents:

1. New Jersey's Clean Energy Program FY19-FY22 Strategic Plan
2. Comprehensive Energy Efficiency & Renewable Energy Resource Analysis Staff Straw Proposal for New Jersey's Clean Energy Program FY19-FY22
3. New Jersey's Clean Energy Program's Protocols to Measure Resource Savings
4. Summary of Proposed Program Changes for FY19

Respectfully Submitted,
__/s/___Scott Samuelsen____
Dr. Scott Samuelsen
Director, National Fuel Cell Research Center
Professor of Mechanical, Aerospace, and
Environmental Engineering
University of California Irvine
Irvine, CA 92697-3550
Email: gss@nfcrc.uci.edu
Phone: 949-824-5468

NEW JERSEY BOARD OF PUBLIC UTILITIES

OFFICE OF CLEAN ENERGY

1. NEW JERSEY'S CLEAN ENERGY PROGRAM FY19-FY22 STRATEGIC PLAN

2. COMPREHENSIVE ENERGY EFFICIENCY & RENEWABLE ENERGY RESOURCE ANALYSIS STAFF STRAW PROPOSAL
NEW JERSEY'S CLEAN ENERGY PROGRAM™ PROPOSED FUNDING LEVELS FY19-FY22

3. NEW JERSEY'S CLEAN ENERGY PROGRAM'S PROTOCOLS TO MEASURE RESOURCE SAVINGS

4. SUMMARY OF PROPOSED PROGRAM CHANGES FOR FY19

Comments of the National Fuel Cell Research Center

I. Introduction and Background

The National Fuel Cell Research Center ("NFCRC") appreciates the opportunity to submit comments on the following New Jersey Clean Energy Program (NJCEP) Policy Update documents:

- New Jersey's Clean Energy Program FY19-FY22 Strategic Plan
- Comprehensive Energy Efficiency & Renewable Energy Resource Analysis Staff Straw Proposal for New Jersey's Clean Energy Program FY19-FY22
- New Jersey's Clean Energy Program's Protocols to Measure Resource Savings
- Summary of Proposed Program Changes for FY19

Specific recommendations and comments are made on the Distributed Energy Resources (DER) program (including Combined Heat and Power and Fuel Cells).

The NFCRC facilitates and accelerates the development and deployment of fuel cell systems; promotes strategic alliances to address the market challenges associated with the

installation and integration of fuel cell systems; and educates and develops resources for global distributed generation and combined heat and power (CHP) stakeholders. The NFCRC is working with Doosan Fuel Cell America; Fuel Cell Energy; LG Fuel Cell Systems Inc.; and Bloom Energy.

The Fuel Cell program in the Distributed Energy Resources segment of the NJCEP has resulted in the successful deployment of over nine megawatts (MW) of fuel cell generation systems in New Jersey. These clean, non-combustion systems have been verified to be performing as expected, with very high efficiency, high capacity factor, and large emissions reduction while also providing backup power during grid outages. The NFCRC recommends additional changes to the Distributed Energy Resources (DER) program that would improve support and program utilization of these highly efficient CHP and all-electric fuel cell systems. Both of these types of fuel cell systems provide unique clean power generation advantages to address the State of New Jersey's long-term energy and emissions goals.

Stationary fuel cells have highly dynamic dispatch capabilities to (1) manage the diurnal and seasonal power demand variations, (2) handle intermittencies associated with solar and wind power generators, and (3) increase the maximum penetration of renewable resources that can be accommodated in the utility grid network.[1,2] These capabilities will result in maximum sustainability and additional GHG reductions through the integration of renewables with clean dispatchable power and transportation electrification. Stationary fuel cells can also improve the quality of power while contributing to cleaner air and the improved health of citizens. In fact, fuel cells are suitable for siting near or even inside buildings, due to virtually zero pollutant emissions, acoustically benign attributes, and the avoidance of challenges related to emissions permitting and zoning.

Large stationary fuel cells are today providing over 300 MW of clean, stable power and heat in New Jersey and across the U.S. in microgrids and at wastewater treatment plants, food and beverage plants, grocery stores, office buildings, telecommunication hubs, data centers, retail stores, universities, hospitals, hotels, government facilities, and other applications. Additionally,

[1] Maton, Jean-Paul, Zhao, Li, and Brouwer, Jacob, *Dynamic modeling of compressed gas energy storage to complement renewable wind power intermittency*, International Journal of Hydrogen Energy, Volume 38, pp. 7867-7880, 2013.
[2] Shaffer, Brendan, Tarroja, Brian, Samuelsen, Scott, *Dispatch of fuel cells as Transmission Integrated Grid Energy Resources to support renewables and reduce emissions*, Applied Energy, Volume 148, 15 June 2015, Pages 178-186.

these highly efficient CHP and all-electric fuel cell systems have been successfully operating as part of the NJCEP.

On the utility side of the meter, large-scale fuel cell systems are being deployed to create grid support solutions where transmission and distribution is constrained or increased reliability is sought. Examples range from a 15MW system in Connecticut, to a 30MW system in Delaware, to a 59MW system in Hwasung City, Korea. These resources are providing clean, 24/7, power generation to complement the increasing deployment of intermittent solar and wind resources and support grid reliability in locations where it is most needed.

II. Discussion

The FY19 CRA Straw Proposal retains the extensive changes that were made to the CHP and Fuel Cell Program in FY16 and FY17. This fuel cell program had previously been fully utilized and successfully met its objectives, and New Jersey remains a valuable market for fuel cell industrial and commercial customers, with additional opportunity in the multi-family housing sector. The NFCRC provides new information and details in these comments for each of the four NJCEP documents, with the following high-level recommendations:

- **The importance of environmental avoided costs and reduction of emissions should be accounted for in program evaluation and reported regularly to the Board with other metrics.**
- **An NJBPU focus group should establish a process to convert the incentive program to a simple "reverse auction" that is designed to fund those projects that achieve the program objectives at the lowest possible cost, similar to a successful model used in other states.**
- **Program eligibility should be based on technology neutral achievement of the program criteria and objectives, and all fuel cells projects, with or without heat recovery, should be eligible for the NJCEP.**
- **Rather than revising the Program's efficiency requirement from 65% (LHV) to 60% (HHV), a capacity factor assessment for all projects should be adopted as a more important metric to maximize energy savings and emissions reduction.**

- **The NJBPU should use a twenty-year useful life for a fuel cell system, based upon current industry performance characteristics.**
- **Implement the recommendation to add a bonus incentive of 10% of the total system incentive for a system incorporating blackstart technology at a critical facility.**
- **While the four-year budget serves as a guideline, protocols should be adopted to move funding between program categories annually based on reviews of program utilization.**

A. Document 1: New Jersey's Clean Energy Program FY19-FY22 Strategic Plan

1. The NFCRC supports increasing the importance of environmental avoided costs and reduction of emissions should be accounted for in program evaluation and presented regularly to the Board.

Key objectives of the NJCEP are to save energy, money, and the environment. The Avoided Costs listed in Section 8.3.2 (pages 42-43) are important to fully value the attributes of distributed energy resources. To this end, it is important that informed, data-driven decisions are made to specifically address these priorities and to ensure use of the most effective technologies that are proven to satisfy these objectives. Eligibility and incentive levels should be based upon the ability of an energy technology to reduce emissions, while maintaining cost effectiveness and resiliency. The NFCRC agrees with the plan Page 33, Section 6.7 – consideration of CHP as a new opportunity to achieve energy saving and other benefits.

The NFCRC also supports the NJBPU objective of reducing long-term environmental impacts of energy use and the Plan acknowledges the importance of reducing criteria air pollutant emissions, such as SO_x, NO_x and particulate matter. The NFCRC supports the strong valuation of air quality by the BPU in deciding incentive levels, along with the reduction of GHG emissions. Twenty-one New Jersey counties are already in nonattainment zones for achieving national ambient air quality standards and the NFCRC applauds the suggestions in the Plan to value energy conversion technologies that reduce criteria air pollutants as a priority to meet federal requirements, but also improve air quality and provide societal and health benefits.

The BPU should include reduction of criteria air pollutants in evaluating projects within the program and should evaluate results of verified emissions reductions against established metrics, which should be presented regularly to the Board. The NFCRC expresses concern about the recent CHP evaluation[3] that was used to determine the eligibility of fuel cell systems for the NJCEP. This recent evaluation was not based upon performance data of fuel cell systems, but rather upon extrapolated estimates of performance of other technologies and assumptions for lifetime, capacity factor, and emissions rates. The study of Jafari and Mahani does not cite any references or data to justify the performance characteristics that they present, nor do they clearly state their underlying assumptions (e.g., did they assume identical capacity factors for all technologies; is this a reasonable assumption based upon performance data?)

For example, the combustion CHP technologies (MT - microturbines, RECIP - reciprocating engines) presented in Table 25 (page 35) are shown to produce greater annual reductions of carbon dioxide and criteria air pollutants than fuel cell systems in either CHP or electric-only cases. Similar comparable annual emissions reductions are presented in Tables 7, 9, 11, 13, 15, 17, 19, 21, 23, and 27 for different applications. These numbers could only have been produced if the technologies exhibited similar capacity factors, similar electrical efficiencies, and similar criteria pollutant emissions rates. It is known that the capacity factor for fuel cell systems is higher than that for micro-turbine generators and reciprocating engines.[4] It is known that the electrical efficiency for fuel cell systems is higher than that for micro-turbine generators and reciprocating engines.[5,6] Finally, fuel cell systems have proven criteria pollutant emissions rates that are significantly lower (typically by an order of magnitude) than these combustion-based technologies.[7] Therefore, the annual emissions reductions

[3] Jafari, M. and Mahani, K. *CHP EVALUATION - DATA AND TECHNOLOGY DRIVEN METHODOLOGY*, June 2017 Rutgers Center for Advanced Infrastructure and Transportation, Laboratory for Energy Smart System (RU LESS)

[4] Athawale, Rasika, Felder, Frank A., and Goldman, Leo A., "*Do Combined Heat and Power Plants Perform? Case Study of Publicly Funded Projects in New York*," available at: http://ceeep.rutgers.edu/wp-content/uploads/2016/02/WP2-Do-CHPs-Perform-Case-Study-of-NYSERDA-funded-Projects-11302015.pdf)

[5] Mac Kinnon, Michael A., Brouwer, Jacob, and Samuelsen, Scott, *The role of natural gas and its infrastructure in mitigating greenhouse gas emissions, improving regional air quality, and renewable resource integration*, Progress in Energy and Combustion Science, Volume 64, pages 62 – 92, 2018.

[6] Eichman, Joshua D., Brouwer, Jacob, and Samuelsen, G. Scott*, Exploration and prioritization of fuel cell commercialization barriers for use in the development of a fuel cell roadmap for California*, Journal of Fuel Cell Science and Technology, Volume 7, pp. 051017-1-12, October, 2010.

[7] Mac Kinnon, Michael A., Brouwer, Jacob, and Samuelsen, Scott, *The role of natural gas and its infrastructure in mitigating*

(especially for the criteria pollutant emissions) are not correct and should be investigated and updated to assure accuracy with the available data and performance characteristics of all of these technologies.

2. The NFCRC is available to work with the BPU in providing market and performance data on current and developing fuel cell systems.

Section 7.2 of the Strategic Plan (page 35) refers to the BPU gathering market and publicly available data as early as possible, and to refresh these data through the years 2019-2022. The NFCRC can provide information on the fuel cell sector to the BPU and its consultants that may be more up-to-date than some of the currently used sources.

3. The NFCRC strongly recommends that the BPU form a focus group to establish a process to convert the incentive program to a simple "reverse auction" that is designed to fund those projects that can achieve the program objectives at the lowest possible cost, similar to a successful model used in other states.

In other states with programs to support clean energy and fuel cells, the incentive amount for each project is determined not by Staff selection, but rather via a competitive auction, ensuring that projects do not receive more funding than absolutely necessary to achieve program objectives. If a project and generation resource is too expensive, then the program would objectively eliminate those projects from consideration and funding. The Connecticut Low-Emission Renewable Energy Certificate ("LREC") program and the New York Renewable Portfolio Standard use such a reverse auction model. The use of a competitive reverse auction process in New Jersey will more accurately determine the minimum incentive necessary in a much more effective manner compared to the consultant driven cost-benefit analyses currently used by the Board. This method would also account for actual performance achieved (accounting for capacity factor, actual heat recovered, observed efficiency, etc.) by compensating only for systems that are operating as expected. The Connecticut and New York programs, and additionally the California Self Generation Incentive Program, are all pay for performance programs, using meters to measure the actual system operation and making payments contingent upon a specified minimum level of operational capacity.

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greenhouse gas emissions, improving regional air quality, and renewable resource integration, Progress in Energy and Combustion Science, Volume 64, pages 62 – 92, 2018.

For over a decade, New Jersey has utilized a reverse auction format to procure Basic Generation Service ("BGS") for the State's utility default electric customers, with the consideration that this approach results in the best default service pricing for these customers. A similar reverse auction process would result in selecting the most cost-effective distributed energy resource projects, and significantly reduce administrative burden.

B. Document 2: New Jersey's Clean Energy Program's Protocols to Measure Resource Savings

1. The NFCRC advises that program eligibility be based on technology neutral achievement of the program criteria and objectives, and requests that all fuel cells projects, with or without heat recovery, be eligible for the NJCEP.

All-electric fuel cell projects, regardless of the system type or application, are eligible for incentives and tariffs in California, Connecticut, Massachusetts and New York, and the payment of incentives is based upon their measured performance characteristics against program metrics. The primary performance metrics that are being exceeded in other states by both CHP and all-electric fuel cell systems include efficiency, capacity factor, greenhouse gas (GHG) emission reduction and criteria air pollutant emissions reductions. Some fuel cell systems can operate in either CHP or all-electric mode, depending on what is required at a customer site to achieve their energy efficiency and energy savings objectives. All-electric fuel cell projects have resulted in the largest GHG and criteria air pollutant reductions in the California Self Generation Incentive Program to date.[8] The NFCRC requests that all fuel cell systems, operating in either CHP or electric-only mode, be eligible for the New Jersey Clean Energy Program as long as they meet the program emissions reduction and energy savings criteria. To reiterate, the 2017 Rutgers Study that was used to make eligibility decisions on CHP and fuel cell system was not based upon measured performance characteristics for fuel cell systems or combustion-based systems leading to incorrect values for lifetime, capacity factor, and emissions rates that are not based on data. Previous analyses and experience of the

[8] *Final Report: SGIP 2014-2015 Impacts Evaluation Report.* Submitted by Itron to SoCalGas and the SGIP Working Group, September 29, 2016. Available at: http://www.cpuc.ca.gov/sgip/

NFCRC shows that electrical efficiency of fuel cell systems is higher than that of combustion-based systems and emissions of carbon dioxide and criteria pollutant emissions are substantially lower than combustion-based systems. [9]

2. The NFCRC questions the recommendation to revise the DER Program's efficiency requirement from 65% (LHV) to 60% (HHV) and recommends that capacity factor is a more important metric to maximize energy savings and emissions reduction.

The recommended efficiency requirement (Protocols, pages 152-153) would be the most stringent in the country, and could prohibit clean, GHG-reducing and criteria air pollutant reducing projects from moving forward in New Jersey. Evolving from combustion to non-combustion generation sources will concretely help New Jersey and the BPU to achieve its objectives. Fuel cells are non-combustion energy systems that produce (1) lower criteria pollutant emissions than all other CHP systems, [10,11,12] and (2) higher electrical efficiency than all other CHP systems. [13] Fuel cells also have very high capacity factors compared to other distributed energy resources which leads to a greater potential for energy savings and emissions reductions. Section 15.1.2 (page 80) of the Strategic Plan suggests that commercial and industrial utility customers who are paying into the Societal Benefits Fund have large, consistent thermal loads. Fuel cell industry experience shows that this customer base is limited and that the majority of New Jersey potential customers do not have matching thermal and electric loads.

The NFCRC suggests that the BPU use data to determine both the capacity factor and observed efficiencies (electric and heat) to measure energy savings and the avoided emissions, for all of the technologies that are supported by the Program. Note that the explicit determination of a capacity factor is critical and essential to objectively

[9] Mac Kinnon, Michael A., Brouwer, Jacob, and Samuelsen, Scott, The role of natural gas and its infrastructure in mitigating greenhouse gas emissions, improving regional air quality, and renewable resource integration, Progress in Energy and Combustion Science, Volume 64, pages 62 – 92, 2018.

[10] California Energy Commission, CEC-500-2011-042, Final Report, National Fuel Cell Research Center, August 2011, available on-line at: http://www.energy.ca.gov/2011publications/CEC-500-2011-042/CEC-500-2011-042.pdf

[11] Y Yi, VG McDonell, J Brouwer, M Fujiwara, M Adachi, Emissions sensors for high temperature fuel cell applications, IEEE Transactions – Sensors Conference, 2005.

[12] Y Yi, A Rao, J Brouwer, S Samuelsen, Ammonia as a Contaminant in the Performance of an Integrated SOFC Reformer System, ASME Paper FC2006-97037, June, 2006.

[13] Mac Kinnon, Michael A., Brouwer, Jacob, and Samuelsen, Scott, The role of natural gas and its infrastructure in mitigating greenhouse gas emissions, improving regional air quality, and renewable resource integration, Progress in Energy and Combustion Science, Volume 64, pages 62 – 92, 2018.

determine performance, because a system operating at a higher capacity factor will achieve larger energy savings and avoided emissions in direct proportion to the capacity factor. The adoption of a capacity factor in the metric would also help assure that only systems that are operating well are compensated for their operation.

It appears that BPU has gathered data to verify system performance in the CHP Program, as indicated by the spreadsheet entitled CHP_Projects_4_1_18.xlsx that is available on the BPU website.[14] The verified performance characteristics (including capacity factor) should be used to evaluate projects and determine their eligibility for the Program and for cost effectiveness. In addition to these performance data, reports from other jurisdictions could be used to estimate the expected efficiency and capacity factor performance of distributed energy resources. For example, a 2015 Rutgers University report found that "under-performance of existing CHPs, as demonstrated by low and volatile capacity factors, also suggest that the emissions and associated environmental benefits and higher efficiencies are not translated into reality." [15]

3. The NFCRC suggests creating broader pay for performance requirements that ensure incentives are paid only when program objectives and milestones for energy system performance are met.

The current NJCEP protocols lay out a very specific Pay for Performance Program for Commercial and Industrial Buildings related to achievement of energy efficiency savings (page 155). The NFCRC recommends extending this program concept to Clean Energy Programs, including Renewable Energy and Distributed Energy Resources. Combining a reverse auction project selection mechanism with a true pay-for-performance incentive is very cost-effective from an administrative and project management perspective, eliminating the need for Staff to review individual projects and ensuring that a non-performing project does not receive a 95% up-front incentive after the initial installation review. Pay-for-performance (and measurement of capacity factor) in the NJCEP would ensure that payments to participants are based on

[14] Program Participants, available on-line at: http://www.njcleanenergy.com/commercial-industrial/programs/combined-heat-power/combined-heat-power

[15] Athawale, Rasika, Felder, Frank A., and Goldman, Leo A., "Do Combined Heat and Power Plants Perform? Case Study of Publically Funded Projects in New York," available at: http://ceeep.rutgers.edu/wp-content/uploads/2016/02/WP2-Do-CHPs-Perform-Case-Study-of-NYSERDA-funded-Projects-11302015.pdf)

multiyear operational performance that is carefully measured. If a project does not perform, then any incentive beyond an upfront payment will not be paid, further maximizing the program value to ratepayers. Page 32 of the Strategic Plan calls for the key fundamentals of 1) establishing metrics for program delivery and performance, and 2) making use of evaluation results to design programs and continuously improve program performance. The NFCRC recommends that in addition to measuring the performance of improvements, the incentives themselves should be tied to these metrics and evaluation results.

4. The NFCRC recommends that the NJBPU use a twenty-year useful life for a fuel cell system, based upon current industry performance characteristics.

The Protocols propose reducing the useful life of fuel cell systems from 20 years to 15 years. The justification for this reduction is a reference to a 2015 study from the Lawrence Berkeley National Laboratory (Berkeley Lab). The NFCRC recommends that the NJBPU reinstate a fuel cell system useful lifetime of 20 years based upon the following observations:

- The discussion on page 5 of the study does not cite any sources for the Berkeley Lab assumptions on lifetime and none of their tables cite information that is in the literature, nor any data or observations of real systems. These lifetime assumptions are therefore assumptions only that are not justified by observations. The Berkeley Lab study that is cited concludes that almost all future systems (2020) are expected to have a 20-year lifetime. Because these protocols are proposed for 2019 and beyond, it is clear that the very Berkeley Lab report that the NJBPU cites also recommends a 20-year lifetime. The NFCRC also has observations of many fuel cell installations that suggest a 20-year lifetime is reasonable and strongly recommends that NJBPU use this lifetime to support their analyses.
- Based on NFCRC data and knowledge, it appears that the assumptions contained in this study are based on data from five years ago. The stack life and cost estimates should not be taken as fixed, but as only estimates from the best data that was available at the time (five years ago). The 10kW performance

characteristics are not relevant since no commercial solid oxide systems in this size class are available, and the 100+kW performance characteristics presented do not represent any of the systems that are commercially available to participate in the NJBPU Program. The NFCRC suggests that this report does not contain up-to-date information and thus cannot serve as an accurate reference for the program. NJBPU should rather use data gathered from the latest installations in New Jersey and around the world.

C. Document 3: Summary of Proposed Program Changes for FY19

1. The NFCRC supports the recommendation to add a bonus incentive of 10% of the total system incentive for a system incorporating blackstart technology at a critical facility.

An incentive for resiliency is very appropriate to ensure preparation for unexpected grid outages, and also to encourage further development of microgrids in New Jersey. Fuel cells provide exceptional resiliency and have maintained heat and power for critical communication hubs, cell towers, data centers, emergency shelters and other essential services across the Northeast during and after grid outages caused by Hurricane Sandy and other severe weather events. Fuel cells also help mitigate an over-reliance on the long-distance transmission of electricity from large-scale resources that are located far from load centers. In the event of a grid outage, some fuel cell systems are able to seamlessly island, separate from the utility grid network and support key loads for customers who increasingly require an un-interrupted supply of electricity.

The Summary of Proposed Changes on Page 6 describes critical facility to be "as defined in the Microgrid Development Program." To further enhance the effectiveness of this bonus, the NFCRC recommends that the BPU adopt a broader definition of "critical facility" to include data and telecommunication centers, financial and transportation services and any facility that provides for critical community needs, such as grocery stores and warehouses for food and water. Beyond the existing NJ Microgrid Development Program definition, communities and private entities across the U.S. (that have experienced massive outages) classify the aforementioned types of facilities as critical to serving the needs of the public. These experiences have, to a large extent,

driven the use of fuel cell systems and other distributed energy resources to support all of these services and infrastructure.

D. Document 4: Comprehensive Energy Efficiency & Renewable Energy Resource Analysis Staff Straw Proposal for New Jersey's Clean Energy Program FY19-FY22

1. The NFCRC recommends that the four-year budget serve as a guideline but have in place protocols to move funding between program categories annually based on reviews of program utilization.

Section 3, page 5 of the Straw Proposal refers to ongoing program evaluation to ensure effective spending of ratepayer funds and achievement of technical program objectives. Retaining flexibility in the program budget categories beyond FY19 will allow the BPU to move funding according to both program demand and operational performance to technologies that demonstrate meeting program goals. The new evaluation process proposed by the Rutgers University Center for Energy, Economic and Environmental Policy must ensure accurate and effective determination of performance. The NFCRC again recommends putting in place protocols to deliver incentives based on minimum standard performance, rather than up-front capacity-based payments.

III. Conclusion

The NFCRC appreciates the opportunity to review and comment on the many documents and filings related to the NJ BPU Clean Energy program, and strongly encourages making changes to the program to maximize energy savings and positive environmental impact. We look forward to ongoing discussions with the BPU to support the gathering of information on current fuel cell system performance characteristics and to inform any assumptions used to determine program requirements and eligibility.

State of New Jersey
DIVISION OF RATE COUNSEL
140 EAST FRONT STREET, 4TH FL
P.O. BOX 003
TRENTON, NEW JERSEY 08625

PHIL MURPHY
Governor

SHEILA OLIVER
Lt. Governor

STEFANIE A. BRAND
Director

May 31, 2018

Via Hand Delivery and Electronic Mail
Honorable Aida Camacho-Welch, Secretary
New Jersey Board of Public Utilities
44 South Clinton Avenue
3rd Floor, Suite 314
P.O. Box 350
Trenton, New Jersey 08625

Re: Comments of the New Jersey Division of Rate Counsel
CEP Proposed Revisions to NJCEP Protocols

Dear Secretary Camacho-Welch:

The Division of Rate Counsel ("Rate Counsel") would like to thank the Board of Public Utilities ("BPU" or "Board") for the opportunity to present the within comments on the proposed second revision ("Draft Protocols") to the FY16 version of the Clean Energy Program ("CEP") Protocols ("Protocols"), dated May 10, 2018, [1] which were circulated in red-line form by the BPU's Office of Clean Energy ("OCE") to stakeholders for comment along with the OCE's summary ("OCE May 10 Summary") of its responses to the stakeholder comments on the initial revision, dated January 12, 2018, to the FY16 version of the Protocols.[2]

[1] The Draft Protocols circulated for comment was entitled: "New Jersey Board of Public Utilities, New Jersey Clean Energy Program, Protocols to Measure Resource Savings, Revisions to FY 2016 Protocols, Date: May 10, 2018."

[2] See "Comments and Responses to FY19 Update to FY16 NJCEP Savings Protocols" dated May 10, 2018, available at http://njcleanenergy.com/files/file/public_comments/FY18/3c%20-%20NJCEP%20Protocol%20Comments%20and%20Response%20Doc%20v1.pdf.

Enclosed please find original and ten copies of comments submitted on behalf of Rate Counsel in connection with the above-captioned matter. One additional copy of the comments is enclosed. **Please stamp and date the extra copy as 'filed" and return it in our self-addressed stamped envelope**.

I. Introduction and Summary

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) attributable to CEP EE measures. The within general and specific comments, divided by subject area, reference the Draft Protocols and the OCE May 10 Summary, as well as the OCE's presentation material entitled "Review of Proposed Revisions to NJCEP Protocols per ERS Report," dated March 14, 2018 ("March OCE Presentation"). The OCE's May 10 Summary includes its responses to Rate Counsel's comments dated April 10 ("Rate Counsel April 10 Comments") on the initial revision to the FY16 Protocols dated January 12.

II. General Comments

Rate Counsel makes the following comments that apply to the Protocols, in general, as well as the extent to which previous Rate Counsel recommendations have been implemented and comments have been addressed.

A. Winter Coincident Factors

Rate Counsel previously recommended that the OCE establish winter coincident factors ("CFs") for as many measures as possible.[3] However, the OCE May 10 Summary recommended maintaining the status quo, pending further analysis, consideration, and public input. Rate Counsel would like to continue to emphasize the need for estimates of winter coincident factors ("CFs"). As discussed in Rate Counsel's April 10 Comments, PJM's capacity market Reliability Pricing Model ("RPM") now requires the owners of capacity resources to provide (or seek from other parties) equal amounts of summer and winter capacity reductions in a given load-serving zone.[4] The challenges regarding resource adequacy within the winter in PJM have been outlined in a PJM load forecasting report with zone-specific peak demand requirements. For example, specific PJM zones such as PL and EKPC are expected to have higher winter peaks than summer peaks.[5] Additionally, according to PJM, the reasons for requiring sufficient planning for resource adequacy within the winter include the increased likelihood of extreme weather events and lack of generation reliability due to wintertime pipeline or fuel constraints.[6] This indicates that winter resource adequacy is a future constraint. Including the winter CFs will help facilitate offers of CEP energy efficiency resources into the PJM RPM capacity market in order to obtain additional funds for the programs.

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[3] Rate Counsel April 10 Comments, pp. 2-3.

[4] PJM (n.d.), "Seasonal Resources and Aggregation in RPM," pp. 25 and 26. Available at: http://www.pjm.com/~/media/committees-groups/subcommittees/drs/20170407/20170407-item-04a-intermittent-resources-in-rpm-training.ashx.

[5] PJM Load Forecast Report, January 2016 pp.18-45, https://www.pjm.com/~/media/library/reports-notices/load-forecast/2016-load-report.ashx.

[6] Winter Season Resource Adequacy and Capacity Requirements http://www.pjm.com/~/media/committees-groups/committees/mrc/20161117/20161117-item-09-winter-reliability-requirement-ps-ic-clean.ashx.

B. Free Riders and Free Drivers

The savings calculations in the Draft Protocols do not reflect the impacts of free ridership and spillover (also known as effects of "free drivers"). These values help assess the effectiveness of EE measures. The current Protocols indicate that "[f]ree riders and free drivers are not addressed in these Protocols."[7] Rate Counsel previously recommended that the OCE establish specific timelines to evaluate free riders and free drivers as soon as possible, and that the OCE share that timeline with stakeholders.[8] In response, the OCE May 10 Summary noted that free ridership and other related net effects will be examined further in FY19 and that a schedule would be developed and shared. Rate Counsel requests that the OCE keep stakeholders informed of study timelines once they have been developed.

C. References

Rate Counsel previously recommended that the OCE review, reference, and adopt the values from the latest versions of the technical reference manuals ("TRMs").[9] In response, NJCEP updated 14 measure references. However, six measures (Residential Energy STAR lighting, Refrigerated Case LED, Pre-Rinse Spray Valves, Clothes Washers and Dryers, and Appliance Recycling Programs) continue to refer to the previous TRM versions, per the OCE May 10 Summary. The OCE should provide further clarification regarding its reasons for referencing the earlier version of the TRMs for these specific measures.

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[7] Draft Protocols, p. 8
[8] Rate Counsel April 10 Comments, p. 3.
[9] Rate Counsel April 10 Comments, pp. 3-4.

D. Updates

Rate Counsel would like to acknowledge that the OCE has made updates to the references to the most current version of the Mid-Atlantic and New York TRMs for 14 measures, based on Rate Counsel's April 10 Comments.

III. Specific Comments

Rate Counsel's comments on specific issues and sections of the Draft Protocols are presented below.

A. T&D Line Loss Factor

Rate Counsel previously recommended that the OCE obtain the transmission and distribution ("T&D") loss factors for different customer classes from the utilities and use those factors in the protocols where applicable.[10] In response, the OCE recommended that the status quo would be maintained pending further analysis, consideration, and public input.[11] Rate Counsel would like to emphasize its concerns with the Draft Protocol's reliance on a single T&D line loss factor, based on an average value, for energy and peak demand reductions across the entire state.[12] As indicated in the Rate Counsel April 10 Comments, line losses vary with different voltage levels. In particular, large customers receiving power at high voltage levels experience lower line losses. Other jurisdictions demonstrate potential methods to address this. Several Pennsylvania utilities, for example, estimate savings from their energy efficiency programs using several different line loss factors, depending on the customer type, as shown in Table 1 below. Similarly, PSE&G in New Jersey developed values for line losses which indicate

[10] Rate Counsel April 10 Comments, p. 4-5.
[11] OCE May 10 Summary, p. 8.
[12] Draft Protocols, p. 18.

the losses can be approximately 2.5 percent lower for primary distribution voltages.[13] This highlights the need for line loss factors to be defined for specific rate classes to accurately account for savings through energy efficiency programs.

Table 1. Line Loss Factors by Several Pennsylvania Utilities

Utility	Residential	Small C&I	Large C&I
Met-Ed	9.5%	7.2%	7.2%
Penelec	9.5%	7.2%	7.2%
Penn Power	9.5%	5.5%	5.5%
WPP	9.4%	7.9%	7.9%
PPL	8.8%		4.2%

Source: First Energy (2017) First Annual Report to the Pennsylvania Public Utility Commission, Phase III of Act 129, Program Year 8 (November 15, 2017), page 45, available at http://www.puc.pa.gov/pcdocs/1544648.pdf; Statewide Evaluator Annual Report, Act 129 Program Year 8 (February 28, 2018), p. C-32, available at http://www.puc.pa.gov/Electric/pdf/Act129/Act129-SWE_AR_Y8_022818.pdf.

B. Avoided Emission Rates

The Draft Protocols provide revised electric emission factors for the years 2014, 2015, and 2016.[14] These emission factors are based on PJM's system marginal on-peak emission factors. The main purpose of the Protocols is to estimate benefits from the current and future programs and thus the emission rates from the most recent year are most relevant. As such, Rate Counsel previously requested a clarification as to why three years of historical emission rates are provided in the Draft Protocols.[15] However, the OCE has maintained the status quo pending input from NJDEP, further analysis and consideration, and public input.[16] If the OCE intends to maintain the status quo and utilize the past three years data instead of the most recent year, Rate

[13] See PSE&G Rate Class and Loss Factor Information https://www.pseg.com/business/energy_choice/third_party/rate_class.jsp.
[14] Draft Protocols, p. 19.
[15] Rate Counsel April 10 Comments, pp. 5-6.
[16] OCE May 10 Summary.

Counsel requests that the Protocols - at a minimum - clarify which emission factors should be used for estimating future avoided emissions. Rate Counsel further recommends the Protocols clarify the purpose of presenting three years of historical emission rates rather than the most recent year.

Secondly, Rate Counsel previously requested the Protocols use annual average marginal emission rates rather than annual peak marginal emission rates.[17] In reply, the OCE also responded that status quo would be maintained pending input from NJDEP, further analysis, consideration, and public input.[18] Rate Counsel would like to reiterate the importance of using annual average marginal emission rates instead of the peak marginal emission rates. Energy savings for CEP measures are provided in terms of annual energy savings rather than peak and off-peak energy savings. The source document from PJM also provides marginal emission rates from off-peak time periods. Therefore, for the Protocols, Rate Counsel recommends that the OCE develop annual average marginal emission rates by taking the average of the peak and off-peak marginal emission rates, weighted by the number of hours for peak and off-peak as defined by PJM. If status quo is maintained, then Rate Counsel requests that the OCE provide additional support for its decision not to incorporate the annual average marginal emission rates within the Protocols.

C. Residential Lighting Coincident Factor

As previously stated by Rate Counsel in its earlier comments, the Protocols should be updated to use CFs based on a 2014 study prepared by NMR, *Northeast Residential Lighting*

[17] Rate Counsel April 10 Comments, p. 6.
[18] OCE May 10 Summary.

Hours of Use Study.[19] The NMR study evaluated both summer and winter CFs for northeastern states, including for New York City. The Protocols currently use a value of 5 percent as a residential lighting CF based on Vermont's TRM.[20] Given that New Jersey's lighting load shape is very different from Vermont's, Rate Counsel does not recommend the use of this assumption for the Protocols. The OCE responded within the OCE May 10 Summary that the status quo would be maintained pending further analysis, consideration, and public input. Rate Counsel continues to emphasize the need for incorporating CFs that are representative of New Jersey-specific lighting characteristics as opposed to the residential lighting CFs based on Vermont's TRM. Rate Counsel further recommends that the OCE develop New Jersey-specific lighting CFs for summer and winter based on data for the downstate New York area from the NMR study. Hourly lighting use for downstate New York, which the OCE can use to identify CFs more suitable for PJM peak periods, are provided in Figure 4-7 of the cited NMR study.

D. Residential HVAC EFLH

The Draft Protocols proposed the use of New York City-specific effective full load hour ("EFLH") data for residential cooling and heating in various parts of the Protocols.[21] The New York EFLH estimates are provided for old, average, and new buildings separately. However, in its March OCE Presentation, the OCE stated that it found no definitions for classifying the old, average, and new buildings used for the New York estimates. On the other hand, the current

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[19] See Rate Counsel April 10 comments, p.6, and the cited NMR Group study, available at: http://www.neep.org/sites/default/files/resources/Northeast-Residential-Lighting-Hours-of-Use-Study-Final-Report1.pdf.
[20] Draft Protocols, p. 60.
[21] Draft Protocols, pp. 37, 38, 40, and 41.

effective estimates for New Jersey are based on Vermont Energy Investment Corporation ("VEIC") estimates, which are "consistent with analysis of PEPCo and LIPA."[22]

Rate Counsel has previously suggested that before making a recommendation to use a different set of assumptions for EFLH, it would be helpful to have a better understanding of the source and basis of the values that are currently being used.[23] If VEIC values are based on a New Jersey study, Rate Counsel recommends that the revised New Jersey Protocols retain the EFLH estimates used in the existing Protocols. Rate Counsel also recommends that the OCE conduct an analysis of EFLH estimates for cooling and heating. The analysis should include various types of heating and cooling systems such as gas furnaces, ducted heat pumps, and ductless mini-split heat pumps. However, the OCE recommended that the current EFLH values would be maintained pending further analysis, consideration, and public input.[24] Rate Counsel recommends that if the current EFLH values are maintained pending further analysis, the OCE should provide additional clarification regarding the source of these values and whether they have been obtained from a New Jersey-specific study and any reasons for their prioritization over the New York City EFLH values.

E. Measure Life

In the initial revision to FY16 Protocols, the OCE proposed to use a measure life of 20 years for residential insulation based on two data points: 25 years from the Mid-Atlantic TRM and 15 years from Pennsylvania's TRM.[25] Rate Counsel previously noted that the actual measure life value referenced in Pennsylvania's TRM is 25 years, which was based on a value

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[22] Draft Protocols, p. 231.
[23] Rate Counsel April 10 Comments, p. 8.
[24] OCE May 10 Summary, p.10.
[25] March OCE Presentation, slide 5; ERS 2017. "NJCEP Protocols – Comparative Measure Life Study and Summary of Measure Changes to NJCEP Protocols, p. 2

used in Massachusetts. Rate Counsel recommended that the Protocols keep the current insulation measure life value of 30 years which is consistent with the value used in New York[26] or use a slightly lower value of 25 years consistent with the value used in Massachusetts and Pennsylvania.[27]

The OCE proposed to maintain the 20-year measure life, but now proposes to use California's savings protocols called the Database of Energy Efficiency Resources ("DEER") as the basis for the measure life.[28] In principle, Rate Counsel does not recommend the use of the values from California, especially when measure life values are available from neighboring states. The exception would be if an analysis demonstrates that the value in California DEER is more accurate and appropriate for the New Jersey region. In the case of insulation measure life, it is obvious that neighboring states use long measure life values consistent or close to what New Jersey is currently using. Thus, Rate Counsel reiterates its original recommendation that the Protocols retain the current value or use a 25-year life based on the value consistent with the value used in Massachusetts and Pennsylvania.

F. Fuel Use Economizer for Commercial Boilers and Furnaces

The Protocols currently use a 13-percent savings factor for fuel use economizers for commercial boilers and furnaces. This savings factor is based on studies by Brookhaven National Laboratories for NYSERDA and ConEdison. The Draft Protocols have proposed a 4-percent factor based on a study conducted by ERS using third-party reviews and impact evaluation data.[29]

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[26] New York TRM Version 5.1, p. 47.
[27] Rate Counsel April 10 Comments, pp. 9-10.
[28] OCE May 10 Summary, p.11.
[29] OCE March Presentation, p. 12.

The performance of fuel use economizers differs significantly by climate. The New York TRM provides kilowatt-hour ("kWh") savings estimates per unit for different types of commercial buildings in its Appendix J, pp. 515 – 516. The Mid-Atlantic TRM adjusted the kWh savings value from the NY TRM to be consistent with enthalpy data from New York City and Mid-Atlantic cities.[30] Rate Counsel has previously recommended that OCE take the same approach as found in the Mid-Atlantic TRM.[31] More specifically, the OCE should adjust the New York City value based on New Jersey-specific enthalpy data for inclusion in the Protocols. Alternatively, the Protocols can use the savings values developed by the Mid-Atlantic TRM for Wilmington, Delaware. The OCE responded that it will be maintaining the status quo pending further analysis, consideration, and public input.[32] Rate Counsel reiterates its recommendation that the OCE should adjust the savings factor based on New Jersey-specific enthalpy data.

[30] Mid-Atlantic TRM Version 7, p. 393.
[31] Rate Counsel April 10 Comments, p. 10.
[32] OCE May 10 Summary, p.11

G. C&I Lighting Hours

Rate Counsel previously recommended that the hospital hours for lighting be updated to reflect the values provided within the New York TRM.[33] The Draft Protocols assume 8,760 hours of lighting operation for hospitals, based on an assumption that hospitals operate year-round.[34] While some lighting fixtures at hospitals certainly operate throughout the year, other lighting fixtures are turned off during certain times of the day or year. New York's TRM currently uses 7,666 hours for hospital lighting.[35] The New York TRM also stipulates operating hours for many other commercial buildings. Rate Counsel recommends that the OCE review and consider adopting the operating hours for hospital buildings from the New York TRM. Also, Rate Counsel recommends that the OCE review operating hours for other types of buildings and determine whether the data for the other building types should be reflected in the Protocols. The OCE responded that the recommended lighting hours had been reviewed and updated based on the Mid-Atlantic TRM V7.[36] However, based on Rate Counsel's review of the Draft Protocols, lighting hours for hospitals remain at 8,760 hours of lighting as opposed to the 7,666 hours for hospitals in the NY TRM.[37] Rate Counsel requests that the OCE revise the Draft Protocols to reflect the change to the lighting operating hours as it recommended in the OCE May 10 Summary.

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[33] Rate Counsel April 10 Comments, p. 11.
[34] Draft Protocols, p. 101.
[35] New York TRM Version 5.1, p. 274.
[36] OCE May 10 Summary, p. 11.
[37] Draft Protocols, p.101.

H. Revisions to Comfort Partners Protocols

The Draft Protocols added savings protocols for two new Comfort Partners program measures: the water pipe heat wrap and gas HVAC repairs.[38] Rate Counsel has reviewed the proposed savings protocols for these measures. For the water pipe heat wrap measure, the Draft Protocols proposed savings algorithms based on annual electric and gas savings factors. Using a numeric annual savings factor, would not allow for calculation of savings as a function of varying pipe diameter, types of insulation, temperature differences between water in the pipe and the ambient air, and recovery efficiencies as have been taken into account in the Mid-Atlantic TRM. Rate Counsel requests clarification regarding the reasons for not including formulae that would account for a range of variables in the methodology proposed within the Protocols. A formulaic approach would be consistent with the practices within the Mid-Atlantic[39] and New York TRMs[40]. Additionally, based on the recommendations of the OCE's Utility Working Group, a water heater replacement cross reference was suggested as an additional edit to the Comfort Partners Program.[41] Rate Counsel requests clarification on whether this water heater replacement cross reference has been addressed within the Draft Protocols and if so, the location for this cross reference within the Draft Protocols.

For all the foregoing reasons, Rate Counsel respectfully requests that the BPU and the OCE adopt its recommendations for the Protocols.

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[38] Draft Protocols pp. 53, 56-57
[39] Mid-Atlantic TRM Version 7, p.159.
[40] New York TRM Version 6, p. 46.
[41] Review of Proposed Revisions to NJCEP Protocols per ERS Report, Utilities Working Group Meeting Presentation

Thank you for your consideration of the within comments.

Respectfully submitted,

STEFANIE A. BRAND
Director, Division of Rate Counsel

By: _____
Kurt S. Lewandowski, Esq.
Assistant Deputy Rate Counsel

c: Via Hand Delivery and Electronic Mail
Kenneth Sheehan, Esq., BPU
Sheri Jones, BPU
Anne Marie McShea, BPU
Noreen Giblin, Esq., BPU
Rachel Boylan, Esq., BPU

Via First Class and Electronic Mail
Caroline Vachier, DAG
Michael Ambrosio, AEG

publiccomments@njcleanenergy.com

AMERESCO
Green • Clean • Sustainable

211 Broad Street, Suite 206
Red Bank, NJ 07701

ameresco.com

May 31, 2018

New Jersey Clean Energy Program
New Jersey Board of Public Utilities
44 South Clinton Avenue
Trenton, New Jersey 08625

SENT VIA EMAIL

RE: Ameresco Comments Regarding NJCEP Protocols to Measure Resource Savings

To Whom It May Concern:

On behalf of Ameresco, Inc., a leading provider of energy efficiency and renewable energy solutions, we write in support of the NJCEP proposed updated changes to the CHP Program under the Protocols to Measure Resource Savings dated May 10, 2018.

Combined Heat and Power (CHP) is a critical resource to support resiliency, reliability and emissions reduction in New Jersey. CHP meets many objectives of the New Jersey Clean Energy Program, including peak demand savings, energy conservation and energy resilience.

Ameresco supports the NJCEP proposed changes to the CHP Program, and we encourage the Board's efforts to increase participation among stakeholders.

In addition, Ameresco supports the referenced reward for resiliency through black start and islanding capabilities for critical facilities, as this reflects an increasing demand in the market. We also support the change to HHV from LHV as a standard of efficiency measurement, as long as the program thresholds are revised in line with the new metrics to maintain current efficiency requirements.

Ameresco also supports the removal of electric-only power generation from the program. Maintaining a specific CHP program as proposed, separate and distinct from other distributed generation technologies, is consistent with many state and federal initiatives seeking to encourage the deployment of CHP.

Lastly, Ameresco appreciates that the NJBPU OCE CHP Program is supportive of resilience and microgrid objectives. The use of CHP is critically important in providing energy assurance and can support the cost-effectiveness of microgrid solutions.

We appreciate this opportunity to provide public comment. If we can be of further assistance, please don't hesitate to contact me by email at apatterson@ameresco.com.

Sincerely,

Ashley N. Patterson
Vice President, Government Relations & Public Policy
Ameresco