BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF DELAWARE

PSC DOCKET NO. 11-362

IN THE MATTER OF THE APPLICATION OF
DELMARVA POWER AND LIGHT COMPANY
FOR APPROVAL OF QUALIFIED FUEL CELL PROVIDER
PROJECT TARIFFS
(FILED AUGUST 19, 2011)

REPORT ON DELMARVA POWER'S APPLICATION FOR APPROVAL OF A NEW ELECTRIC TARIFF APPLICABLE TO PROPOSED BLOOM ENERGY FUEL CELL PROJECT

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I. OVERVIEW AND EXECUTIVE SUMMARY

A. Overview and Executive Summary

On August 19, 2011, Delmarva Power & Light Company ("Delmarva" or "Company") filed an application with the Delaware Public Service Commission ("Commission") for approval of a new electric tariff (and associated gas tariff) pursuant to which a Qualified Fuel Cell Provider would sell the energy, capacity and other products from a 30 MW natural gas-fueled fuel cell project into the PJM market and Delmarva's distribution customers would pay the net amount of specified charges minus revenues to be obtained from the sale of products in the PJM marketplace. This filing, and the proposed tariff for which approval is sought, is made pursuant to amendments signed into law by Governor Markell on July 7, 2011 (the "Amendments" or "REPSA Amendments") to the Renewable Energy Portfolio Standards Act ("REPSA" or "RPS").[1]

The Amendments provide for a regulatory framework pursuant to which Bloom Energy Corporation ("Bloom Energy" or "Bloom") would build a manufacturing facility in Newark, Delaware at the site of the former Chrysler plant to produce fuel cells, and in consideration of the associated employment and other economic benefits accruing to Delaware, Delmarva's ratepayers would pay over a 21-year period charges for the output of 30 MWs of fuel cells under a tariff, subject to Commission approval.[2] Under REPSA, the Bloom Energy fuel cells approved by the Commission under the tariff would be treated as fulfilling Delmarva's RPS obligations in amounts specified under the statute, as may be adjusted by the Secretary of the Department of Natural Resources and Environmental Control ("DNREC") in coordination with Delmarva and the Commission. Adjustments have been proposed in connection with the application.

The Amendments require that the tariff satisfy a variety of minimum requirements, including that "the cost to customers of [Delmarva] for each MWH of output produced by the project, which on a levelized basis at the time of Commission approval, does not exceed the highest cost source for combined energy, capacity and environmental attributes approved by the Commission for inclusion in the renewable portfolio of [Delmarva] as of January 1, 2011."[3] While the language of this statutory provision is not crystal clear, the Secretary of DNREC and Delmarva have interpreted this language as a net customer impact in dollars per month for the average residential customer under the proposed fuel cell tariff compared to that under the power purchase agreement ("PPA") signed by Delmarva with Bluewater Wind Delaware LLC in 2008, as amended. Under this interpretation, which we do not find to be unreasonable, we concur that the proposed tariff

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1 The Amendments are set forth in full in Appendix A to this report.

2 There is also provision for a similar transaction for an additional 20 MW, which is not currently before the Commission for approval.

3 Amendments Section 8, 26 Del C. § 364(d)(1)c.

passes this test. Our assessment is that the proposed tariffs also satisfy the other minimum requirements set forth in the Amendments.

Under the REPSA Amendments, the Commission is charged with considering the "incremental cost of the Qualified Fuel Cell Power Project to customers."[4] In doing so, the Commission is charged with "applying at least the following factors:

- **a.** Whether the Qualified Fuel Cell Provider Project utilizes innovative baseload technologies,
- **b.** Whether the Qualified Fuel Cell Provider Project offers environmental benefits to the state relative to conventional baseload generation technologies,
- **c.** Whether the Qualified Fuel Cell Provider Project promotes economic development in the State, and
- **d.** Whether the Tariff as filed promotes price stability over the project term."[5]

Since the statute directs the Commission to apply "at least" the specified factors, our report addresses the specified considerations as well as broader considerations of whether the economic development benefits are likely to exceed the costs of the project to Delmarva ratepayers and Delaware taxpayers on a risk-adjusted basis. This is not an easy task, especially given limitations of time and budget, and we address these matters in the context that other state agencies, specifically, the Delaware Economic Development Office ("DEDO") and DNREC, have been charged with addressing economic development benefits in the first instance.

Our analysis also looks at the details of the proposed electric and natural gas tariffs (Delmarva proposes to procure natural gas for the owner of the fuel cell project) in terms of whether they meet the requirements of the REPSA Amendments and whether they pose any particular issues. We do so in the context that under the Amendments: (a) the Commission may only approve or deny the proposed tariff *in toto* and may not impose any conditions, and (b) with limited exceptions, the Commission may not alter the tariff, once approved, for the term of service under the tariff.

Our report initially summarizes the pertinent provisions of the REPSA Amendments and Delmarva's application, supported by Bloom Energy and DNREC. Then, we analyze the expected benefits of the proposed project in comparison to expected costs and assess the risks associated with the realization of the expected benefits. In this context, we also address the specified factors in the REPSA Amendments that the Commission is directed to consider. We then address whether the application satisfies the minimum statutory requirements, including the cost comparison requirement, and address other issues associated with the proposed tariffs, including risk allocation, Secretary O'Mara's

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4 REPSA Amendments Section 8, 26 Del C. § 364(d)(2).

5 *Id.*

adjustment to the REC/SREC fulfillment ratios under the REPSA Amendments, Bloom Energy's request for an expedited decision, and our conclusions.

In our report, we find that the Bloom fuel cells are expensive, with the net cost to Delmarva's ratepayers from the proposed fuel cell project estimated to be over $100 million in net present value over the proposed 22-year term. On the other hand, the economic development benefits to the State of Delaware from the construction and sustainable operation of the manufacturing plant are very high—estimated in the hundreds of millions of dollars per year. A critical issue, in our view, is the "tie" between the fuel cell project and the proposed manufacturing facility. We have strong concerns that Delmarva's ratepayers could be responsible for tens of millions of dollars of costs under the proposed tariff, without an adequate remedy, if the fuel cell project is built but the manufacturing plant is not built. We also have questions regarding the sustainability of operations of the proposed manufacturing facility if Bloom is not successful in its business with resulting reduction in estimated economic development benefits. Finally, we have specific requests for Delmarva and Bloom regarding modifications of and clarifications to the proposed tariffs. In the concluding section of this report, we set forth specific questions regarding these matters which we have asked the project proponents to address prior to the hearing scheduled before the Commission on October 18, 2011.

II. THE PROPOSED FUEL CELL PROJECT, THE REPSA AMENDMENTS AND DELMARVA'S APPLICATION

A. Introduction

This filing is the result of an economic development effort on the part of the State of Delaware to attract Bloom Energy, a manufacturer of solid oxide fuel cells, to build a new manufacturing plant at the site of the former Chrysler plant in Newark, with the expectation that this would create approximately 375 construction jobs, up to 900 Bloom Energy jobs at the manufacturing center, and up to an additional 600 jobs in Delaware created by Bloom Energy suppliers.[6] As part of the effort to attract Bloom Energy to Delaware, Delmarva and the State of Delaware collaborated to offer Bloom Energy a long-term power transaction to support a 30 MW grid-connected fuel cell project, with the potential for an additional 20 MW of Bloom Energy fuel cells, subject to the approval of the Commission. Having substantially negotiated the transaction, officials of the State submitted proposed legislation to the Delaware legislature setting forth the parameters of the transaction, including the concept that the terms would be embodied in a tariff and not a power sales contract, minimum requirements for the tariff, and standards for the Commission to review a proposed tariff to be filed by Delmarva with the support of Bloom Energy. The proposal in its final form was approved by the Legislature on June 23, 2011 and signed by Governor Markell on July 7, 2011.

B. Relationship Between the Proposed Manufacturing Facility, the Proposed Fuel Cell Project, and Bloom Energy

The Amendments allow for Delmarva to use the energy output from a Qualified Fuel Cell Provider Project ("QFCPP" or "Fuel Cell Project") to "fulfill"—technically, to reduce—a portion of the Company's Tier 1 Renewable Energy Credit ("REC") and Solar Renewable Energy Credit ("SREC") requirements.[7] A QFCPP/Fuel Cell Project is defined under the Amendments as a "a fuel cell power generation project located in Delaware owned and/or operated by a Qualified Fuel Cell Provider under a tariff approved by the Commission pursuant to §364 (d) of this title."[8]

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6 Direct Testimony of Collin O'Mara, Secretary of the Department of Natural Resources and Environmental Control, State of Delaware ("O'Mara Testimony") at 1-2.

7 Amendments Section 2, 26 Del. C. § 353(d).

8 Amendments Section 1, 26 Del. C. § 352 (17).

"Qualified Fuel Cell Provider" is defined under the Amendments as "an entity that:

a. By no later than the commencement date of commercial operation of the full nameplate capacity of a fuel cell project, manufactures fuel cells in Delaware that are capable of being powered by renewable fuels, and

b. Prior to approval of required tariff provisions, is designated by the Director of the Delaware Economic Development Office and the Secretary of DNREC as an economic development opportunity."[9]

Mr. Collin O'Mara, Secretary of DNREC, has provided to the Commission his designation and that of Mr. Alan B. Levin, Director of DEDO, of Bloom Energy as an "economic development opportunity" as a result of its plan to build "its new, high-tech manufacturing campus at the site of the former Chrysler factor in Newark to manufacture Bloom Energy Servers. ..." The other requirements for a Fuel Cell Project are that (a) Bloom Energy owns or operates the Fuel Cell Project, (b) Bloom Energy manufactures fuel cells in Delaware by the commencement date of commercial operation of the "full nameplate capacity of a fuel cell project," and (c) the fuel cells in the Fuel Cell Project are capable of being powered by renewable fuels. The Amendments further specify that:

> For purposes of this Subchapter, all fuel cell units of a Qualified Fuel Cell Provider in a fuel cell project under tariff with [Delmarva] shall be considered to have been manufactured in Delaware as long as:
>
> **(1)** By no later than the second anniversary of commercial operation of a fuel cell project or December 31, 2016, whichever is earlier, either (i) at least 80% of the installed nameplate capacity shall have been sourced from fuel cells manufactured in a permanent manufacturing facility located in the State or (ii) no more than ten megawatts of nameplate capacity from a fuel cell project shall be manufactured outside of the State, and
>
> **(2)** Fuel cell manufacturer has executed an agreement with the Delaware Economic Development Office that a termination payment shall be made by the fuel cell manufacturer in the event that it ceases manufacturing operations in the state.[10]

Diamond State Generation Partners, LLC, the company, currently owned by Bloom, which would own the Fuel Cell Project (the "Project Company" or "QFCP Generator" under the proposed tariff) plans to build the 30 MW fuel cell project at two sites and in five phases. The project sites, sizes, and expected commercial operation dates are as follows:

[9] Amendments Section 1, 26 Del C. § 352 (16).
[10] Amendments Section 8, 26 Del. C. § 364(e).

- Brookside—3.0 MW (Q2 2012)
- Red Lion I—5.4 MW (Q4 2012)
- Red Lion II—3.0 MW (Q2 2013)
- Red Lion III—8.0 MW (Q3 2013)
- Red Lion IV—10.6 MW (Q4 2013)[11]

Bloom Energy plans to begin construction of the proposed manufacturing facility in early spring 2012 and expects to complete construction in mid-2013.[12]

An important question is what is the "tie" between the desired object—construction of the manufacturing plant—and the benefit being offered to Bloom—the 30 MW fuel cell transaction. Bloom has made it clear that it will not build the manufacturing facility unless the Commission approves the proposed tariff.[13] However, Mr. Richman, Bloom's Vice President of Business Development, has stated that in order for Bloom to build the manufacturing facility:

a. The proposed tariff must be approved by the Commission;

b. Project financing for the fuel cell project must be closed; and

c. Approval of Bloom Energy's Board of Directors must be obtained.[14]

Bloom Energy is seeking expedited approval so it can start construction before the end of 2011 to qualify for the federal cash grant in lieu of the investment tax credit. However, this would be before Bloom actually starts construction of the manufacturing plant. Moreover, there is no specific requirement in the Amendments or in any agreement of which we are aware that Bloom actually build the manufacturing plant after Commission approval is granted.

Instead, the way the Amendments and the proposed tariff address this is that no more than 10 MW of the fuel cell project (equivalent to the first two phases and part of the third) may be manufactured outside of Delaware by the earlier of (a) two years after the 30 MW project is built—expected to be 4th Quarter of 2015—or (b) December 31, 2016. There is also the requirement of a termination payment in the event Bloom ceases manufacturing operations in Delaware, but the agreement has not been finalized.

If for whatever reason the manufacturing facility is not built but the proposed project is built, there are several possible scenarios:

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11 Response of Joshua Richman, Vice President of Business Development for Bloom Energy ("Richman") to Staff Data Request PSC-09(a).

12 Richman Response to Staff Data RequestPSC-08.

13 Richman Response to Staff Data Request PSC-152(a).

14 Richman Response to Staff Data Request PSC-152(b).

- It appears that the Fuel Cell Project can be in compliance if it operates at the 10 MW level (with fuel cells manufactured outside of Delaware);
- There appears to be no financial penalties under the statute or the tariff if the Fuel Cell Project is not fully built out to its expected 30 MW; moreover, if the Fuel Cell Project is built out between 10 MW and 30 MW, it would not be in default of the proposed tariff until the earlier of the second anniversary after commercial operation is achieved with 30 MW or the end of 2016, at which time it would lose eligibility under the tariff.[15]

Hence, there is a potential risk that the manufacturing plant is never built in the first place. Under the proposed termination agreement, there would be a termination payment of up to $20 million or so if Bloom Energy permanently ceases manufacturing in Delaware. However, what if it never starts manufacturing? Also, what if it ceases manufacturing temporarily for many years or its manufacturing plant operates at a far lower level than expected?

Bloom currently owns the Project Company.[16] However, its plan is to sell its sponsor equity stake to a third party,[17] and to have an ongoing relationship with the Project Company, presumably contractual, regarding installation of the Energy Servers and monitoring them remotely.[18] Risk issues associated with the "tie" between payments to be made under the proposed tariff for the Fuel Cell Project and Bloom's construction of the manufacturing facility in Delaware and ongoing operation in Delaware is addressed in Section III.E below. This is especially important to understand because, in our opinion, it is very difficult to justify the incremental costs associated with the proposed tariff for the Fuel Cell Project in the absence of the benefits on a risk-adjusted basis to the State of Delaware flowing from the construction and operation of the proposed manufacturing facility in Newark.

C. Fuel Cell Project MWh and Relationship to RECs and SRECS; Cost Comparison to Bluewater PPA

The REPSA Amendments contain various minimum requirements that a proposed tariff filed jointly by Delmarva and the Qualified Fuel Cell Provider—Bloom Energy—must contain. One of those is that "the cost to customers of [Delmarva] for each MWH of

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15 Richman Response to Staff Data Request PSC-14.

16 Bloom Energy Corporation owns 100% of the membership interests in Clean Technologies II, LLC, which in turn owns 100% of the membership interests in Diamond State Generation Holdings, LLC. Richman Testimony at p. 20, lines 16-20. Diamond State Generation Holdings, LLC has signed a service agreement with Delmarva.

17 Mr. Richman states that this is in connection with obtaining its expected accounting treatment for the transaction. Richman Response to Staff Data Request PSC-36.

18 *Id.*

output produced by the project which, on a levelized basis at the time of Commission approval, does not exceed the highest cost source for combined energy, capacity and environmental attributes approved by the Commission for inclusion in the renewable portfolio of the Commission-regulated electric company as of January 1, 2011."[19] Secretary O'Mara and Delmarva have interpreted this language as requiring that the net customer cost impact on Delmarva customers of the proposed project cannot exceed that of the PPA between Delmarva and Bluewater Wind Delaware, LLC, the highest cost source for combined energy, capacity and environmental attributes in Delmarva's renewable portfolio as of January 1, 2011.[20] The metric used is average customer impact per month for a Delmarva residential customer.[21]

The other relevance of the customer cost impact of the proposed Fuel Cell Project is in a comparison of whether the incremental cost of the Fuel Cell Project is warranted in light of the benefits that may flow as a result of it.

Under the REPSA Amendments, one MWh of production from a Fuel Cell Project results in the reduction of one REC from Delmarva's purchase obligations under REPSA (one REC is the environmental attribute produced by one MWh of a Class I Eligible Renewable Resource, such as that produced by a wind energy project) . However, Delmarva can use the energy output from a Fuel Cell Project to reduce its SREC (solar renewable energy credit) obligation by the ratio of one SREC for each 6 MWh of Fuel Cell Project output, subject to a maximum reduction of SREC purchase obligation of 30% per year (the "SREC Contribution Cap").[22]

According to Secretary O'Mara's testimony, the analysis conducted prior to the filing of the application by ICF, Delmarva's consultant, showed that the cost impact per residential customer was estimated to be $1.63 per month.[23] However, when the Amendments were enacted, based on a preliminary analysis, the projected levelized cost impact had been estimated to be $1.00 per average residential customer per month.[24]

In order to bring the expected cost impact in line with the earlier cost impact, Secretary O'Mara, in conjunction with Delmarva, is proposing adjustment of the Fuel Cell Project to REC/SREC ratios. Under the REPSA Amendments, "The Secretary of DNREC may, after coordination with the Commission and [Delmarva], adjust the requirements of this section including permitting [Delmarva] participating in a Commission-approved project

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19 Amendments Section 8, 26 Del. C. § 364(d)(1)a.

20 Direct Testimony of Collin O'Mara at p. 4, lines 5-7; Direct Testimony of Gary R. Stockbridge at p. 6, lines 4-11.

21 Direct Testimony of Gary R. Stockbridge at p. 5, lines 17-19.

22 Exceptions are where due to lack of SREC availability in the market, the alternative would be to incur Alternative Compliance Payments for SRECs or where the SREC obligation under REPSA is increased (and then only to the extent of the increase).

23 Direct Testimony of Collin O'Mara p. 7.

24 *Id.*

to exceed the percentages set forth in this section."[25] The Secretary's adjustments are as follows:

For the first 15 years, 1 Fuel Cell Project MWh will result in the reduction of 2 RECs of Delmarva's RPS obligations; applying the 6 RECs to 1 SREC ratio, 3 Fuel Cell Project MWh can result in the reduction of 1 SREC;

For the remainder of the tariff (approximately 6 years), 1 Fuel Cell Project MWh will result in the reduction of 1 REC; applying a 3 REC to 1 SREC ratio, 3 Fuel Cell Project MWh can result in the reduction of 1 SREC;

The SREC Contribution Cap will be 25% in Years 1-5, 30% in Years 6-15 and 35% in Years 16-21.

Determining the amount of RECs and SRECs to be reduced annually "would be determined through a process established by the Commission, in consultation with Delmarva and the DNREC, with priority given to minimizing customer impacts, avoiding Alternative Compliance Payments, and ensuring sufficient opportunity for in-state renewable energy economic development."[26]

With these adjustments, ICF's expected average levelized residential customer impact per month is $1.00.[27] Based on ICF's economic analysis, this cost impact to customers from the Fuel Cell Project is approximately 56% to 59% below that of the Bluewater PPA.[28] We address the economic analysis and the comparison to the Bluewater PPA in Sections III.C and IV.C of this report.

D. Other Statutory Requirements Pertaining to the Tariff

The Commission is required to accept a tariff filed by Delmarva before Delmarva may collect charges on behalf of a Fuel Cell Project and reduce its REC and SREC obligations. The Project Company—Diamond State Generation Partners, LLC--and Delmarva, acting as a collection agent, shall jointly file the tariff, which in addition to meeting the cost comparison vis-à-vis the Bluewater PPA shall "at a minimum" provide for:

- A project of 30 MW and future additions up to an additional 20 MW; provided, that any additional MW beyond 30 MW must be reviewed and approved by the Commission;

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25 Amendments Section 8, 26 Del. C. § 364(d)(1)b.
26 Direct Testimony of Collin O'Mara pp. 6-7.
27 Direct Testimony of Maria Scheller p. 4.
28 *Id* at 4.

- A term of at least 20 years;
- Require the Project Company to sell all energy, capacity and ancillary services produced by the Project into PJM;
- Delmarva's collection on behalf of the Project Company through a non-bypassable charge on Delmarva's distribution customers the positive difference between (A) the sum of (1) the $/MWh charge to be paid to the Project Company, (2) the cost of fuel to produce such output, and (3) any costs incurred by Delmarva arising out of the Fuel Cell Project minus (B) the amount received by the Project Company for the market sale of its output (if this is a negative amount, the negative amount shall be distributed to Delmarva's distribution customers) and the associated mechanism;
- An average efficiency that the Fuel Cell Project must maintain;
- A definition of the role of Delmarva solely as the agent of the Project Company for the collection of funds and disbursement of such collected funds to the Project Company and to its customers;
- A provision that protects the Project Company from any future changes to REPSA that would prevent the Project Company from recovering all amounts approved in the tariff;
- Provisions pertaining to a force majeure and interruption of fuel supply:
    - In the event of a force majeure event that prevents the Project Company from supplying output of at least 80% of the capacity of the Fuel Cell Project, Delmarva shall, on behalf of the Project Company, collect from its customers a maximum of 70% of the price per MWh of output affected by the force majeure;
    - In the event of an interruption in fuel supply, in whole or in part, Delmarva shall collect from its customers and transfer to the Project Company 100% of the price per MWh of output affected by the interruption;
    - During the force majeure event or interruption in fuel supply, Delmarva will continue to receive the full reduction in RPS obligations that would have been provided by the output but for the force majeure event or fuel supply interruption.

In order for the Commission to approve the tariff, it must find that these minimum provisions are satisfied.[29] Under the REPSA Amendments, "All tariff filings must be approved or denied by the Commission in whole, as proposed, without alteration or the imposition of any condition or conditions with respect thereto by the Commission."[30] In

[29] Amendments Section 8, 26 Del. C. § 364(d)(2).
[30] *Id.*

addition, "the Commission shall consider the incremental cost of the Qualified Fuel Cell Provider Project to customers, applying at least the following factors:

- Whether the Qualified Fuel Cell Provider Project utilizes innovative baseload technologies,
- Whether the Qualified Fuel Cell Provider Project offers environmental benefits to the state relative to conventional baseload generation technologies,
- Whether the Qualified Fuel Cell Provider Project promotes economic development in the State, and
- Whether the Tariff as filed promotes price stability over the project term.[31]

Hence, the Commission in considering the incremental cost of the Fuel Cell Project is required to apply *at least* the four specified factors in reaching its decision. However, the Commission is not limited from considering other factors, such as whether the benefits associated with the Fuel Cell Project, including employment and other economic benefits to the State associated with construction of the proposed manufacturing plant outweigh the incremental cost of the Fuel Cell Project to Delmarva's ratepayers.[32]

Delmarva and the Project Company may jointly modify proposed tariff provisions prior to any final ruling by the Commission. However, once approved by the Commission, "tariff provisions cannot be altered, nor may approval be repealed or modified, without the agreement of [Delmarva] and the Project Company" (with minor exceptions).[33]

E. The Proposed Tariff

For the most part, the proposed tariff filed by Delmarva tracks the provisions set forth in the REPSA Amendments (this will be addressed in more detail in Section IV below).

One provision in the proposed tariff that is not specified in the REPSA Amendments provides for payment by Delmarva's distribution customers due to reduced output caused by Bloom Energy not providing replacement parts or service. This provision—found in Section K(5) of the proposed tariff—provides for reduced payment by Delmarva customers in that circumstance and is intended to provide support to Bloom's financing of the Fuel Cell Project. The reasons behind this provision are based on the emerging nature of Bloom's fuel cell technology as well as the size and scale of the proposed projects and are addressed in the next section. We address this in Sections III.E.2 and IV.M below.

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31 *Id.*

32 In response to a Staff data request, Secretary O'Mara stated that "the law gives the Commission the discretion to weigh whether the additional benefits of the Bloom project outweigh the incremental costs to Delmarva's customers." Response to Question PSC-112.

33 26 Del. C. § 364(d)(5).

F. Qualifications of Staff Consultants

New Energy Opportunities, Inc. ("NEO"), with the assistance of La Capra Associates, Inc. ("La Capra Associates") and Birch Tree Capital, LLC, has been retained by the Commission to evaluate and report on Delmarva's application regarding the Fuel Cell Project. New Energy Opportunities and its principal, Barry Sheingold, served as the Independent Consultant for the Commission and other State Agencies with respect to Delmarva's 2006 In-State Generation RFP that led to the Delmarva-Bluewater PPA. In addition, NEO has served or is serving as Commission staff consultant in the review of (a) three land-based wind PPAs entered into by Delmarva in 2008 and approved by the Commission in PSC Docket No. 08-205,[34] (b) Delmarva's SREC purchase contract with the Dover Sun Park Project, and (c) the proposed SREC procurement pilot program in PSC Docket No. 11-399. La Capra Associates, a consulting firm specializing in the electric and natural gas industries, has played a substantial role with NEO in each of the foregoing assignments with respect to modeling and economic issues, with Alvaro E. Pereira, Ph.D., an energy economist, being lead consultant for La Capra Associates on this assignment. John Harper, principal of Birch Tree Capital, LLC, a consultant specializing in project finance of renewable and other energy projects, has provided assistance in this assignment on issues pertaining to project finance. Qualifications of the consulting team are described in Appendix B to this report.

[34] Findings, Opinion, and Order No. 7462 (Oct. 23, 2008).

III. BENEFITS OF THE PROPOSED PROJECT RELATIVE TO ITS COSTS

A. *The Fuel Cell Project in Context—Fuel Cells, Bloom Energy, and Fuel Cell Market Applications*

Fuel cells in general have been a technology that has been in existence for several decades but which still is considered an emerging technology. Fuel cells, because of their relatively small size, high unit costs, generally high reliability and baseload nature, are used almost exclusively as distributed generation, usually on-site for end-use customers, such as high technology companies, grocery stores, and educational institutions. Bloom Energy is a company that has been producing solid oxide fuel cells for several years, and has made sales to a variety of customers in California—none for more than 2 MW per site. Bloom has attracted significant venture capital funding and media attention. In order for Bloom Energy to be successful, it will have to sell its fuel cells in larger quantities and in new and different markets. We provide some background information for the Commission's consideration.

Bloom Energy (then called Ion America) was founded in 2001 by Dr. K. R. Sridhar, who led a team that built a fuel cell for the National Aeronautics and Space Administration. Investors in the company included Kleiner Perkins and New Enterprise Associates, two successful venture capital firms. Bloom produced the first "alpha" units in 2006. The first commercial fuel cells produced by Bloom Energy were shipped in 2008, with Google as the customer.[35] Bloom Energy produces fuel cells utilizing solid oxide technology, which employs ceramic materials in the creation of a chemical reaction in which a fuel, usually natural gas, and oxygen create electricity. Bloom has produced fuel cell stacks in 100 kW and 200 kW size ranges, which can be combined for on-site customer installations or, in the case of the proposed projects, utility-scale grid connected installations.

Bloom Energy Servers (Bloom boxes) "typically cost between $7,000 and $8,000 per kW."[36] In addition Bloom customers also pay for an ongoing O&M agreement and the cost of fuel.[37] These costs are incorporated into the proposed tariff in terms of the transaction with Delmarva.

The fuel cells degrade over time (similar to a battery), resulting in lower efficiency in converting natural gas into electricity (i.e., it takes more BTUs of natural gas to produce one kWh, resulting in a higher "heat rate"). This requires either more fuel to produce the desired level of output, or results in reduced output, or both. Delmarva expects that the

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35 Direct Testimony of Joshua Richman, p. 3, lines 8-14.
36 Richman Response to Staff Data Request PSC-50.
37 *Id.*

Facility cell "stack" will be replaced every five years on average.[38] The cost of the fuel cell stacks that are periodically replaced represent a significant portion of the initial total project capital cost.

For fuel cells in the size range and type of application, Bloom Energy has two major competitors—Fuel Cell Energy, Inc., which utilizes a molten carbonate technology, and UTC Power, Inc., which produces phosphoric acid fuel cells. Both Fuel Cell Energy and UTC Power are headquartered in Connecticut. According to Bloom, the solid oxide fuel cell technology is superior because with low cost ceramic materials and high electrical efficiencies, it can deliver attractive economics without relying on combined heat and power, and Bloom has solved the engineering challenges associated with the extremely high temperatures (typically, above 800 degrees C) at which solid oxide fuel cells operate.[39]

Bloom has assembled a management team with a diverse background and has reportedly raised hundreds of millions of dollars for its business.[40] It has also demonstrated a strong commercial aptitude, offering its end-use customers PPA and leasing alternatives in addition to selling the equipment to customers and generating positive media reports. Bloom has also been successful in the public relations arena, enjoying generally positive coverage in the mainstream media.

However, the biggest challenge that Bloom Energy will face will not just be competing with other fuel cell suppliers, but providing a competitive and attractive source of energy to customers. Fuel cells, at this point in time, are still an emerging, high-cost technology. Bloom, however, has made substantial progress over the last several years in making sales to end-use customers in California for on-site applications in the 100 kW to 2.0 MW size range. All of these projects have received substantial state subsidies (in addition to the federal Investment Tax Credit ("ITC") or cash grant in lieu of the ITC, where available).

Thus far, all of the Bloom Energy fuel cell projects that have been built have been installed in California. Bloom has identified 39 different projects totaling 18.5 MW (18,500 kW) at various commercial and university sites with a median size of 400 kW and an average size of 474 kW. Only two projects are larger than 1.0 MW, one at 1.2 MW and one at 2.0 MW. This scale and application is far more typical of fuel cell installations than a 27-30 MW installation on a utility grid. In fact, the proposed 30 MW at two sites would be the single largest fuel cell project in the United States, based on our knowledge.

All of Bloom's commercial installations in California have received state incentive payments from the Self-Generation Incentive Program ("SGIP"),[41] which has been set at

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38 Finfrock Response to Staff Data Request PSC-54. See also Richman Response to Staff Data Request PSC-153.

39 Testimony of Joshua Richman at pp. 9-10.

40 Direct Testimony of Joshua Richman at pp. 12-15. http://finance.fortune.cnn.com/2011/09/15/bloom-energy-worth-nearly-3-billion/.

41 Response of Joshua Richman to Staff Data Request PSC-26.e.

$2.50/kW.[42] Last month, the California Public Utilities Commission ("CPUC") modified SGIP on a going forward basis, reducing the incentives for fuel cells—characterized as an "emerging technology"--to $2.25 per kW.[43] The reduction, in part, was the result of recent increases in completed or currently active applications for fuel cell projects—from 13 MW in 2009 to nearly 72 MW in 2010.[44] The CPUC also applied a manufacturer concentration limit per technology to 40 percent.[45] Stated purposes of the SGIP include:

- The SGIP should support distributed energy resources that are either cost-effective or represent the potential to achieve cost-effectiveness in the near future.
- The SGIP should only support technologies that produce fewer Greenhouse Gas emissions than they avoid from the grid;
- The SGIP should support behind the meter generation to offset all or some of the host's on-site demand, including peak load demand.[46]

It is reasonable to believe that the distributed generation market in California will continue to be a major market for Bloom.

The subsidy provided in California is a substantial one, especially when combined with the 30 percent federal "ITC[47] or the Treasury cash grant in lieu of the ITC.[48] Together, the ITC and the SGIP incentive have substantially reduced the capital cost of a fuel cell to a customer. The ITC will be in place for any qualifying fuel cell project that is placed in service on or before December 31, 2016.

For the proposed manufacturing plant, the target market area (at least, initially) is primarily the northeastern United States with similar types of large end-use customers as in California.[49] However, a key issue is whether there are sufficient demand and incentives in the Northeast to support Bloom's construction and continued operation of a manufacturing facility in Delaware for the product Bloom will manufacture and at a marketable and sufficiently profitable cost. This is pertinent because, as shown below, the cost of the proposed Fuel Cell Project is considerable, the potential economic benefit to the State of Delaware from construction and operation of the manufacturing facility is

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42 There has been an even larger incentive payment of $4.50/kW where biogas is used as the fuel.

43 Decision Modifying the Self-Generation Incentive Program and Implementing Senate Bill 412, Decision 11-09-015 (September 16, 2011) at 3.

44 *Id.* Much of this demand was driven by a combination of fuel cell and biogas incentives, but one-third of the 2010 reservation requests were for projects using standard natural gas. *Id.* At 35.

45 *Id.* at 48.

46 *Id.* at 7-8.

47 26 U.S.C. § 48(a)(3)(A)(iv).

48 Section 1603 of the American Recovery and Reinvestment Tax Act, as amended by Section 707 of the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, provides for the U.S. Treasury Department to make payments to fuel cell developers in lieu of the ITC for plants placed in service by 2016 and which meet other applicable requirements. The Treasury Department has provided specific guidance regarding those requirements. http://www.treasury.gov/initiatives/recovery/Pages/1603.aspx. [check]

49 Richman Response to Staff Data Requests PSC-29, PSC-30 and PSC-31.

high, but the realization of those economic benefits are largely dependent on Bloom's ability to produce and sell fuel cells for the intended market area on a sustainable basis.

B. Payments to the Fuel Cell Project Under the Proposed Tariff

The direct costs (gross costs) of the tariff are a $/MWh Disbursement Rate and a charge for recovery of the cost of fuel. The direct costs of the Fuel Cell Project are:

- Disbursement Rate: $155/MWh levelized over the service term
  - $166.87/MWh for first 15 years;
  - $102.00/MWh for years 16-20;
  - $30 for year 21;
- Cost of fuel: $66/MWh levelized over the service term
  - Fuel is paid for based on Delmarva's actual costs to procure the natural gas for Bloom at Bloom's actual heat rate, but if the actual average heat rate on a cumulative basis exceeds the Target Heat Rate of 7,550 btu/kWh, Bloom will be compensated based on the Target Heat Rate;
- Recovery of incremental Delmarva costs associated with administration of the project and tariff.

Our estimate is that the total direct levelized cost is $221/MWh. According to ICF, the total levelized cost per MWh is $215/MWh,[50] which we calculate as $218/MWh.[51] The

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50 Scheller Response to Staff Data Request PSC-155.

51 The reason for the relatively small difference is the different manner in which levelized costs are calculated. We utilized an approach (taking into consideration partial years) in which the net present value of the $ amounts paid is divided by the net present value of the MWh in question—whether it is the MWh produced by the generator or the amount of MWh for consumption by Delmarva's distribution customers. This is a widely accepted method. See, e.g., PG&E 2011 Renewables RFO Protocol, Attachment K at 3: "Market valuation considers how an Offer's costs compares to its benefits, from a market perspective. Costs include fixed and variable components representing all anticipated significant relevant costs, including Transmission and Integration cost adders. Benefits include energy, capacity, and ancillary services. Costs and Benefits are each quantified and expressed in terms of present value (January 1, 2011 dollars) per MWh. Market Value is Benefits minus Costs, and is expressed in terms of levelized price, that is, present value per MWh (2011 dollars and 2011 MWh)." http://www.pge.com/b2b/energysupply/wholesaleelectricsuppliersolicitation/renewables2011/index.shtml, SCE 2011 Renewable RFP Bidders Conference presentation at p. 58, http://asset.sce.com/Documents/Shared/2011_SCEBiddersPresentation.pdf, and Independent Evaluation Report for Southern California Edison's First Silver State PPA RPS Transaction, Public Appendix C to SCE's Advice letter 2581-E dated May 6, 2011 to the California Public Utilities Commission at pp. 2-3, http://www.sce.com/NR/sc3/tm2/pdf/2581-E.pdf, and APS Request for Proposal ("RFP") for Renewable Energy Small Generation Resources (April 5, 2011), Section 6.b and Attachment 3. http://www.aps.com/files/rfp/2011SmallGen_RFP.pdf.

remaining $3/MWh is due to incorporation of other costs of natural gas incurred under the natural gas tariff and not included in ICF's analysis (discussed below). This is a very high cost for utility-scale generation—or even on-site distributed generation—and higher than the per-MWh prices to be paid to Bluewater under the Bluewater PPA.

From this gross amount, the Fuel Cell Project remits to Delmarva's distribution customers the revenues the Fuel Cell Project obtains for the sale of energy and capacity from the project. The net amount is the amount paid by Delmarva's distribution customers.

The distinction between gross and net cost for the Fuel Cell Project is similar to what occurs under a PPA. Under a PPA, the seller sells energy and capacity and any environmental attributes to the buyer at what is equivalent to the "gross amount" under the proposed tariff. Under the Bluewater PPA, for example, Delmarva would sell into the market the energy purchased and charge ratepayers the difference between the PPA price and the amounts obtained in market sales. Under the proposed tariff, the primary difference is that the Fuel Cell Project is responsible for making market sales of energy and capacity, rather than Delmarva.

C. Net Costs to Delmarva Ratepayers Under the Proposed Tariff

Key to any analysis is not just the direct or gross cost, but what is the net cost or benefit after taking into consideration the market value of the products purchased and/or costs avoided. The energy and capacity produced by the Fuel Cell Project will be liquidated in the PJM market and the revenues accruing from this sale will be deducted from the dollar amounts due to the Fuel Cell Project. With regard to RECs and SRECs, Delmarva's ability to reduce its REC and/or SREC purchase requirements will reduce its costs. These are also considered in the economic analysis. A further value component is the impact that the Fuel Cell Project will have on energy, capacity and REC/SREC market values due to adding the 30 MW increment of supply. Based on ICF's analysis, the impact on energy and capacity prices is not material, as would be expected, but there is some significant price suppression impact on SREC market prices.

As shown below, our assessment is that the ICF analysis is not unreasonable.[52] With several adjustments that we would recommend, our base case projection is that the net cost

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We believe, this method of calculating levelized costs produces a more accurate estimate where production varies per year or where there is production for parts of years. However, this is not to say that the method used by ICF—levelizing the annual $/MWh or $/customer amounts—is unacceptable.

52 Although we made adjustments to a number of parts of ICF's analysis, we did not make changes to ICF's energy price forecast for a number of reasons. First, a comparison of the forecast with La Capra's in-house energy forecast (on an annual basis) as well as forward price curves showed that the forecasts were within a reasonable range. Second, although we did not examine all of the IPM's input in detail, important inputs, such as natural gas prices and load growth, also appeared reasonable. Finally, energy prices are a function of a number of factors, such as fuel prices, retirements/additions of capacity, environmental regulations, and a full analysis of all these inputs was beyond the available time and budget.

to Delmarva's average residential customer on a levelized $/MWh basis will be $1.34 per month ($1.40 if the public utility tax on retail electricity sales is considered), rather than the $1.00 referenced in the application.

The key take-away is that under any reasonable scenario the proposed Fuel Cell Project will impose substantial net costs on Delmarva's ratepayers. One of the major issues before the Commission is whether it is in the public interest to approve the proposed tariff on the grounds that the economic and other benefits to the State of Delaware outweigh the costs to Delmarva ratepayers.

Table 1 below summarizes the ICF evaluation of the Fuel Cell Project by comparing the total contract cost with the market value and avoided costs of the project. The difference between the cost of the project, which consists of disbursements to Bloom and natural gas costs to fuel the project, and the value of the various market products—energy, capacity, RECs, and SRECs—determines the above market cost per MWh and, ultimately, the forecasted bill impact on customers. The first column represents the sum of all payments over the 2012-2035 time period. In total, the fuel cell project is expected to cost over $1.1 billion during these years. Subtracting the market value of the outputs yields a total above-market cost of $86 million. Net present values (assuming a 6.5% discount rate) are shown in the second column.

The next column shows nominal levelized cost estimates, which are calculated by dividing the NPV values in the second column with the NPV of the MWh generated by the project. The value of $33.18/MWh represents the levelized above-market cost of the Fuel Cell Project per MWh of generation. In other words, one would have to pay $33.18 per MWh (3.3 cents/kWh) more per MWh of production to purchase the output from the Fuel Cell Project rather than make those purchases in the market (while taking into consideration price suppression effects). The next column shows the incremental cost to Delmarva's distribution customers on a levelized $/MWh basis--$1.04. This is a smaller number than the preceding column since the output from the Fuel Cell Project represents only 3% of Delmarva's Delaware distribution load. In the last column is $1.02 for an average Delmarva residential customer that uses 975 kWh per month—this is the metric Delmarva and ICF have presented. The $1.02 estimate shown in the table is slightly higher than the $1.00/month impact cited in the ICF testimony[53] due to differences in how levelized cost is calculated[54] rather than adjustments to the ICF analysis. Table 1 represents the ICF analysis as filed with the Commission (although the only information directly provided in the testimony was the nominal levelized impact (above-market) on residential customers per month.

[53] Direct Testimony of Maria Scheller at 9.
[54] See footnote 52 above.

Table 1: ICF Evaluation of Fuel Project Case (2012-2035)

	Sum of Payments ($000)	NPV of Payments ($000)	Nominal Levelized Cost Per MWh Generated	Nominal Levelized Cost Per Distribution Customer MWh	Nominal Levelized Per Residential Customer per Month
Project Costs					
Disbursement Rate	$767,725	$399,118	$154.62	$4.86	$4.73
Fuel Costs	$370,419	$163,634	$63.39	$1.99	$1.94
Total Gross Cost	$1,138,144	$562,753	$218.01	$6.85	$6.68
Market Value and Avoided Costs					
Energy	$559,492	$245,296	$95.03	$2.98	$2.91
Capacity	$101,057	$52,063	$20.17	$0.63	$0.62
RECs/SRECs	$374,346	$179,753	$69.63	$2.19	$2.13
Total Market Value/Avoided Costs	$1,034,894	$477,113	$184.83	$5.81	$5.66
Above Market Cost of Contract	$103,250	$85,640	$33.18	$1.04	$1.02

Table 2 shows our base case and the effect of adjustments to ICF's analysis. Overall, our adjustments result in an increase of $0.32 cents per average monthly residential bill. Using ICF's model, we adjusted various inputs to their analysis, which we describe in turn:

- **REC/SREC Production**—ICF assumed a 99% capacity factor ("CF") for production of RECs and SRECs and a 96% capacity factor for energy. The assumption for energy is based on the statutory requirement that MWh production under the proposed tariff may not exceed a 96% capacity factor on an annual basis.[55] We have two reasons for using a 96% capacity factor for production of SRECs and RECs as well as energy. First, on a long-term basis, our assessment is that a 96% capacity factor assumption is more reasonable than using a 99% capacity factor assumption based on energy production. Second, it is unclear under the REPSA Amendments and the proposed tariff that Delmarva could obtain credit for reductions in RPS obligations where energy is not being sold under the tariff. One would expect that if energy is produced above the 96% capacity factor limitation, the Project Company would sell the energy into the PJM market and retain the revenues and sell the environmental attributes, if any, associated with such energy.
- **Capacity Prices**—We adjusted one year (2015) of the calendar year capacity price input down to $136.50/MW-day, which was the EMAAC clearing price for the 2014-15 Base Residual Auction ("BRA"). The 2015 values used by ICF were much higher than this clearing price and higher than other years in its forecast.
- **REC Prices**—We adjusted the 2012 and 2014 REC prices down to $2 and $22, respectively (2013 is interpolated). The $2 figure is based on recent forward trades

[55] See Section IV.B of this report.

while the 2014 value represents a glide path to the higher figure forecasted by ICF in 2015.

- **Natural Gas Costs**—We adjusted the natural gas costs upward to account for premiums associated with firming up the gas supply (we assumed $.02/MMbtu) plus first year capital costs, continuing operating costs, and application of the 4.25% public utility tax to gas purchase costs under the proposed gas tariff. These adjustments affect the Project Company's cost of natural gas, which is then passed through to Delmarva's ratepayers under the proposed electric tariff. Table 2 shows total fuel costs of $387 million compared to $370 million in Table 1.

Table 2: Staff Consultant Estimate (2012-2035)

	Sum of Payments ($000)	NPV of Payments ($000)	Nominal Levelized Cost Per MWh Generated	Nominal Levelized Cost Per Distribution Customer MWh	Nominal Levelized Per Residential Customer per Month
Project Costs					
Disbursement Rate	$767,725	$399,118	$154.62	$4.86	$4.73
Fuel Costs	$387,519	$171,274	$66.35	$2.08	$2.03
Total Gross Cost	$1,155,244	$570,392	$220.96	$6.94	$6.77
Market Value and Avoided Costs					
Energy	$559,492	$245,296	$95.03	$2.98	$2.91
Capacity	$95,238	$46,744	$18.11	$0.57	$0.55
RECs/SRECs	$352,908	$165,572	$64.14	$2.01	$1.96
Total Market Value/Avoided Costs	$1,007,637	$457,612	$177.27	$5.57	$5.43
Above-Market Cost of Fuel Cell Project	$147,606	$112,780	$43.69	$1.37	$1.34

We note that both our quantification of ratepayer impact, as well as ICF's, does not take into consideration the 4.25% public utility tax associated with the proposed electric tariff. Since Delmarva's customers pay a 4.25% tax on their bills, an increase in customer bills of $1.34/month will result in an additional tax of approximately $.06/month for a total impact of $1.40/month.[56]

Table 3 calculates the differences between our estimates and the ICF analysis and provides a breakdown of the adjustments and their relative impact on the metrics. The percentages shown were calculated by running each adjustment separately and can be used to consider the rough impacts of different subsets of the adjustments used in our estimates.

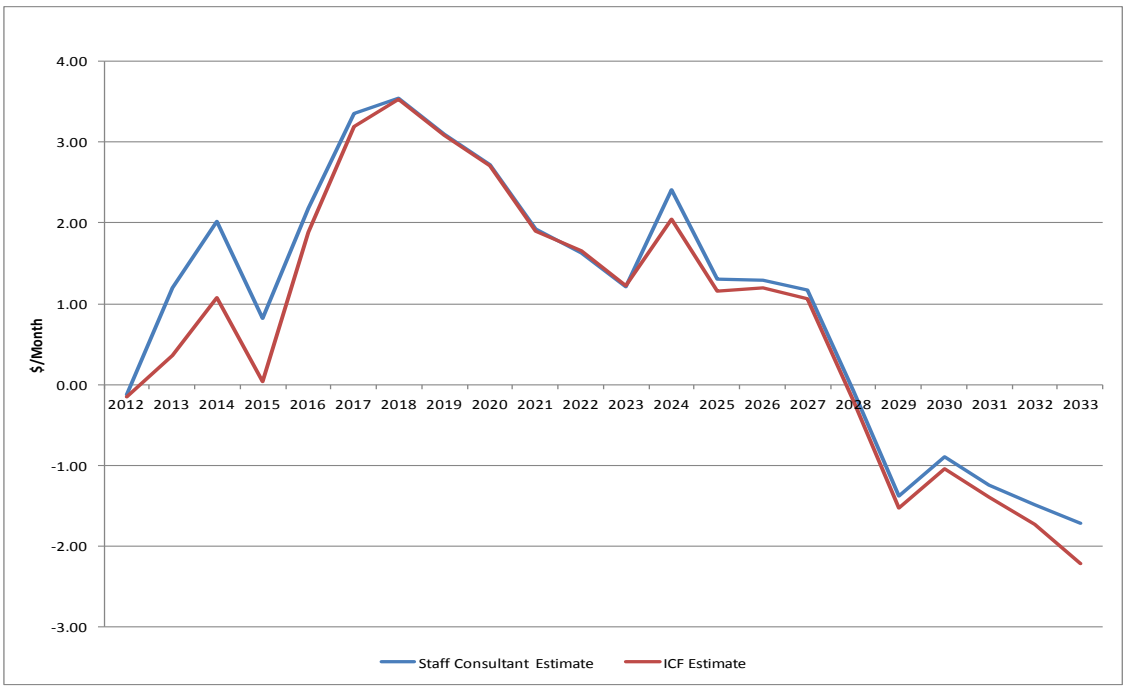
[56] We did not include a quantification of the public utility tax impact on distribution customers' electric bills in the tables since the tax would only show up at the retail level and it is not customary to consider this in evaluating the economics of wholesale power generation resources. However, it is relevant in terms of residential customer impacts associated with the Fuel Cell Project. This analysis assumes that the public utility tax would be applied to both the proposed gas tariff and the proposed electric tariff, even though this would present a situation where there is a tax (electric) on top of a tax (gas).

Table 3: Breakdown of Adjustments From ICF Evaluation (2012-2035)

	Sum of Payments ($000)	NPV of Payments ($000)	Nominal Levelized Cost Per MWh Generated	Nominal Levelized Cost Per Distribution Customer MWh	Nominal Levelized Per Residential Customer per Month
Staff Consultant Base Case Estimate	$147,606	$112,780	$43.69	$1.37	$1.34
ICF Base Case	$103,250	$85,640	$33.18	$1.04	$1.02
Difference	$44,356	$27,140	$10.51	$0.33	$0.32
Adjustment Items--% of Value of Adjustments					
REC/SREC Credit Above 96% CF	19%	12%	12%	11%	12%
Capacity Price	13%	19%	19%	20%	18%
REC/SREC Prices--Early Years	31%	43%	43%	43%	42%
Natural Gas Costs	37%	27%	27%	26%	27%
Total	100%	100%	100%	100%	100%

Figure 1 shows a graphical comparison of the monthly above-market cost figures for the ICF analysis and our estimate. The curves feature a similar shape but, due to our adjustments in the early years of the project, there is a significant gap between costs in the 2013-2015 period. As with the ICF analysis, our estimate shows that in the later years of the project, above-market costs to ratepayers is negative as the disbursement rate falls significantly and market prices for power products increase.

Figure 1: Average Monthly Above-Market Residential Customer Impact, 2012-2035



The table below shows for selected years payments to the Fuel Cell Project, estimated market value and avoided costs, above-market costs, and customer impacts.

Table 4: Staff Consultant Analysis of Above Market Costs, Selected Years

	2013	2017	2021	2025	2029	2033
Project Cost						
Disbursement Rate ($000)	$19,954	$42,099	$42,099	$42,099	$26,174	$17,017
Fuel Costs ($000)	$5,019	$13,099	$17,323	$19,141	$21,063	$26,134
Total Gross Cost ($000)	$24,973	$55,199	$59,422	$61,240	$47,237	$43,151
Market Value and Avoided Costs						
Energy ($000)	$19,954	$19,493	$23,060	$27,309	$33,500	$38,849
Capacity ($000)	$5,019	$4,104	$4,675	$4,811	$4,854	$3,688
RECS/SRECs ($000)	$24,973	$6,061	$17,816	$19,364	$20,225	$15,929
Above Market Cost of Fuel Cell Project						
Contract Cost ($/MWh)	$ 208.84	$218.79	$ 235.53	$242.74	$187.23	$186.73
Market Value and Avoided Costs ($/MWh)	$ 128.89	$117.56	$ 180.55	$204.07	$232.19	$253.00
Above-Market $/Full Cell Project MWh	$ 79.96	$101.23	$ 54.98	$ 38.67	$ (44.95)	$ (66.27)
Staff Consultant Estimate of Residential Bill Impact ($/Month)	$ 1.20	$ 3.36	$ 1.92	$ 1.31	$ (1.38)	$ (1.71)
ICF Estimate of Residential Bill Impact ($/Month)	$ 0.36	$ 3.20	$ 1.89	$ 1.16	$ (1.53)	$ (2.21)

We conducted a number of sensitivity analyses of our estimate (shown in Table 4). The first set of sensitivities relates to the capacity value. The ICF analysis assumed that 90% of the nameplate capacity would be offered and cleared as capacity starting in calendar year 2013, which implies that Bloom would clear in the third incremental auction for the 2012/2013 RPM and in either the first or second incremental auctions for the 2013/2014 RPM. However, clearing in the incremental auctions is not as certain as in the base residual auctions. In addition, the imposition of the minimum offer price rule may negatively impact the chances of the Fuel Cell Project, which is a high-cost capacity resource, of clearing or clearing at a higher price point in the Base Residual Auctions. As a result, we examine the impact of assuming that the Fuel Cell Project will only obtain capacity revenues for 75% of nameplate capacity. We also examine the use of a 95% capacity factor, although this seems much less likely than the 75% assumption.

The next two categories involve changing the REC values only and SREC values only. We assume market values 15% higher and 30% lower than ICF's base cases, since we believe that downward pressure on prices is more likely than upward pressure despite the possibility for expiration of the production tax credit.

Table 5: Sensitivity Analysis, Staff Consultant Estimate, 2012-2035

	Sum of Payments ($000)	NPV of Payments ($000)	Nominal Levelized Cost Per MWh Generated	Nominal Levelized Cost Per Distribution Customer MWh	Nominal Levelized Per Residential Customer per Month
Capacity value					
95% of Capacity Value	$142,315	$110,183	$42.68	$1.34	$1.31
75% of Capacity Value	$163,479	$120,571	$46.71	$1.47	$1.43
REC value					
15% Higher	$125,577	$100,487	$38.93	$1.22	$1.19
30% Lower	$191,666	$137,367	$53.21	$1.67	$1.63
SREC value					
15% Higher	$115,601	$100,534	$38.95	$1.22	$1.19
30% Lower	$211,616	$137,272	$53.18	$1.67	$1.63
REC and SREC Value					
15% Higher	$93,572	$88,241	$34.18	$1.07	$1.05
30% Lower	$255,675	$161,859	$62.70	$1.97	$1.92

D. Benefits if the Proposed Manufacturing Plant is Built and Operates on a Sustainable Basis; Comparison to Net Delmarva Ratepayer Costs

The potential economic development benefits associated with Bloom Energy's proposal to build a manufacturing plant at the site of the former Chrysler plant are impressive. First, building the 200,000 square foot factory in which Bloom would manufacture and test fuel cells could cost more than $50 million and create 350 construction-related jobs.[57] On an ongoing basis, Bloom says that it plans to create "up to 900 engineering, quality control, design, testing, and manufacturing jobs, in addition to the potential of up to an estimated 600 supplier jobs."[58] According to DEDO, the 900 employees is Bloom's estimate within three years of starting the operation.[59] The proposed factory would be built on 50 acres in the University of Delaware's Science and Technology Park.

Utilizing IMPLAN economic impact modeling software, DEDO estimated that the Bloom Energy manufacturing facility would create 2,034 direct, indirect and induced jobs by the goods and services purchased by the employees, by the company, and by the company's suppliers. The table below summarizes the IMPLAN results.[60]

57 Testimony of Collin O'Mara at 2; Testimony of Joshua Richman at 5.
58 Testimony of Joshua Richman at 5.
59 Memorandum dated June 14, 2011 from Bernice Whaley to Council on Development Finance at 2, Attachment to Response of Collin O'Mara to Staff Data Request 134(a).
60 Response of Collin O'Mara to Staff Data Request 163.

Table 6: DEDO Economic Impact Analysis Results

Impact Type	Employment (jobs)	Labor Income	Total Value Added	Output
Direct Effect	900	$113,919,698	$218,698,918	$392,625,399
Indirect Effect	371	$27,373,032	$43,491,091	$86,640,144
Induced Effect	763	$34,448,649	$61,919,707	$103,982,307
Total Effect	2,035	$175,741,378	$324,109,716	$583,247,850

The table shows the direct impact of the manufacturing plant of 900 jobs and the associated impacts on Labor Income, Valued Added and Total Output. Total output is the most aggregate measure of economic impact and includes total value added. Value added, in turn, includes labor income (including benefits), business and other income, and indirect business taxes. The table also shows the indirect and induced effects of the project. Indirect effects are due to purchases from supplying industries by the direct effect industry or project, which in this case is the Bloom manufacturing plant. Induced effects are changes in spending due to changes in income received by employees of Bloom and its suppliers. These indirect and induced effects are calculated using multipliers. The table below shows the multipliers implied by the results of the table above.

Table 7: DEDO Economic Impact Multiplier Results

	Employment	Income	Value Added	Output
Direct	1	1	1	1
Indirect	1.41	1.24	1.2	1.22
Indirect and Induced	2.26	1.54	1.48	1.49

Multipliers can vary depending on the sector and its labor and capital inputs. For example, labor-intensive industries can have relatively high employment multipliers. These state-level multipliers are within reasonable ranges.[61]

In response to Staff Data Request 134(a), DEDO provided a memo that characterized the total output figure of $583 million as the "total economic impact" generated by the Bloom Energy manufacturing plant. The benefit to the Delaware economy—the value of all goods and services used by the manufacturing facility—was estimated to be $583 million in the year when Bloom's proposed factory is projected to reach full capacity and 900 employees are projected to be hired (approximately 2015-16).[62] Though that is technically true, total output is actually total sales, which includes all inputs to production. Value added, on the other hand, is the net value created by the Bloom project (the direct effect

[61] DEDO's selection of IMPLAN Section 273 represents a reasonable approximation to the Bloom manufacturing plant and its NAICS 33593 Code.

[62] Response of Collin O'Mara to Staff Data Requests 117 and 134.

value shown above) and can be considered as a better measure of "new" economic impact. For example, a wholesaler that moves into the state may produce an increase in output or sales but very little value added, which is not the case for the Bloom project. Gross state (and national) product metrics are value added metrics; thus, in terms of additions to gross state product, the total value added of approximately $324 million is the more appropriate figure to use to examine economic impacts on the state economy.

The figures shown in the table are for a single year (jobs should be considered job years), and if the Bloom operations are sustainable, the impacts to Delaware's Gross Domestic Product could be multiples of this estimate on a long-term basis. DEDO estimates that on an annual basis, once 900 new jobs are created, additional annual tax revenues accruing to the State would be approximately $1 million.[63]

This analysis did not explicitly model the anticipated 600 supplier jobs or the estimated 350 construction-related jobs, but the IMPLAN analysis has calculated 371 indirect or "supplier" jobs related to the 900 job creation at the manufacturing plant. Assuming Bloom's anticipated additional supplier employment figure of 600 is correct, IMPLAN has produced a conservative economic analysis. In addition, IMPLAN could have been utilized to estimate the multiplier impacts of the construction jobs, though these jobs would not be "permanent." The permanence of jobs will determine the overall benefit of the project as measured over the entire project life. Such a long-term analysis would be necessary in order to incorporate the analysis of ratepayer costs and benefits that was modeled and calculated by the ICF analysis. Though it is beyond the scope of this report to conduct such an analysis, which would generally require a more complicated econometric model to capture both demand-side and supply-side (or production cost) dynamics, we discuss below some important points to consider when evaluating the project's total economic impacts.

To attract Bloom Energy to Delaware, the State has offered several incentives to Bloom (aside from the proposed Fuel Cell Project), which also would be included in the analysis of the project's total net economic impacts or benefits. These incentives are: a grant from the Delaware Strategic Fund of up to $16.5 million approved by the Council on Development Finance on June 27, 2011 (the agreement is not yet finalized), containing the following features:

> *"First, a performance grant of $11.25M, the first half of which will be delivered upon execution of a long-term lease at the University of Delaware Technology Park, Newark, Delaware. The second portion of the Performance Grant will be delivered upon the issuance of a Certificate of Occupancy for the manufacturing facility. Within the next three years, Bloom must certify the employment of 900 full time employees, and such employment figures must be maintained through 2033.*

[63] Memorandum to Council on Development Finance at 3.

> *The second component is a capital investment grant of up to $1.5M, which is based on 3% of Bloom's capital expenditures within Delaware from groundbreaking for a period of (5) five years from the groundbreaking date—capped at $1.5M.*
>
> *Finally, the third component is a supplier incentive grant of up to $3.75M, which is based on the relocation of Bloom's suppliers from outside Delaware to Bloom's manufacturing facility in Newark. Bloom will receive $6,250 per job that they relocate, with the number of jobs averaged over a five year period. This incentive is capped at $3.75M or 600 jobs."*[64]

In addition, an additional $7 million grant was awarded by the Delaware Strategic Fund to the University of Delaware for infrastructure and site improvement at the Technology Park, of which $1.2 million will be dedicated for infrastructure and site improvements which could benefit the Bloom facility.[65] The University of Delaware has also agreed to provide a ground lease on the site for Bloom and its vendors and suppliers rent-free for a 25-year term.[66] Without considering the value of the ground lease, the cost to attract Bloom in terms of direct taxpayer incentives appear to be approximately $18 million if Bloom's expectations are realized

The above incentives should be considered "costs" of delivering the project to the State and should be included in the overall net economic benefit calculus. Moreover, one should add the net above-market costs to be paid by Delmarva's ratepayers, either in the form of costs per year (approximately $7 million per year) or a net present value figure, which we estimate to be approximately $113 million.

The table below illustrates the netting out of costs from the benefits, as measured by total value added generated by the project. The first set of costs relate to the incentives described above.[67] A second set of costs is the net ratepayer contribution per year due under the PPA that is a condition of the manufacturing project. We calculate this to be approximately $7 million per year (nominal).[68] For both these cost categories we show an induced effect, assuming that the increased costs from the incentives and rate increases negatively affect incomes.[69] Even assuming these changes, economic impacts of this

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64 Response of Collin O'Mara to Staff Data Request No. PSC-135(a).

65 Response of Collin O'Mara to Staff Data Request No. PSC-135(b).

66 Public Hearing Minutes of the Council on Development Finance, July 25, 2011, p. 9.

67 It is important to note that these are one-time costs, thus the example below only pertains for the year that these funds are disbursed. We did not include the infrastructure costs or free lease payments for ease of illustration. For the supplier incentive, we did not use the full $3.75 million, but used the $6,250 per job incentives multiplied by the 371 IMPLAN estimate of indirect jobs.

68 Calculated as the above-market cost of $147.6 million (Table 2) divided by 21 years.

69 As described above, different modeling techniques would be necessary to capture the effects of increased costs on business production decisions. One cost category that is not included is reduction in economic activity from reduced demand for solar installations. We do not include negative impacts on in-state solar installations since SREC obligations can be met by out-of-state projects and the strong possibility, if not likelihood, that much of the

project are substantial with net value added (or gross state product) increases of over $296 million per year.

Table 8: Adjusted DEDO Economic Impact

Total Effect (Value Added)	$	324,109,716
Incentives		
Performance Grant	$	(11,250,000)
Supplier Incentive	$	(2,318,750)
Capital Investment	$	(1,500,000)
Induced Effect	$	(3,616,500)
Above-Market Costs		
Net Rate Impact (per year)	$	(7,028,871)
Induced Effect	$	(1,686,929)
Net Value Added	$	296,708,666

These estimates assume, however, that jobs added will equal the "up to" estimates provided by Bloom. Actual employment could be substantially lower, which should be taken into consideration in reviewing the net benefit estimates.

Taken as a whole, the economics to Delaware of the Bloom proposal—a manufacturing facility and attendant jobs—tied to the proposed 30 MW fuel cell project/tariff and economic development incentives is what is really at stake in the Commission's consideration of the proposed tariff. The Commission will be weighing whether the benefits to the Delaware economy, as a whole, outweigh the costs to Delmarva's ratepayers. There are also equity issues associated with the fact that Delmarva distribution customers—approximately half of the State's population—would be paying the great bulk of the costs to attract Bloom, but the economic benefits of the manufacturing project, if built, would diffused statewide.

The numbers to be compared are not "apples to apples," but comparisons must be made, explicitly or implicitly. Our assessment is that the economic benefits associated with the Bloom proposal are strong, although the costs to Delmarva's customers are relatively high. However, there is a risk that the manufacturing plant is not built or if built does not operate on a sustainable basis at a sufficient level to create the expected job benefits. We address these scenarios below.

SREC obligations that would displaced would have been produced by larger, out-of-state solar projects. See Direct Testimony of Gary R. Stockbridge, pp. 2-3, and Response of Gary R. Stockbridge to Staff Data Requests PSC-03, PSC-04, PSC-05 and PSC-06.

E. Risks that the Manufacturing Plant is Not Built or Cannot Operate on a Sustainable Basis

1. Overview

The construction and sustained operation of the manufacturing plant at or near expected levels with associated employment creation should create a substantial benefit to the Delaware economy. The net value estimate referenced above of almost $300 million represents almost one half of one percent of Delaware's entire gross state product in 2010 ($62.3 billion).[70] DEDO's estimate of direct, indirect and induced employment of over 2,000 jobs that would be created represents approximately one half of one percent of Delaware's total 2010 employment of approximately 400,000—or one in 200 jobs in the state.[71]

However, there are several risks in terms of the expected benefits from the proposed manufacturing plant not being realized:

- The Commission approves the proposed tariff and the Fuel Cell Project is built, but the manufacturing plant is not built;
- The Commission approves the proposed tariff and the Fuel Cell Project and manufacturing plant are built, but the manufacturing plant closes after a few years of operation;
- The Commission approves the proposed tariff and the Fuel Cell Project and manufacturing plant are built, but the manufacturing plant operates at a lower level, with lower employment benefits than expected;
- The Commission approves the proposed tariff and the Fuel Cell Project and manufacturing plant are built, but Bloom goes out of business or otherwise fails to provide fuel stack replacements or other supplies or services to the Project Company.

We address each risk individually.

2. Risk that the Manufacturing Facility is not Built

Bloom is currently planning for the construction of the factory and has already incurred costs in doing so, but states that continued progress is contingent upon Commission approval of the proposed tariff.[72] Bloom's current plan is to pour concrete for the new factory—commence actual construction—after the end of the

[70] http://www.statehealthfacts.org/profileind.jsp?rgn=9&cat=1&ind=27.
[71] http://www.bls.gov/ro3/qcewde.pdf.
[72] Joshua Richman Response to Staff Data Request PSC-09.

winter in 2012 and complete construction in mid-2013.[73] As indicated previously, the construction cost could be over $50 million.

Bloom, however, is seeking Commission approval of the proposed tariff months before Bloom will actually start construction on the manufacturing facility (and invest the associated tens of millions of dollars to do so). The obligation of Delmarva's ratepayers to pay under the tariff for the Fuel Cell Projects is *not* contingent on Bloom's actual construction of the manufacturing facility. The reason has to do with the way the Fuel Cell Project is being financed and the federal tax benefits that the Fuel Cell Project plans to access.

The company that will be the owner of the Fuel Cell Project is not Bloom Energy. It is Diamond State Generation Holdings, LLC ("QFCP Generator" under the proposed tariff, "or "Project Company"), which Bloom Energy currently owns outright through a 100% ownership of Clean Technologies II, LLC.[74]

An important part of Bloom's plan for financing the Fuel Cell Project is for the Project Company to utilize the Treasury cash grant ("Cash Grant") in lieu of the ITC.[75]

In order to access the cash grant in lieu of the ITC, the Fuel Cell Project needs to "commence construction" by the end of this year under guidance provided by the U.S. Treasury Department.[76] To facilitate obtaining eligibility for the cash grant, Bloom is seeking a Commission order on October 18, 2011. Bloom plans to finance the Fuel Cell Project with a combination of debt, tax equity and equity.[77] Bloom plans to sell its sponsor equity stake to a third party in connection with obtaining the expected accounting treatment for the transaction.[78] Bloom, however, will remain involved

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[73] Joshua Richman Response to Staff Data Request PSC-08.

[74] Testimony of Joshua Richman at 20, lines 16-20. It is not uncommon for project developers to establish an intermediate holding company to own the ownership interests in a project company.

[75] Renewable power projects that commence construction prior to the end of 2011 may elect to receive the investment tax credit in the form of a cash grant from the U.S. Treasury. This is a temporary program created to offset a temporary decline in the availability of tax equity investment capital during the 2008-09 recession. Without the Cash Grant, Bloom states that the project would need a higher electricity price to make the deal economics feasible to attract sufficient tax equity to make use of the ITC.

[76] See Richman Response to Staff Data Request PSC-38.

[77] The federal government encourages investment in renewable power projects by providing a 30% ITC (or cash grant) to investors in such projects and enabling the investors to depreciate the project assets more quickly (accelerated depreciation). These tax benefits can reduce the federal income tax obligations of a project company. As these benefits exceed the tax obligations in the early years of a project, project developers can use the excess credit or depreciation-related losses to reduce tax obligations in future years. Retaining the tax benefits for future use, however, reduces their worth on a present-value basis. The more common alternative is to establish the project company as a limited liability company (LLC) and elect to have the Internal Revenue Service disregard the entity for tax purposes. If this is done, the project company's income and losses (and the associated tax benefits and obligations) are allocated to the owners of the project company. Developers then seek equity investors ("tax equity investors") that can use the ITC and the accelerated depreciation to offset or reduce their federal tax obligations from their other business activities in the same year as when the tax benefits are generated. This maximizes the value of the tax benefits on a present-value basis.

[78] Richman Response to Staff Data Request PSC-36.

through a contractual relationship with the Project Company—installing the Energy Servers, monitoring them remotely, and providing replacement parts for the duration of the Fuel Cell Project's 22-year life.[79] However, Bloom would no longer be involved as a seller—an owner of the QFCP Generator—under the proposed tariff.

Construction of the first several phases of the Fuel Cell Project is planned before the planned manufacturing facility will have been completed.[80] Under current planning, the first several phases of the Fuel Cell Project will be built without using fuel cell systems manufactured in Delaware. Bloom will use systems produced from its existing manufacturing facility in California in order to meet deadlines for the cash grant. This is allowed under the REPSA Amendments, which permit up to 10 MW of fuel cell systems initially produced to be manufactured outside of Delaware.[81]

Under the proposed tariff, there does not appear to be an adverse consequence to the Project Company if it does not build as much as 30 MW by the Guaranteed Initial Delivery Date under the proposed tariff, as such date may be extended due to Force Majeure, other than losing eligibility to sell for the additional phases under the proposed tariff. Hence, it appears under the proposed tariff that the Project Company could build up to 10 MW using out-of-state manufactured fuel cells and not be in default under the proposed tariff. Under those circumstances, Delmarva's ratepayers would be obligated to pay under the proposed tariff for up to 10 MW of energy produced by the Fuel Cell Project, with approximately one-third of the associated net cost to be paid over a 22-year period without any of the economic development benefits used to justify ratepayers bearing these costs. This is equivalent to a net present value cost on Delmarva's ratepayers of approximately $48 million or approximately $0.45 per month for an average residential customer assuming that the Fuel Cell Project operates under the tariff for the entire 22-year term.

If, however, the Project Company does build out the 30 MW project it appears that under the REPSA Amendments and the proposed tariff, at least 20 MW would need to have been manufactured from facilities in Delaware. In these circumstances, as Bloom's witness Joshua Richman has stated in response to a Staff data request, "the project company will no longer be eligible under the proposed tariff."[82]

Hence, it appears that the ratepayers' risk that the manufacturing facility will not be built is limited to 10 MW under the proposed tariff (at least after December 31, 2016). We request that Bloom, Commissioner O'Mara and Delmarva confirm that that is their understanding; if not, they should state what the exposure is that Delmarva's ratepayers are assuming if the manufacturing plant is not built.

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79 *Id*.

80 Richman Response to Staff Data Requests PSC-09 and PSC-13.

81 Section 364(e)(1) of REPSA.

82 Richman Response to Staff Data Request PSC-14.

In response to a question from Staff to "state under what obligations Bloom Energy would be obligated to build the proposed Manufacturing Facility," Bloom referred to a letter agreement dated June 28, 2011 and stated that pursuant to that agreement, "Bloom is currently obligated to do so."[83] However, we do not find any language in the letter agreement that obligates Bloom to build the manufacturing facility. The referenced letter agreement provides the following:

- Upon passage of the REPSA Amendments, Delmarva will file with the Commission a proposed tariff for the 30 MW Fuel Cell Project;

  The State of Delaware will use its best efforts to facilitate the siting and installation of up to 20 MW of Bloom fuel cells throughout Delaware;
- If this 20 MW is not installed by June 30, 2014, at Bloom's option, Delmarva shall submit a filing with the Commission for up to an additional 20 MW of fuel cells under similar terms as the first 30 MW but with 10 percent lower disbursement rates;
- Within 10 business days after the enactment of the REPSA Amendments, Bloom and an agency of the State (currently contemplated to be DEDO) shall enter into an agreement under which Bloom:
  - Will guarantee the obligation of the Fuel Cell Project under the proposed tariff to use commercially reasonable efforts to find replacement RECs in the event of a Forced Outage Event; and
  - "Commit to make a termination payment to the State in the event that Bloom permanently ceases the manufacturing of fuel cells in the State," with the termination payment based on the following schedule depending on the year that manufacturing has ceased:
    - 2012: $20,288,793
    - 2013: $16,373,500
    - 2014: $12,953,001
    - 2015: $10,004,336
    - 2016: $ 7,504,279
    - 2017: $ 5,340,813
    - 2018: $ 3,524,391
    - 2019: $ 2,090,651
    - 2020: $ 1,035,956
    - 2021: $ 344,854

The letter agreement is conditioned on PSC approval of the proposed tariff and project financing of the Fuel Cell Project.[84]

[83] Richman Response to Staff Data Request PSC-13.a.ii. The letter agreement is Exhibit 13a.
[84] Exhibit 13a.

As we understand it, the definitive agreement which is contemplated has not been finalized or signed. It is a statutory requirement that "Fuel cell manufacturer has executed an agreement with the Delaware Economic Development Office that a termination payment shall be made by the fuel cell manufacturer in the event that it ceases manufacturing operations in the State."[85]

Based on the termination payments for 2012 and 2013, it appears that the intent of the agreement is that it would apply if the manufacturing facility is not constructed, although the language references permanent ceasing of manufacturing. Our hope is that the definitive agreement will call for a termination payment if the Fuel Cell Project goes forward under the proposed tariff but the manufacturing facility is not built.[86] Our understanding is that the termination payment would be used to compensate Delmarva's ratepayers in the event that the termination payment is required.

We note, however, that according to our analysis the termination payment would not fully compensate Delmarva's ratepayers. At most, it would provide approximately 40% compensation based on the sale of output from a 10 MW fuel cell project (assuming a termination payment would be due).

A point of equal concern is that no security or credit support stands behind Bloom's termination payment commitment. In this regard, DEDO reviewed financial information provided by Bloom and determined that it "is consistent with its experience with early-stage, venture-backed entities."[87] In other words, Bloom Energy's financial strength is not that of a mature industrial or commercial company. Bloom might not make, or might not be able to make, the termination payment due to bankruptcy, financial distress, or some other reason. Under those circumstances, the State of Delaware might not be able to collect on Bloom's termination payment obligation.[88] Meanwhile, the Fuel Cell Project, or at least part of it, would be built and Delmarva's ratepayers would be liable to pay under the proposed tariff.

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85 REPSA Amendments section 8, 26 Del C. § 364(e)(2).

86 This risk could be mitigated if construction of the Fuel Cell Project is deferred until after construction of the manufacturing facility commences. However, such an approach could or would jeopardize eligibility for the Cash Grant. While the Fuel Cell Project's investors would be able to qualify for the ITC, Bloom believes that tax investors who could utilize the ITC would demand a higher return for their ability to use the tax credits, which, in turn, would increase the amounts Bloom would have to charge under the proposed tariff. Richman Response to Staff Data Request PSC-165.

87 Memo dated June 14, 2011 to Council on Development Finance at 10.

88 It is also possible that some of the economic development incentive grants due on the signing of the ground lease could be paid but the manufacturing plant would not be built.

3. Closure of the Manufacturing Facility After Initial Operations

If the manufacturing facility closes—permanently—after it is initially built and 20 MW of fuel cells are manufactured in Delaware, Delmarva's ratepayers would remain liable to pay for the output from the Fuel Cell Project under the proposed tariff.[89] Under the letter agreement, Bloom would be responsible for making termination payments in an amount based on the year manufacturing ceases in the State. For example, if the manufacturing plant starts up in 2013 and closes down in 2016, the termination payment would be $7.5 million. In this scenario, Delmarva's ratepayers would be subject to a larger exposure—a net present value cost of approximately $113 million or $1.34 per month for the average residential customer, based on our base case projection--with a smaller termination payment ($7.5 million), and the same payment risks compared to the no-construction scenario. On the other hand, there would be at least some added value to the State's economy through some level of added employment, although the added employment would be short-lived.

4. The Manufacturing Facility Operates at a Lower Level Than Expected

Another risk is that the manufacturing facility is built and operates but at below the expected capacity of 80 MW of fuel cells per year.[90] In that event, direct, indirect and induced employment and the associated economic benefits to the State would be lower than projected. How much lower would likely depend on the level of output, which, in turn, could depend on the success or lack of success Bloom has in selling its fuel cells to customers in its expected market—initially focused on the Northeastern United States—and doing so at a cost that is profitable or at least sustainable. This, in turn, will likely depend on Bloom's ability to reduce the costs of producing and operating fuel cells, whether due to technological advances, greater manufacturing efficiencies, or some combination of the two.

This risk--that the manufacturing plant is built but operates at a low level with lower than expected employment due to unfavorable business conditions, with or without temporary shutdowns—appears to be high. In fact, the employment numbers Bloom quotes are "up to" numbers. Hence, there is a risk that employment might be a fraction—say 50%--of Bloom's estimates. Under these circumstances, there would

[89] See Richman Response to Staff Data Request PSC-168. There have been several recent examples where manufacturing plants built with the support of governmental financial incentives have closed down, with attendant losses of government funds—Evergreen Solar in Massachusetts, http://articles.boston.com/2011-08-16/business/29893202_1_million-and-debts-solar-projects-bankruptcy-filing, and Solyndria in California. http://www.nytimes.com/gwire/2011/09/06/06greenwire-solyndra-bankruptcy-reveals-dark-clouds-in-sol-45598.html?pagewanted=all.

[90] The planned capacity of the manufacturing plant is 80 MW of fuel cells per year, with expected output of up to 80 MW of fuel cells per year within 3-5 years of commencement of operations. Response of Joshua Richman to Staff Data Requests PSC-11 and PSC-12.

still be substantial, but reduced, economic benefits for Delaware and Delmarva's ratepayers would still be responsible for full payments to the Fuel Cell Project.

5. Bloom Energy Goes Out of Business or Otherwise Fails to Provide Component Parts or Services to the Project Company

A related scenario is where Bloom goes out of business or otherwise fails to provide replacement components or services, causing a forced outage to the Fuel Cell Project. Assuming that the project has qualified as a Qualified Fuel Cell Project (by the earlier of the second anniversary of commercial operation of the Fuel Cell Project or December 31, 2016, whichever is later), Delmarva's ratepayers would have the obligation to make payments to the Project Company for energy that is not delivered, albeit at a reduced rate.

In this scenario, it is likely but not necessary that manufacturing of fuel cells in Delaware has ceased. Under this scenario, after a 90-day period, Delmarva's ratepayers would be obligated to pay (pursuant to Section K(5) of the proposed tariff) 70% of the $166.87/MWh Disbursement Rate for energy not delivered due to Bloom's failure to perform, which is equivalent to $116.81/MWh. This assumes that the Fuel Cell Project will provide replacement RECs/SRECs and retire them. If the Fuel Cell Project fails to do so despite using commercially reasonable efforts, the Fuel Cell Project would still be paid 55% of the Disbursement Rate--$91.78/MWh-- for energy not delivered. In either scenario, Delmarva would get credit for reducing its RPS obligations as if the Fuel Cell Project had produced energy.[91] This potential exposure for making payments due to Bloom's failure as a supplier extends to July 1, 2025, somewhat beyond the period of the expected debt financing (the expected term of the permanent debt financing is 10 years), but would terminate earlier if Bloom receives an investment grade rating.

This provision was not specified in the REPSA Amendments, unlike provisions relating to Force Majeure Events and Gas Interruptions. All of these provisions, which mitigate risk for the Fuel Cell Project and impose risks on ratepayers, are addressed in Section IV.M of this report.

In summary, whether or not Bloom builds the manufacturing facility and operates it at a sustainable level is critical in terms of evaluating the proposal. This, in turn, will be highly dependent on there being an adequate market for Bloom's fuel cells over the next 5-15 years and Bloom's ability to manufacture fuel cells at an acceptable cost. We address the prospects for Bloom's success in this context.

[91] Response of Collin O'Mara to Staff Data Request PSC-173.e and PSC-173.f.

F. The Market for Fuel Cells to Be Produced at the Proposed Manufacturing Plant

Bloom has indicated that its target market area for the proposed manufacturing plant (at least initially) is the northeastern United States with similar types of large end-use customers as in California.[92] Other than Delaware, Bloom has indicated that New York, Connecticut, New Jersey and Pennsylvania have forms of subsidy programs, providing a combination of rebates or RECs, tax credits or tax exemptions for fuel cells operating on natural gas.

Connecticut is a state where fuel cells operating on non-renewable fuels (such as natural gas) are eligible Class I renewable generation resources under Connecticut's renewable portfolio standard.[93] Connecticut is also home to Bloom's two major fuel cell competitors, Fuel Cell Energy and UTC Power. In 2003 (as amended in 2007), the Connecticut legislature enacted a statute in which the state's investor-owned utilities were required to purchase the energy output and RECs from approximately 150 MW of RPS-eligible generation located in Connecticut (known as Project 150). Since Connecticut is an urban state without significant wind resources, the competition was limited and a number of fuel cell projects received long-term contracts approved by the Department of Public Utility Control. These included a 4.8 MW project and a 2.4 MW project at hospitals in Round 2 of the competitively bid program and five additional fuel cell projects in Round 3 of the program.[94] All projects were reportedly planned to use Fuel Cell Energy fuel cells. While a few of these projects are going forward, most have experienced problems with accessing financing.[95] The program is not currently available. There are two upcoming program opportunities for fuel cells.

Under Section 110 of Public Act No. 11-80 enacted earlier this year, the state's electric distribution companies are required to solicit proposals for 15-year power purchase agreements for Class I renewable energy facilities of no more than 2 MW that are located on the customer side of the revenue meter.[96] In addition, the Connecticut Clean Energy Fund is offering a funding opportunity for fuel cells through its On-Site Distributed Generation Program, through which approximately $12.9 million has been allocated (although a substantial portion of this may already be committed).[97] Funding is pursuant to a RFP process. For fuel cells the maximum incentive is $2.50/kW.[98] Connecticut's focus on fuel cells is driven in large part on supporting the state's fuel cell industry and

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[92] Richman Response to Staff Data Requests PSC-29, PSC-30 and PSC-31.

[93] Conn. Gen. Stat. §16-1(a)(45). See http://www.ct.gov/dpuc/cwp/view.asp?a=3354&q=415186.

[94] Fuel Cells 2000, State of the States: Fuel Cells in America (June 2011) (hereinafter "State of the States") http://www.fuelcells.org/StateoftheStates2011.pdf, at 30.

[95] http://plattsenergyweektv.com/story.aspx?storyid=166969&catid=293.

[96] An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future, Public Act No. 11-80, http://www.cga.ct.gov/2011/act/pa/pdf/2011PA-00080-R00SB-01243-PA.pdf.

[97] State of the States at 27.

[98] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CT16F&re=1&ee=1.

preference may be given to its two in-state competitors.[99] This may make it difficult for Bloom to be competitive in the Connecticut market.

New York also offers financial incentives to support the installation and operation of fuel cell systems, with up to $1 million available per site for fuel cell systems rated larger than 25 kW.[100] Funding is available on a first-come, first-served basis until December 31, 2014 or until funding has been fully committed. The total amount available is $21.6 million.[101] Bloom, Fuel Cell Energy and UTC Power are eligible for participation in the Large Fuel Cell Program.[102]

New York and Connecticut, in addition to Delaware, are the states most supportive of fuel cells in the Northeast. Fuel Cell 2000 rates California, Connecticut, and New York as the best of the top five fuel cell states.[103] Bloom Energy notes that Pennsylvania and New Jersey also have incentives for fuel cells operating on natural gas.[104]

At bottom, it is very uncertain as to whether the market in the Northeast for Bloom Energy's fuel cells will be sufficiently robust to sustain a Bloom Energy manufacturing facility operating at its peak capacity of 80 MW of fuel cells per year. It is likely that Bloom will need to reduce its costs very substantially from the $7,000 or $8,000 per kW in capital costs quoted by Bloom (as well as ongoing costs of and/or time periods between stack replacements), state incentive programs will need to expand for fuel cells and become more generous, or both. While construction of the proposed manufacturing facility may help Bloom achieve cost reductions, it is not known whether this will be sufficient in order for Bloom's business to be sustainable on a long-term basis.

G. Factors Which the Commission is Required to Consider Under the RESPA Amendments

In determining whether the incremental cost of the Fuel Cell Project is warranted to support approval, the Commission is required to consider:

- Whether the Fuel Cell Project utilizes "innovative baseload technologies;"
- Whether the Fuel Cell Project offers "environmental benefits to the state relative to conventional baseload generation technologies;"
- Whether the Fuel Cell Project "promotes economic development in the State;" and

[99] For example, under the new procurement program recently adopted by the Connecticut legislature, "The authority may give a preference to contracts for technologies manufactured, researched or developed in the state." Act No. 11-80, Section 110(a).
[100] State of the States at 56.
[101] http://www.nyserda.org/Press_Releases/2011/PressReleas20110316.asp.
[102] http://www.nyserda.org/funding/2157atte1.pdf.
[103] State of the States at 7.
[104] Richman Response to Staff Data Request PSC-31.

- Whether the proposed tariff "promotes price stability over the project term."[105]

We address these considerations below.

1. Innovative Baseload Technologies

Bloom has produced fuel cells in 100 kW modules, and the proposed Red Lion facility (27 MW) and Brookside facility (3 MW) would be built with 200 kW fuel cells.[106] According to Bloom, Bloom fuel cells are an innovative base load technology because of (a) their efficiency, low emissions, advanced use of solid oxide fuel cell technology which is "regarded by the scientific community as the most likely to achieve large-scale commercial viability due to their performance, durability, materials, scale and high operating temperatures," and (b) their ability to be "easily sited at the point of consumption or close to demand centers."[107]

Bloom fuel cells are a baseload technology. Like other fuel cells, they are designed to run continuously on a 24x7 basis. This is not a virtue in the context of grid-connected generation. Unlike conventional combustion technology, they are not designed to cycle up and down or go off line when there is insufficient load or if it is uneconomic to generate. While lacking flexibility, they are not intermittent generators, as are wind energy and solar facilities.

The primary virtues of fuel cells—small size, 24x7 operation, relatively low emissions, and ease of permitting—are most valuable in on-site applications for customers who have sizable loads on a continuous basis and can offset purchasing from the grid, with the potential to reduce distribution and transmission charges as well as energy and capacity charges and losses. In other words, avoided costs are higher, which helps the economics, and the inflexibility of fuel cell operation is not a significant negative factor. It is not surprising that all of Bloom's prior fuel cell sales have been for on-site distributed generation.[108]

Bloom fuel cells can certainly be viewed as being innovative. They are the only major fuel cell manufacturer building solid oxide fuel cells in the 100 kW-200kW size range. These fuel cells can be combined for larger applications. While current economics are not attractive for the type of grid-connected applications proposed, Bloom's contention is that its solid oxide fuel cell technology has a greater potential for cost reductions than competing fuel cell technologies. While we do not have an opinion on Bloom's claims regarding its technology, their assertions do not appear to be unreasonable.

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[105] 26 Del. C. § 364(d)(2).

[106] Richman Responses to Staff Data Request PSC-09.a and PSC-27; Exhibit 51.a, Exhibit 51b, http://bloomenergy.com/products/data-sheet/.

[107] Direct Testimony of Joshua Richman, pp. 16-17.

[108] With respect to grid-connected applications, there are situations where fuel cells can be used to avoid transmission/distribution level investments to address congestion or reliability issues, but the congestion or reliability issues are not present with regard to the proposed Red Lion or Brookside installations.

Moreover, the market demand created by the Fuel Cell Project coupled with the new manufacturing facility could help Bloom in improving its products and lowering its costs, which Secretary O'Mara has stated (in a somewhat different context) could "help accelerate Bloom Energy's overall success."[109] In any event, there is ample support to conclude that the Fuel Cell Project will use innovative baseload technologies.

2. Environmental Benefits Relative to Conventional Baseload Generation Technologies

According to Secretary O'Mara, the electrochemical reaction used by Bloom's fuel cells to produce electricity from natural gas "emits significantly less pollution than traditional fossil fuel combustion alternatives (virtually no nitrogen oxides or sulfur dioxide emissions; no mercury; and significantly less carbon dioxide than traditional base load generation). In addition, the system does not require a continuous supply of water."[110] The fuel cells also have the capability to operate on renewable biogas as well as natural gas.

At the guaranteed heat rate of 7,550 btu/kWh (7.55 MMbtu/MWh), Bloom's fuel cells have the following emission rates over the life of the project (per Bloom Energy):

- Carbon dioxide: 884 lbs/MWh (beginning of life is <773 lbs/MWh
- Nitrogen oxides: 0.002 bls/MWh
- Sulfur dioxide: de minimis
- Carbon monoxide:0.08/MWh (latest results)
- VOCs (as hexane):0.01/MWh[111]

Degradation of the fuel cells' performance over time increases the carbon dioxide emissions per MWh but the initial performance is achieved when the fuel stacks are periodically replaced (3-5 years).

The question is how these emissions compare to "conventional baseload technologies." Compared to coal-fired generation, the emissions from a Bloom fuel cell using natural gas are certainly lower. For example, according to the Environmental Protection Agency, the average emission rates in the United States from coal-fired generation are 2,249 lbs/MWh of carbon dioxide, 13 lbs/MWh of sulfur dioxide, and 6 lbs/MWh of nitrogen oxides.[112] The average emissions rates in the United States from natural gas-fired generation are 1,135 lbs/MWh of

109 Direct Testimony of Collin O'Mara p. 2, lines 9-13.
110 Direct Testimony of Collin O'Mara at p. 3, lines 1-4.
111 Richman Response to Staff Data Request PSC-41.
112 http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html.

carbon dioxide, 0.1 lbs/MWh of sulfur dioxide, and 1.7 lbs/MWh of nitrogen oxide.[113]

Large new natural gas combined cycle power plants have heat rates of approximately 7,100 btu/kWh.[114] They can produce similar emissions rates as a fuel cell with respect to greenhouse gas emissions with somewhat higher nitrogen oxide emissions.[115] Natural gas-fired combined cycle plants can operate in baseload mode, but usually cycle for economic reasons. They consume more water than fuel cells.

On the whole, it is reasonable to conclude that fuel cells have environmental benefits compared to conventional baseload generation technologies, although the benefit is certainly greater where the comparison is to coal-fired generation or a mix of coal-fired generation and natural gas-fired generation.

In evaluating the environmental impact of a proposed project, it is customary to evaluate the emissions or other environmental effects that are avoided or displaced by the proposed generation. If the fuel cell project was being considered outside of a RPS context, the emissions that would be avoided would be those of the marginal generators in PJM during the hours that the fuel cell project would operate. In 2010, the marginal on-peak CO_2 emission rate was 1,854 lbs/MWh and the marginal off-peak CO_2 emission rate was 1,867 lbs/MWh,[116] which is more than twice the emission rate of the Fuel Cell Project. During 2010, the average CO_2 emission rate of generating units in PJM was 1,168 lbs/MWh.[117]

However, the proposed Fuel Cell Project is being treated as RPS-eligible and Delmarva's RPS purchase obligations are being reduced as a result of energy generation of the Fuel Cell Project. On a long-term basis, it is reasonable to assume that if REC and SREC purchases are being reduced from what they otherwise would be, then there will be less eligible renewable energy generation that is constructed. In light of the adjustments proposed by Secretary O'Mara to the statutory reductions to Delmarva's RPS obligations, the energy that would be avoided for the different years and scenarios are as follows:

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113 *Id.*

114 This is ICF's projection for new natural gas-fired combined cycle plants built in 2013-15. Fuel Cell Analysis Market Forecast Assumptions Document prepared August 2011, Schedule MFS-2, p. 64.

115 See Natural Gas Combined-Cycle Plants With and Without Carbon Sequestration, http://docs.google.com/viewer?a=v&q=cache:hhoExZMt2RoJ:www.netl.doe.gov/energy-analyses/pubs/deskreference/B_NGCC_051507.pdf+natural+gas+combined+cycle+plant+emission+rates+carbon+dioxide&hl=en&gl=us&pid=bl&srcid=ADGEESgthw4Pa5e03-wXo1Dc1PliMKzaPimeGlfBnA0W9fyl5irFAqXzc3lrmK3bp_eMyx3AacKk2Paaf0RDBdEOGE5HGhUPjELGbTrZgh2WULFEFifPZrTG5xozyd-g0cwVgFfoIsPN&sig=AHIEtbTCjRL6RSvDFh28RrKEd0lnoE1VnQ.

116 PJM Executive Report, March 31, 2011, p. 37, http://www.pjm.com/~/media/committees-groups/committees/mc/20110331/20110331-item-16a-markets-report.ashx.

117 *Id.*

YEARS 1-15: When Fuel Cell Project energy is generated and RECs are to be displaced, the net environmental impact of Fuel Cell Project energy production will be negative: one MWh of Fuel Cell Project emissions will replace 2 MWh of renewable energy, most likely produced by 2 MWh of zero emission wind energy. At current emissions rates, for each MWh of Fuel Cell Energy produced, CO_2 emissions would increase by approximately 2,800 lbs. (relative to 2 MWh that would have been produced by wind energy projects).

When Fuel Cell Project energy is generated and SRECs are to be displaced, the environmental impact of Fuel Cell Project energy production will replace 1/3 MWh of energy produced by solar PV projects during certain on-peak hours and 2/3 MWh of marginal energy produced in PJM. At current emissions rates, for each MWh of Fuel Cell Project energy produced, CO_2 emissions would decline by approximately 350 lbs.

YEARS 16-21: Where RECs are to be displaced: Each Fuel Cell Project MWh, with associated emissions, will displace one MWh of renewable energy, most likely produced by 1 MWh of zero emission wind energy. At current emissions rates, for each MWh of Fuel Cell Energy produced, CO_2 emissions would increase by approximately 970 lbs.

When Fuel Cell Project energy is generated and SRECs are to be displaced, the environmental impact of Fuel Cell Energy production will replace 1/3 MWh of energy produced by solar PV projects during certain on-peak hours and 2/3 MWh of marginal energy produced in PJM. At current emissions rates, for each MWh of Fuel Cell Project energy produced, CO_2 emissions would decline by approximately 350 lbs.

ICF's analysis indicates much higher reduction of Delmarva's REC purchase obligations compared to SREC purchase obligations. Based on this allocation, the projected net carbon dioxide reduction effect of the proposed project would be substantially negative. This, however, is a function of reductions in Delmarva's RPS obligations, rather than the fuel cell technology itself.

For similar reasons, we do not believe that there will be any significant health benefits associated with the Fuel Cell Project since much of the energy that will be displaced will be zero emission renewable energy.

Used in a normal on-site distributed generation setting, the Bloom fuel cells do offer additional environmental benefits compared to purchasing energy from the grid due to lower emissions rates and the ability to reduce transmission and distribution losses. There is also the argument that there are indirect environmental benefits associated with the Fuel Cell Project due to its potential to contribute to incremental on-site fuel cell installations.

However, construing the REPSA Amendments as to whether the Fuel Cell Project offers environmental benefits to the State relative to conventional baseload generation technologies as being independent of the effects caused by reductions to Delmarva's RPS obligations, it is reasonable to conclude that there are such environmental benefits.

3. Whether the Fuel Cell Project Promotes Economic Development in the State

The evidence is compelling that if the proposed manufacturing plant is built and can operate on a sustainable basis there will be very substantial economic development in the State. Clearly, by being tied to construction of the manufacturing plant, the Fuel Cell Project should promote economic development in Delaware. The associated risks are that the manufacturing plant is not built, operates only a short time, or operates far below its expected capacity. Secretary O'Mara, along with the Director of DEDO, have presumably taken these matters into consideration and have concluded that the Fuel Cell Project promote economic development in Delaware.118

4. Whether the Fuel Cell Project Under the Proposed Tariff Promotes Price Stability Over the Project Term

As indicated in the testimony of ICF consultant Maria Scheller, the impact of the Fuel Cell Project on price stability over the project term is marginal.119 This is due primarily to the small percentage—3%--of the Fuel Cell Project MWh to total Delmarva electric distribution MWh load in Delaware. Natural gas is a component of the total price for the Fuel Cell Project, which will change with changes in natural gas market prices, but the majority of the total fuel cell price is in the fixed $/MWh Disbursement Rate, which is netted against Fuel Cell Project PJM revenues. In short, price stability is not a major factor either for or against the proposed Fuel Cell Project.

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118 Under the REPSA Amendments, Bloom Energy's plan to build its manufacturing campus in Delaware was designated by Secretary O'Mara and Director Levin of DEDO as an "economic development opportunity." See Attachment to Direct Testimony of Collin O'Mara.

119 Direct Testimony of Maria Scheller, pp. 22-24.

G. Other Factors for Consideration

1. Potential Future Limitations on REC and SREC Purchase Obligations

There are two provisions in REPSA that potentially put limitations on Delmarva's obligations to purchase RECs and SRECs. Section 354(i) provides:

> *The State Energy Coordinator, in consultation with the Commission, may freeze the minimum cumulative solar photovoltaics requirement for regulated utilities if the Delaware Energy Office determines that the total cost of complying with the requirement during a compliance year exceeds 1% of the total retail cost of electricity for retail electricity suppliers during the same compliance year. In the event of a freeze, the minimum cumulative percentage from solar photovoltaics shall remain at the percentage for the year in which the freeze is instituted. The freeze shall be lifted upon a finding by the Coordinator, in consultation with the Commission, that the total cost of compliance can reasonably be expected to be under the 1% threshold. The total cost of compliance shall include the costs associated with any ratepayer funded state solar rebate program, SREC purchases, and solar alternative compliance payments.*

Section 354(j) provides:

> *The State Energy Coordinator, in consultation with the Commission, may freeze the minimum cumulative Eligible Energy Resources requirement for regulated utilities if the Delaware Energy Office determines that the total cost of complying with the requirement during a compliance year exceeds 3% of the total retail cost of electricity for retail electricity suppliers during the same compliance year. In the event of a freeze, the minimum cumulative percentage from Eligible Energy Resources shall remain at the percentage for the year in which the freeze is instituted. The freeze shall be lifted upon a finding by the Coordinator, in consultation with the Commission, that the total cost of compliance can reasonably be expected to be under the 3% threshold. The total cost of compliance shall include the costs associated with any ratepayer funded state renewable energy rebate program, REC purchases, and alternative compliance payments.*

These provisions allow (but do not require) the Delaware Energy Office, in consultation with the Commission, to freeze Delmarva's RPS obligations if SREC costs exceed 1% of total retail electricity costs or if Tier 1 REC costs exceed 3% of total retail electricity costs. They present several issues with respect to the proposed Fuel Cell Project.

First, should the payments, or any portion of the payments, to be made by Delmarva's electric distribution customers be considered as REC or SREC payments for purposes of determining whether the threshold for a freeze has been reached? While not addressed in the application or the accompanying testimony, we are satisfied that they should not be. Under REPSA and the proposed tariff, Delmarva is not acquiring RECs or SRECs. Rather, its obligations to purchase RECs and/or SRECs are being reduced. Moreover, there is no specific payment being made to the Project Company for "fulfilling" Delmarva's REC or SREC obligations. Hence, our conclusion is that none of the payments to be made to the Project Company under the proposed tariff would constitute a cost of complying with Delmarva's obligations under the RPS for purposes of Sections 364(i) and 364(j).

Second, a substantial portion of the quantified value in ICF's customer impact analysis is Delmarva's ability to avoid future REC and SREC obligations. However, if the amounts of those future REC and SREC obligations exceed the threshold and would be subject to a potential future freeze, then there is significantly more uncertainty regarding the quantification of those estimated avoided costs. ICF did not conduct an assessment of this potential.[120] However, Secretary O'Mara states that he did consider the potential impact of Section 364(i) and Section 364(j) of REPSA when he proposed his adjustments to the REC/SREC reduction provisions of the REPSA Amendments and concluded that the freeze provisions apparently did not come into play.

> *The requirements of 26 Del. C. §§354(i) and (j) were evaluated before the proposed adjustment. The analysis indicated that the impact would not exceed the thresholds established in law and would remain below both the solar limit and Tier 1 limit every year compared to the previous year. This analysis assumed a balanced allocation of SRECs and RECs; however, Delmarva will have discretion in consultation with the Commission to determine the appropriate allocations in any given year, while working to minimize any rate impacts. Ensuring compliance with 26 Del. C. §§354(i) and (j) should be part of the evaluation of the commission when considering allocation proposals.*[121]

It is not clear how this assessment was conducted. However, Secretary O'Mara's reference to the impact not exceeding the thresholds "compared to the previous year" suggests that he views the 1% and 3% thresholds as being a limit on the increase in RPS costs from year to year rather than a comparison of total RPS costs to "the total retail cost of electricity for retail electricity suppliers" in a particular compliance year. In addition, it is not clear whether the "total retail cost of electricity for retail electricity suppliers" includes transmission and distribution charges in addition to the cost of wholesale supply or is simply the cost of wholesale supply (including RPS-related cost). While the appropriate comparisons and associated quantifications are

[120] Responses of Maria Scheller to Staff Data Request PSC-87 and PSC-88.
[121] Response of Collin O'Mara to Staff Data Request PSC-118.

somewhat difficult to puzzle through, it appears that in the near term the risk that a freeze would degrade the ability of the Fuel Cell Project to reduce RPS-based avoided costs is low. However, on a long-term basis, the risk, in our opinion, is substantially higher in the event that a new Administration were to interpret the law differently and would be more willing to invoke a freeze if one or both statutory thresholds are reached.[122]

2. Reasonableness of Pricing for a Fuel Cell Project Under the Proposed Tariff

It is very difficult to assess whether the pricing under the proposed tariff is reasonable for a fuel cell project of this size and duration of term (over 20 years). To our knowledge, the only long-term contracts for fuel cell projects of this nature were those approved by the Connecticut Department of Public Utility Control associated with Project 150. The complex pricing structures associated with the contracts and limited public information available regarding them make a reasonable comparison difficult .[123] Moreover, the Bloom proposal is unique in that it is tied to a manufacturing facility with its attendant economic development benefits. Hence, even if the proposed pricing is higher than these other contracts, it is unclear what conclusion should be drawn. Bloom's one major competitor that is a publicly-owned stand-alone fuel cell company and whose fuel cells were proposed to be used for these other projects has been unprofitable and may not have sold the fuel cells at a price that would be profitable for it.[124]

When comparing expressed capital costs for Bloom fuel cells compared to costs quoted by one of its major competitors, we note that the installed costs are comparable.[125] We also note that the information provided by Bloom as to how it proposes to finance the facility does not appear unreasonable. However, we do not have enough information to conclude that the proposed tariff rates are either reasonable or unreasonable compared to comparable long-term contracts. Yet, the high rates under the proposed tariff suggest that a similar proposal would not be

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122 At a discovery conference, the Caesar Rodney Institute raised the issue whether Delmarva's obligations to purchase RECs and SRECs expire after 2025, which is the last year that Delmarva's obligations to purchase RECs and SRECs increase on a yearly basis under a schedule set forth in Section 354(a) of REPSA. Our understanding is that Delmarva's obligations to purchase RECs and SRECs continue after 2025 at the same percentage levels as 2025 or higher, as provided by 26 Del. C. § 364(b): "Cumulative minimum percentage requirements of eligible energy resources and solar photovoltaics shall be established by Commission rules for compliance year 2026 and each subsequent year. In no case shall the minimum percentages established by Commission rules be lower than those required for compliance year 2025 in Schedule I, subsection (a) of this section." http://delcode.delaware.gov/title26/c001/sc03a/index.shtml.

123 There is also the issue of differences in state subsidies and tax treatments.

124 Fuel Cell Energy, Inc., a publicly traded stand-alone fuel cell company, has an accumulated deficit of almost $700 million and has been operating for many years at a loss. See Fuel Cell Energy, Inc. SEC Form 10-Q filed September 9, 2011 at 3-4, http://fcel.client.shareholder.com/secfiling.cfm?filingID=950123-11-83785.

125 See Fuss & O'Neill, Fuel Cells Evaluation, Connecticut State Universities System Final Report (June 18, 2010) p. 17, http://www.ct.edu/images/uploads/CSUS-0374_Fuel_Cell_Study.pdf.

attractive to another customer in a grid-connected context, absent the benefit of a local manufacturing plant, a similar economic development opportunity, substantial subsidies, legal requirement, or severely limited competition for the opportunity.

3. The Additional 20 MW

The REPSA Amendments allow for a total nameplate capacity of 50 MW of qualified fuel cell projects, but requires that "Any additional MW beyond the 30 MW [initial] project . . . must be reviewed and approved by the Commission."[126] The proposed tariff does not apply to fuel cells beyond the 30 MW project that is the subject of Delmarva's application. However, if the proposed tariff is approved, there is a strong possibility that the Commission will subsequently be asked to approve an additional application for up to 20 MW of fuel cells. One would hope that the expected benefits associated with such a proposal would be in addition to those that are being offered to support approval of the proposed tariff for the 30 MW project.

[126] Amendments Section 8, 28 Del. C. §364(d)(1)a.

IV. MINIMUM REQUIREMENTS UNDER THE REPSA AMENDMENTS

Under the REPSA Amendments, Delmarva and Bloom shall propose tariff provisions, which, at a minimum, must contain 14 specified provisions in order for the Commission to approve the proposed tariff.[127] In this section, we address each of the requirements and address whether they have been satisfied. As we explain in more detail below, we believe that the proposed tariff satisfies these minimum requirements.[128]

A. Project Size and Maximum MWh

Under Section 364(d)(1)c of REPSA, the tariff must apply to a "project of 30 MW nominal nameplate, and future potential additions of up to an additional 20 MW nominal nameplate, not to exceed a total of 50 MW nominal nameplate or 1,152 Megawatt Hours per day averaged on an annual basis." The limitation on energy paid under the tariff for a 50 MW facility is equivalent to the amount of energy produced at a 96% capacity factor. Section A of the proposed tariff is consistent with this requirement in that "Service under this Service Classification QFCP-RC is limited to a Facility nominal nameplate rating of no more than 30 MWs" and the energy limitation is "691.2 Megawatt Hours per day averaged on an annual calendar year basis,"[129] which is equivalent to the 30 MW nameplate facility operating at a 96% capacity factor.

B. Term of Service

Under Section 364(d)(1)b of REPSA , the proposed tariff must have a term of service of at least 20 years from commercial operation of the completed Fuel Cell Project. Under Section B of the proposed tariff, service shall commence on the "Initial Delivery Date" and extend through the "Services Term." The "Services Term" is defined as 21 years after the Initial Delivery Date for each "Unit." A Unit means each array of fuel cells combined to form a single distributed power generation unit. "Initial Delivery Date" is the date commercial operation has occurred for the particular Unit and other requirements have been satisfied under Section B of the tariff. The proposed tariff complies with the REPSA Amendments' term of service requirements.

[127] 26 Del. C. § 364(d)(1).

[128] Each of the requirements will be addressed in the same order that they appear in 26 Del. C. § 364(d)(1).

[129] REPSA also allows for future potential additions of up to an additional 20 MW nominal nameplate (reduced by customer installations), but any additional MW above the 30 MW project must be reviewed and approved separately by the Commission.

C. The Cost to Customers May Not Exceed the Cost of the Bluewater PPA

Section 364(d)(1)c of REPSA provides as follows:

> *The cost to customers of [Delmarva] for each MWH of output produced by the project which, on a levelized basis at the time of Commission approval, does not exceed the highest cost source for combined energy, capacity and environmental attributes approved by the Commission for inclusion in the renewable portfolio of the Commission-regulated electric company as of January 1, 2011.*

This is a cost cap provision. The "highest cost source for combined energy, capacity and environmental attributes approved by the Commission" is the PPA between Delmarva and Bluewater Wind Delaware, LLC executed in June 2008, as amended.[130] Hence, the cost to customers of the Fuel Cell Project must be less than that under the Bluewater PPA.

The language of the REPSA Amendments is not clear as to how this comparison should be made. While it is clear that the comparison should be made "on a levelized basis," the "cost to customers" "for each MWH of output produced by the project" could be interpreted in a number of different ways. First, the "cost to customers" could be (a) the direct cost (or gross cost) without netting (or offsetting) the value of energy and capacity from the projects or the value of the environmental attributes created by or avoided by the projects or (b) the net cost after such offsets. Second, the "cost to customers" "for each MWh of output produced by the project" could be (a) the cost per MWh of production by the project, (b) the cost per MWh of consumption of Delmarva's customers, or (c) the cost per average customer per month or other time period.

Secretary O'Mara and Delmarva appear to have interpreted Section 364(d)(1) of REPSA as requiring or allowing a comparison of the costs of the Fuel Cell Project against the Bluewater PPA on a net basis (considering the market value of energy, capacity, and attributes). The specific metric they have used is the net levelized impact per month for an average residential customer.

In the table below, we have made a comparison of the Fuel Cell Project to the Bluewater PPA using our base case assumptions (ICF's assumptions with our adjustments). Based on this table, one can make the comparison using each of six possible metrics based on (a) (i) gross costs and (ii) net costs as applied to (b) (i) $/MWh of production, (ii) $/MWh of customer consumption, and (ii) monthly residential customer bill impact.

Table 5 compares the cost of the Bloom project with the Bluewater project and thus addresses only the minimum requirements of the legislation, as described above. The analysis is shown only for the 2016-2035 period, which is common to both projects. Since

[130] Direct Testimony of Maria Scheller, pp. 19-20. The Bluewater PPA was approved by the Commission and three other state agencies in Order No. 7440 in PSC Docket 06-241 on September 2, 2008.

the Bluewater project will not be in service in 2012 or 2013 and is unlikely to be in-service prior to 2016, it is not useful to include earlier years for the Bluewater PPA in the comparison.

Table 9: Comparison of Fuel Cell Project to Bluewater PPA, Staff Consultant Estimate Common Period (2016-2035)

	Sum of Payments ($000)	NPV of Payments ($000)	Nominal Levelized Cost Per MWh Generated	Nominal Levelized Cost Per Distribution Customer MWh	Nominal Levelized Per Residential Customer per Month
Fuel Cell Project					
Total Contract Cost	$1,023,947	$595,676	$230.76	$7.25	$7.07
Market Value and Avoided Costs	$906,465	$482,782	$187.03	$5.87	$5.73
Above Market Cost of Fuel Cell Project	$117,482	$112,894	$43.73	$1.37	$1.34
Bluewater Wind PPA					
Total Contract Cost	$2,054,944	$1,059,874	$179.67	$12.90	$12.57
Market Value and Avoided Costs	$1,671,058	$855,969	$145.10	$10.41	$10.15
Above Market Cost of Bluewater PPA	$383,886	$203,905	$34.57	$2.48	$2.42

The energy to be purchased under the Bluewater PPA on an annual basis (558 GWh) is more than twice that to be produced annually by the 30 MW Fuel Cell Project (252 GWh). On a gross and net $/MWh of production, the cost of the Fuel Cell Project is higher than that of the Bluewater PPA.

With respect to $/MWh of customer consumption, the cost of the Fuel Cell Project is lower than that under the Bluewater PPA on both a gross and net basis. Since the customer impact per month is based on average monthly residential consumption of 975 kWh (0.975 MWh),[131] the comparison with Bluewater is no different than if the metric used is $/MWh of consumption. On a $/month per average residential customer basis, the Fuel Cell Project has substantially less impact than the Bluewater PPA, which is the same conclusion reached by ICF.

We also conducted a comparative analysis using our base case assumptions where the above-market costs and ratepayer impacts for both the Fuel Cell Project and the Bluewater PPA are calculated based on their respective contract terms and projected in-service dates (December 2012 to February 2035 for the Fuel Cell Project and July 2016 to June 2041 for the Bluewater Project). The results are basically the same as in Table 9.

[131] Response of Maria Scheller to Staff Data Request PSC-67.

Table 10: Comparison of Fuel Cell Project to Bluewater PPA
Staff Consultant Estimate
Full Service Terms of Each Project

	Sum of Payments ($000)	NPV of Payments ($000)	Nominal Levelized Cost Per MWh Generated	Nominal Levelized Cost Per Distribution Customer MWh	Nominal Levelized Per Residential Customer per Month
Fuel Cell Project--2012 to 2035					
Total Contract Cost	$1,155,244	$570,392	$220.96	$6.94	$6.77
Market Value and Avoided Costs	$1,007,637	$457,612	$177.27	$5.57	$5.43
Above Market Cost of Fuel Cell Project	$147,606	$112,780	$43.69	$1.37	$1.34
Bluewater PPA--2016 to 2041					
Total Contract Cost	$2,836,506	$964,328	$187.68	$13.51	$13.17
Market Value and Avoided Costs	$2,297,638	$780,756	$151.95	$10.94	$10.66
Above Market Cost of Contract	$538,868	$183,572	$35.73	$2.57	$2.51

In terms of applying Section 364(d)(1), our view is that using net cost, rather than gross cost, is a suitable approach because the concern underlying this statutory provision is that the "cost to customers" under the Fuel Cell Project not exceed that of the Bluewater PPA. With respect to both resources, customers would pay the net cost after the energy and capacity is liquidated in the PJM market taking into consideration the value of the environmental attributes.

Mathematically, there is no difference in results when one uses a $/MWh of consumption metric or average residential monthly customer bill impact. Either interpretation would be reasonable because, again, the focus of the statutory provision is on the cost to customers. Since the Fuel Cell Project is substantially smaller than the Bluewater PPA both in terms of energy (252 GWh/year compared to 558 GWh/year) and installed capacity (30 MW compared to 200 MW), the customer impact is lower. While a comparison based on the $/MWh of production, in our view, would not be an unreasonable interpretation either, the Commission is entitled to interpret this statutory provision as it deems appropriate consistent with the language and intent of the statute. Under the statutory scheme, the Secretary of DNREC is authorized to make a number of decisions, in coordination with other government agencies, including the Commission, such as adjusting the ratio of RECs and SRECs that a Fuel Cell Project MWh may displace or "fulfill" under REPSA. Secretary O'Mara's interpretation appears to be that the monthly customer bill impact metric is appropriate, which, in our opinion, should be given weight by the Commission. For these reasons, our conclusion is that the Fuel Cell Project meets the cost cap requirement of Section 364(d)(1)c of REPSA under the assumption that either $/MWh impact on Delmarva's distribution customers or $/month impact on the average residential customer is an appropriate metric, which we believe is reasonable under the statute.

D. Fuel Cell Project to Receive Compensation for Fuel Costs to Produce Output Minus Revenues Received From PJM

Under Section 364(d)(1)d of REPSA, the tariff must provide for:

> *Adjustments to funds to be collected from customers and distributed to the Qualified Fuel Cell Provider that will also compensate the Qualified Fuel Cell Provider for its costs of fuel to produce such output and that will reduce compensation to the Qualified Fuel Cell Provider for any revenues received by the Qualified Fuel Cell Provider for such output sold in the PJM or any successor market.*

Simply put, the tariff must provide for (a) the Fuel Cell Project to be compensated for its fuel costs based on its MWh output and (b) the Fuel Cell Project must credit from amounts paid to it under the tariff the revenues it receives from PJM. Section H(1) of the tariff provides that Delmarva will make payments under the tariff for the amounts paid to Delmarva for fuel costs under the gas tariff (proposed Service Classification LVG-QFCP-RC) and the incremental Site Preparation Cost above the Site Preparation Cost Cap—defined as $17.2 million—incurred by the Fuel Cell Project, less the "sale of any Products" by the Fuel Cell Project Owner. Products are defined to include energy, capacity, ancillary services, and environmental attributes. The tariff complies with Section 364(d)(1)d of REPSA.

Section 364(b) of REPSA provides that all funds disbursed to a Qualified Fuel Cell Provider, "including incremental site preparation costs incurred by a Qualified Fuel Cell Provider," shall be collected from Delmarva's entire Delaware customer base through adjustable, non-bypassable charges to be established by the Commission. Under the tariff, Site Preparation Costs are the costs, the amount of which will be determined mutually by Delmarva and the Fuel Cell Project Owner, to prepare the Sites to accommodate Facility commercial operation. Delmarva has stated that "At this time the Company does not believe that any amounts will be incurred for Site Preparation Costs by the Company above the Site Preparation Cost Cap."[132] Section H of the tariff also complies with Section 364(b) of REPSA.

E. Fuel Cell Project to Sell All Products Into PJM

Under Section 364(d)(1)e of REPSA, the tariff must provide for:

> *The requirement that the Qualified Fuel Cell Provider must sell all energy, capacity, and ancillary services, produced by the project and any other output available or that becomes reasonably available to the Qualified Fuel Cell Provider*

[132] Response of Wayne W. Barndt to Staff Data Request PSC-100.

> *during the term of the project into the PJM or any PJM successor market. To the extent any additional output produced by the project, including but not limited to any product or environmental attribute from the project becomes available for sale in the PJM Market, PJM successor market, or a market other than PJM or a PJM successor market, the Qualified Fuel Cell Provider and Commission-regulated electric company shall jointly propose additional provisions to the tariff designed to reduce the cost of the Qualified Fuel Cell Provider Project to customers of the Commission-regulated electric company.*

Simply put, this provision requires the Qualified Fuel Sell Provider to sell all products produced by the Project into PJM. Parts of Section C of the tariff contain provisions which comply with these requirements.

F. Under Tariff, Payments = $/MWh Amount to Fuel Cell Project + Fuel Costs + Delmarva Incurred Costs – PJM Revenues

Section 364(d)(1)f of REPSA provides that:

> *The Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, collect from its customers, through a non-bypassable charge provided for in subsections (b) and (c) of this section, any positive difference between the sum of (i) the price for each MWH of output produced by the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project minus the amount received by the Qualified Fuel Cell Provider for the market sale of its output, and shall distribute such amount to the Qualified Fuel Cell Provider.*

This means that the tariff must allow for collection from customers of: (a) the price for each MWh produced by the Project plus (b) the cost of fuel plus (c) allowable Delmarva incurred costs minus (d) the amount the Project receives for the sale of its output, which net amount shall be distributed to the Fuel Cell Project. Section 364(c) of REPSA describes allowable Delmarva costs as "All miscellaneous costs arising out of Qualified Fuel Cell Provider Projects incurred by [Delmarva], including but not limited to, filing costs, administrative costs and incremental site preparation costs," which "costs shall be recovered unless, after Commission review, any such costs are determined by the Commission to have been incurred in bad faith, are the product of waste or out of an abuse of discretion, or in violation of law."

Sections D through I of the proposed tariff contain provisions which demonstrate compliance with this provision of REPSA, including provisions for payment to the QFCP Generator at a specified $/MWh Disbursement Rate. However, recoverable costs under Section D of the tariff include:

> *Any amounts incurred for Site Preparation Cost by the Company above the Site Preparation Cost Cap, including but not limited to Costs that may be incurred to relocate Energy Servers after the Initial Delivery Date through the Services Term as mutually agreed upon by Company and the QFCP Generator.*

In response to a Staff data request, Delmarva states that Section 364(c) of REPSA allows Delmarva to incur costs to relocate Energy Servers from the 30 MW Fuel Cell Project and to recover them, subject to Commission review.[133] In our review of the REPSA Amendments, we did not find any specific statutory language authorizing recovery of costs by Delmarva to relocate Energy Servers pertaining to the 30 MW Fuel Cell Project after its Initial Delivery Date, especially where it would result in increased costs to Delmarva ratepayers. We suggest the sentence in Section D of the tariff pertaining to Site Preparation Costs be modified as follows:

> *Any amounts incurred for Site Preparation Cost by the Company above the Site Preparation Cost Cap, except for Costs that may be incurred to relocate Energy Servers after the Initial Delivery Date through the Services Term as mutually agreed upon by Company and the QFCP Generator, which shall be subject to prior Commission approval.*

Otherwise, our assessment is that the proposed tariff conforms with Section364(d)(1)f of REPSA.

G. Any Positive Amounts Due to Delmarva's Customers Shall Be Distributed to Delmarva's Customers

Section 364(d)(1)g of REPSA provides that:

> *The Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, distribute to its customers from the Qualified Fuel Cell Provider Project, through a distribution mechanism to be established in a tariff, any positive difference between the amount received by the Qualified Fuel Cell Provider Project for the market sale of its output minus the sum of (i) the price established for each MWH of output from the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project.*

This provision simply requires Delmarva to distribute to its ratepayers any positive amount reflecting revenues received by the Fuel Cell Project for the sale of its output minus the $/MWh Disbursement Rate for each MWh of output plus fuel costs plus appropriate Delmarva-incurred costs. Under current market conditions, this would be

[133] Response of Wayne W. Barndt to Staff Data Request PSC-101.

extremely unlikely to occur. In any event, Sections E, F, and H(2) of the tariff provide a mechanism to distribute any net positive amounts to Delmarva's customers.

H. Average Fuel Efficiency Level for the Fuel Cell Project

Section 364(d)(1)h of REPSA provides that the tariff must contain:

> *An average efficiency level that the fuel cells in a project must maintain.*

Section C(5) of the proposed tariff contains a Target Heat Rate mechanism that is in compliance with this provision of the REPSA Amendments. The Target Heat Rate is 7,550 btu/kWh. Under the proposed tariff, the Project Company is paid for its actual cost of fuel as long as on a cumulative basis the Fuel Cell Project operates at or below an average efficiency of 7,550 btu/kWh. Based on fuel consumption, the heating value of the fuel and kWWh produced, the Actual Heat Rate is calculated monthly. If the quantity of natural gas is less than that which would be utilized at the Target Heat Rate, the amount of fuel (that would have been utilized) is "banked" in a tracking account. Banked natural gas can be used by the Fuel Cell Project in any month where the Actual Heat Rate exceeds 7,550 btu/kWh. In any month where the Actual Heat Rate exceeds the Target Heat Rate and there are no or insufficient amounts of natural gas in the "bank," once the bank hits zero the Project Company may only recover the cost of natural gas based on the Target Heat Rate.

I. Role of Delmarva as Collector and Disburser of Funds

Section 365(d)(1)i of REPSA provides that the tariff must contain:

> *A definition of the role of the Commission-regulated electric company solely as the agent of a Qualified Fuel Cell Provider Project, for the collection of funds and disbursement of such collected funds to Qualified Fuel Cell Provider and to its customers.*

Simply put, the tariff must define Delmarva's role solely as a collection agent. The tariff accomplishes this. Section D of the electric tariff states: "The Company, acting in its role as the agent for collection of amounts due QFCP Generator and disbursement of such amounts to QFCP Generator, shall collect amounts based on Disbursements and all Costs through the Service Classification QFCP-RC Charge, as specified in Section G of this Service Classification."

J. The Mechanism By Which Delmarva Collects Amounts From Customers to Pay the Fuel Cell Project

Section 365(d)(1)j of REPSA provides that the tariff must contain:

> *The mechanism through which the Commission-regulated electric company, on behalf of a Qualified Fuel Cell Provider Project, shall collect from its customers, through a non-bypassable charge provided for in subsections (b) and (c) of this section, any difference between the sum of (i) the price for each MWH of output produced by the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project minus the amount received by the Qualified Fuel Cell Provider for the market sale of its output.*

Section E of the proposed tariff sets forth in detail the calculation of the charge to the Fuel Cell Project and Sections F and G of the proposed tariff specify the mechanism to collect the charge from Delmarva's customers. The tariff is in compliance with this section of the REPSA Amendments.

K. The Mechanism By Which Delmarva Collects Amounts From the Fuel Cell Project to Pay Customers

Section 365(d)(1)k of REPSA provides that the tariff must contain:

> *The mechanism through which the Commission-regulated electric company, on behalf of a Qualified Fuel Cell Provider Project, shall distribute to its customers, through bill credits, any positive difference between the amount received by the Qualified Fuel Cell Provider for the market sale of its output minus the sum of (i) the price established for each MWH of output from the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project.*

The proposed tariff, in Sections E, F, and G sets forth the mechanism to provide net bill credits to customers in the event that bill credits are due in compliance with the REPSA Amendments.

L. Provisions Protecting the Fuel Cell Project From Future Changes in Law

Section 365(d)(1)l of REPSA provides that the tariff must contain:

> *A provision that protects a Qualified Fuel Cell Provider from any future changes to this subchapter that would prevent a Qualified Fuel Cell Provider that provides*

> *service under approved tariff provisions from recovering all amounts approved in such tariff. Such provision shall also include the obligation of the Commission-regulated electric company, in the event of any such change to this subchapter, to collect from its customers amounts necessary to disburse, and to disburse to the Qualified Fuel Cell Provider the full amount approved by the Commission in such pre-existing tariff for each MWH of output produced by the Qualified Fuel Cell Provider Project.*

Section I of the proposed tariff states: "In the event of any future change to the Delaware Fuel Cell Amendments that would prevent the QFCP Generator from providing service or collecting all disbursements under this Service Classification "QFCP-RC," the Company shall collect from its customers, and shall disburse to QFCP Generator, all amounts necessary to provide the QFCP Generator with the full amount approved by the Commission in this Service Classification prior to such change to the Delaware Fuel Cell Amendments for each unit of energy produced by the QFCP Generator or which would have been produced by the QFCP Generator (in a circumstance in which the QFCP Generator would otherwise be entitled to payment pursuant to Section K(2) or (3) below) pursuant to the terms of this Service Classification for the remainder of the Services Term." The tariff is in compliance with Section 365(d)(1)l of the REPSA Amendments.

M. Force Majeure and Interruption of Fuel Supply

Section 365(d)(1)m of REPSA provides that the tariff must provide:

> *In the event of an event of force majeure that prevents the Qualified Fuel Cell Provider from supplying output from at least 80% of the capacity of the Qualified Fuel Cell Provider Project, or an interruption in fuel supply, in whole or in part, to the project, a mechanism through which,*
>
> ***(1)*** *during the event of force majeure, the Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, collect from its customers and transfer to the Qualified Fuel Cell Provider, a maximum of 70% of the price per MWH of output affected by the event of force majeure, and during an interruption in fuel supply, the Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, collect from its customers and transfer to the Qualified Fuel Cell Provider 100% of the price per MWH of output affected by the interruption.*
>
> ***(2)*** *during the event of force majeure or interruption in fuel supply, the Commission-regulated electric company will continue to receive the full reduction in renewable portfolio standards that would have been*

> *provided by the output but for the event of force majeure or interruption in fuel supply.*

Section K of the proposed tariff provides a mechanism that incorporates the statutorily required force majeure and fuel interruption provisions, which are set forth in Sections K(2) and K(3) of the proposed tariff, albeit in a somewhat overly expansive way for fuel interruptions. Section K(5) of the proposed tariff contains provisions not provided for in the REPSA Amendments that require ratepayers to pay the Fuel Cell Project if it does not produce output due to the inability of the Project Company to obtain from Bloom or another person replacement components or services. The significance of tariff provisions that are required by statute as opposed to those that are not is that the Commission may not deny the application on the basis that it finds unacceptable tariff provisions that are required by statute. However, the Commission could disapprove the proposed tariff on the basis that the tariff provision is not required by statute and imposes unacceptable incremental costs on ratepayers or the unacceptable risk of such costs on ratepayers.

Section K(2) of the proposed tariff provides that in the case of a Force Majeure Event affecting the Facility that prevents the QFCP Generator from supplying at least 80% of the nameplate capacity of the Fuel Cell Project, Delmarva shall pay the QFCP Generator 70% of the disbursements per MWh of reduction in output that the Fuel Cell Project would have produced but for the Force Majeure Event.

There is, however, a technical problem in the wording of the tariff. In the definition section of the tariff:

> *"Force Majeure Event" means (i) a Forced Outage Event; or (ii) an event or circumstance that: (a) prevents a Party from performing its obligations under this Service Classification; (b) was not foreseeable by such Party; (c) was not within the reasonable control of, or the result of the negligence of such Party; and (d) such Party is unable to reasonably mitigate, avoid or cause to be avoided with the exercise of due diligence.*

A "Forced Outage Event" is defined as

> *the inability of a QFCP Generator to obtain from its Qualified Fuel Cell Provider or any other Persons a replacement component or a service necessary for operation of one or more Energy Servers at its nameplate capacity.*

In other words, a "Forced Outage Event" occurs when the Fuel Cell Project does not produce output due to the inability of the Project Company to obtain replacement parts or services from Bloom (or another party), regardless of whether the failure of Bloom to do so is itself caused by a Force Majeure Event. There is a separate section—K(5)—that deals with "Forced Outage Events," which has different limitations and rules governing when a Forced Outage Event can be deemed to occur, how long it might last, and consequences in the event it is deemed to occur. **Section K(2) should be revised such**

that "Force Majeure Event" should be changed to "Force Majeure Event other than a Forced Outage Event" in the places where it occurs. This would be consistent with Section K(4) which provides:

> The duration of payments by the Company under Section K(2) above resulting from any Force Majeure Event other than a Forced Outage Event shall in no event exceed 178 days for each Force Majeure Event.

Section K(2) provides that during this type of a Force Majeure Event, Delmarva will receive the full reduction in RPS obligations that would have been provided but for such Force Majeure Event.

Section K(3) of the tariff governs a "Gas Interruption," which is described as:

> a. An interruption in fuel supply, in whole or in part, to the Facility, and such interruption prevents the QFCP Generator from supplying output from its available capacity; or
> b. A Fuel Quality Event.

A "Fuel Quality Event," which in common English is not the same as an "interruption in fuel supply" is defined as:

> An event wherein (a) fuel delivered by the Company to the QFCP Generator fails to meet pipeline quality specifications contained in the respective General Terms and Conditions of the FERC gas tariff(s) of the upstream pipeline(s) that interconnect with the Company's gas system and (b) such failure prevents the QFCP Generator from supplying output from its available capacity. In no event shall a Fuel Quality Event be deemed to occur or to continue in effect at any time after the end of the thirty-six month following the date that the first Unit achieves Facility Commercial Operation.

Under either form of Gas Interruption, the ratepayers shall pay 100% of the disbursements to which the QFCP Generator would have been entitled but for the Gas Interruption (not including recovery of gas costs not incurred) and Delmarva will receive the full reduction in RPS obligation that would have been provided but for the Gas Interruption.

Section K(5) governs a "Forced Outage Event," which is defined in the tariff as a type of "Force Majeure Event," but the definition of "Force Majeure Event" does not subject a "Forced Outage Event" to the requirements for the ordinary type of Force Majeure Event—that the event is not foreseeable by such Party, not within its reasonable control, not the result of negligence of such Party, and which such Party was not able to mitigate, avoid or cause to be avoided with the exercise of due diligence. On the other hand, Section K(5) refers to "a Force Majeure Event resulting from a Forced Outage Event" that prevents the QFCP Generator from supplying output from the Facility. Does this mean

that Forced Outage Events are subject to the same requirements/limitations as normal Force Majeure Events? Or not? **The tariff should be clarified.**

Section K(5) is effective for a limited, albeit probably lengthy time period. It is effective through July 1, 2025, by which time the debt on the project financing of the Fuel Cell Project should be paid off. However, if Bloom has previously received an investment grade credit rating, Section K(5) would no longer be effective as of the date Bloom receives an investment grade rating. Secretary O'Mara has stated that he expects Bloom to receive an investment grade rating in the next 2-3 years,[134] although this appears to be optimistic in the context of DEDO staff's statement that it "has determined that the financial information provided by [Bloom] is consistent with its experience with early-stage, venture-backed entities."[135]

During a Forced Outage Event, there will be no disbursements to the Project Company for the first 90 days. Thereafter, the Project Company will receive (and Delmarva's ratepayers would be obligated to pay) 70% of the $166.87/MWh Disbursement Rate for energy not delivered due to Bloom's failure to perform, which is equivalent to $116.81/MWh. This assumes that the Fuel Cell Project will provide replacement RECs/SRECs and retire them, such that Delmarva would also retire the RECs/SRECs it would have retired had the Fuel Cell Project delivered output. Under paragraph K(5)(a), the Project Company has the obligation to use commercially reasonable efforts to acquire a "Forced Outage Replacement REC" for each MWh of output lost due to a Forced Outage Event. "Forced Outage Replacement RECs" are defined as "any combination of RECs and SRECs such that one-sixth (1/6) of an SREC equates to one REC, providing that at least 90% of the RECs shall be SRECs." If the Project Company fails to do so despite using commercially reasonable efforts, the Project Company would still be paid 55% of the Disbursement Rate--$91.78/MWh-- for energy not delivered.[136] Under paragraph K(5)(1) of the tariff, it is "'commercially reasonable' not to acquire Forced Outage Replacement RECs if they are not available in sufficient quantities or if the acquisition price would exceed $45 per Forced Outage Replacement REC."

These force majeure provisions are different than those in typical PPAs in several ways. First, sellers under PPAs are typically responsible for their own performance and the performance of their suppliers. Second, Force Majeure provisions typically excuse the Seller from defaulting on its obligations, but do not typically result in payment from the buyer. Third, if the Seller fails to perform due to failures of one of its suppliers, the Seller's performance is usually only excused if the failure of the supplier was itself due to a force majeure event (e.g., a hurricane). As will be discussed in the following section on

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134 Direct Testimony of Collin O'Mara, p. 5, lines 6-9.

135 Memorandum from Bernice Whaley dated June 14, 2011 to Council on Development Finance re Bloom Energy's Request for a Delaware Strategic Fund Grant, Attachment to Collin O'Mara Response to Staff Data Request PSC-134.a.

136 In this situation, Delmarva would still be entitled to reduce its RPS obligations as if the Forced Outage Event had not occurred. Response of Collin O'Mara to Staff Data Request PSC-173.f.

risk allocation, the proposed tariff puts unusual risk on ratepayers compared to typical PPAs with projects using normal commercial generation technology manufactured by creditworthy suppliers.

The reasons for these provisions pertain to the technology, the manner in which the project will be financed and associated requirements associated with the financing. Bloom has indicated it expects to finance the project on a project financing basis, with project debt with a ten-year term and a repayment schedule tied to cash flows from the project.[137] Bloom has indicated that it has been unable to find lenders willing to extend financing without PSC approval of the tariff, including the Force Majeure provisions in Section K.[138] Bloom has not identified the names of the prospective lenders that it has approached, so it is not possible to confirm this statement. However, it is not hard to understand that prospective lenders would have a concern given the magnitude of the dollar investment, the limited experience with the technology, the lack of creditworthiness of the technology supplier, and the periodic need for fuel stack replacements by the technology supplier. Bloom believes that inclusion of Section K is a risk mitigant that any project financier to the project will require.[139]

N. Conclusions Regarding Minimum Requirements

The proposed electric tariff meets the minimum requirements for the tariff set forth in the REPSA Amendments. As indicated above, there are a few provisions in the tariff that, in our opinion, should be modified for clarification purposes or because they are not required by the REPSA Amendments and may lead to unnecessary costs for ratepayers. In the next section, we address more broadly the proposed tariffs, risk allocation, and questions regarding particular tariff provisions.

137 Richman Response to Staff Data Request PSC-33.
138 *Id.*
139 *Id.*

V. THE PROPOSED TARIFFS AND RISK ALLOCATION

A. Use of a Tariff Mechanism Instead of a PPA

Delmarva has proposed the use of a tariff mechanism—required under the REPSA Amendments for the Fuel Cell Project—as a means to charge ratepayers for long-term sales of energy and capacity from a power plant rather than the traditional utility PPA. The rationale is provided in the testimony of Mark Finfrock, Director of Risk Management with Pepco Holdings, Inc., Delmarva's parent company. Mr. Finfrock states that the proposed tariff mechanism eliminates the risk that the rating agencies will impute debt on Delmarva's balance sheet as the result of the transaction, which, in turn, could, at least at some point, require incremental equity to be issued, which would increase Delmarva's cost of capital.[140] This, in turn, could produce an indirect cost to be ultimately borne by Delmarva's ratepayers. The proposed electric tariff, under which Delmarva would act as a collection agent, rather than as a buyer under a power purchase agreement, was designed to avoid ratepayer incurrence of these indirect costs, according to Mr. Finfrock. Under the proposed tariff, Delmarva does not purchase energy, capacity or environmental attributes (RECs/SRECs). Rather, ratepayers pay Delmarva, as collection agent, on a $/MWh basis for the output of the plant, which is then sent on to the Project Company, minus the revenues received by the Project Company for the sale of energy and capacity into the PJM market; Delmarva's RPS obligations are reduced according to a specified formula.

To our knowledge, use of a tariff mechanism with the utility acting as a collection agent, rather than the utility acting as a buyer under a PPA, is rare in U.S. utility practice. To the extent use of the tariff mechanism can avoid a long-term power transaction being treated as imputed debt with the potential for indirect costs to be borne by ratepayers is a positive. However, we have several reservations.

Where utilities have cost pass-through mechanisms for power purchased under PPAs, our assessment is that there is no significant incremental risk to the utility that should result in any debt being imputed, a position that Moody's has taken.

> *Some utilities have the ability to pass through the cost of purchasing power under PPAs to their customers. As a result, the utility takes no risk that the cost of power is greater than the retail price it will receive. Accordingly, Moody's regards these PPA obligations as operating costs with no long-term debt-like attributes.*[141]

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140 Direct Testimony of Mark Finfrock, pp. 7-13. Another possibility is that the rating agencies could downgrade the credit ratings of the Company or its bonds, which could also increase the Company's cost of capital.

141 Referenced in the Direct Testimony of Mark Fiinfrock, p. 12, lines 1-6.

Standard & Poor's, the other major rating agency, has a different approach, but where there is a legislatively-created cost recovery mechanism, it discounts the imputed debt treatment substantially or sometimes entirely.

Even if one disagrees strongly with a rating agency's assessment of risk and approach on imputing debt, one has to deal with real world implications associated with their approach to credit ratings. However, other than this consideration, we see no virtue in use of a tariff rather than a PPA. From a utility standpoint, entering into a PPA with a cost pass-through provision to ratepayers is like being the "cheese in the sandwich." Being a collection agent through a tariff removes the utility from the risk, even if remote, that it pays costs to the project seller but does not recover the costs from its ratepayers.

Other than impact on utility credit ratings, what is the effect from a utility customer standpoint of a utility using a tariff for a long-term power transaction rather than a PPA? We have little experience with tariff-based transactions so it is difficult to foresee all the consequences. One consequence, however, is that the Commission will likely be involved in many more issues involving administration of the transaction than is ordinarily the case with a PPA. Typically, utilities and sellers under a PPA deal with and resolve a myriad of issues in terms of contract interpretation and administration that never are presented for regulatory commissions to consider. Since the tariff is the equivalent of a contract for which the Commission is responsible for overseeing, it is likely that the Commission will have to directly address issues of tariff interpretation of the type that a utility usually addresses with a generator. In light of the complexity and potential ambiguity of some of the provisions in the tariff, the Commission could be significantly involved in what are ordinarily contract administration issues.

The particular tariff at issue here allocates substantially more risk to ratepayers than is ordinarily the case with PPAs, a matter we address in the section below. However, these risks may be more of a function of the particular transaction structure negotiated for the Fuel Cell Project rather than a function of the transactional "rules" occurring under a tariff as opposed to a PPA.

B. Risk Allocation Under the Proposed Tariffs

In this section, we identify the risks allocated to ratepayers under the proposed tariffs, the great bulk of which are ordinarily allocated to the sellers under PPAs. The risks previously addressed in this report are:

- Risk of paying for energy not delivered due to:
  - Force Majeure Event;
  - Gas supply interruption or problem with fuel quality;
  - Failure of the technology supplier to provide replacement parts or service.

- Risk that the Project does not clear the capacity market, in whole or in part (or would not be fully available during peak periods);
- Risk that site preparation costs for the Fuel Cell Project exceed $17.2 million, in which case ratepayers will bear the incremental cost;
    - This risk includes costs that may be incurred to relocate Energy Servers after the Initial Delivery Date, subject to agreement by Delmarva;
- Risk that natural gas purchase costs per $/MMbtu exceed the specified index.
- There are also a number of other risks and costs not included in the economic evaluation of the Fuel Cell Project under the proposed tariff or previously addressed in this report. These include:
    - The risk that the Project Company does not maximize revenue for the sale of energy and capacity in the PJM market, despite having a "good faith" obligation to do so.[142]
    - The costs (and risk of costs) will be incurred that were not included in the economic analysis, including costs associated with the sale of energy and capacity in PJM, Delmarva administrative costs, and costs incurred under the gas tariff by Delmarva in procuring natural gas for the Project Company, such as balancing costs.

In addition, there are a number of risks associated with certain structural features or lack thereof in the proposed tariff compared to typical long-term PPAs (including PPAs that Delmarva has executed with wind energy projects). Typically, prices are either flat or escalating over the PPA term. The price structure under the proposed tariff is flat at a high level for the first 15 years ($166.87/MWh), then declines sharply for years 16-20 ($102.00/MWh), with a very sharp decline in the last year of the term ($30.00/MWh). With this price structure and projected increases in market prices for energy and capacity over time, there are projected high net costs to ratepayers in the first 15 years of the Fuel Cell Project but there are net benefits thereafter, as shown in Figure 1 above. However, over time there is a higher risk that the Fuel Cell Project will fail to perform, and if it fails to perform toward the end of the service term, the projected net benefits may not materialize.[143]

Moreover, there is no security required, such as a letter of credit, to support the Project Company's obligations to perform, either initially upon regulatory approval of the tariff or when the Fuel Cell Project goes into commercial operation, as there is in most long-term PPAs entered into by electric utilities. Hence, if there is a failure to perform in later years, there will be no security to support payment of damages to offset the Fuel Cell Project's failure to perform.[144]

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[142] Tariff Section C(3).

[143] Also, market price projections tend to have greater uncertainty over longer time horizons.

[144] In this section, we are only addressing risks associated with the Fuel Cell Project itself and not those risks associated with construction and operation of the manufacturing facility (which are addressed in Section III.E of this report).

In fact, as we understand the proposed tariff, there is no obligation on the part of the Project Company to perform at any specified level—a minimum performance obligation—or perhaps any obligation on the part of the Project Company to perform at all. Consequently, there is the risk that the Project Company could terminate sales through the proposed tariff and pursue other opportunities sometime in the future without adverse consequence at a time when the Fuel Cell Project could provide net benefits to Delmarva's ratepayers under the proposed tariff.

Fundamentally, there is substantially more risk allocated to ratepayers under the proposed tariff than is ordinarily the case in a long-term PPA. However, the risks and benefits associated with energy, capacity, and REC/SREC market prices being lower or higher than projections is similar with regard to those associated with long-term PPAs.

C. Questions Regarding Tariff Provisions

We have several questions regarding both the proposed electric and gas tariffs. First, in the electric tariff, the Project Company's obligation to maximize revenue from the sale of energy, capacity and any other products is on a "good faith" basis.[145] This is a low standard and is atypical in PPAs where there is a standard of performance other than a simple obligation to satisfy a requirement. A standard of "commercially reasonable efforts" is more typical and, in our opinion, more appropriate. In fact, the same standard is used in Section K(5) of the tariff for the purchase of Forced Outage Replacement RECs. We recommend that Section C of the proposed tariff be revised to replace "good faith efforts" with "commercially reasonable efforts."

In addition, as described in Section IV.F of this report, Section D should be modified such that any costs incurred above the Site Preparation Cost Cap after the Initial Delivery Date due to relocation of Energy Servers would require prior Commission approval.

As described in Section IV.M of this report, Section K(2) of the electric tariff should be amended for clarification purposes so that references to "Force Majeure Event" are replaced by "Forced Outage Event other than a Forced Outage Event."

In Section K(5) of the electric tariff, it should be clarified whether or not "a Force Majeure Event resulting from a Forced Outage Event" that prevents the Project Company from supplying output from the Facility is subject to the same requirements/limitations as normal Force Majeure Events (addressed in Section IV.M of this report).

With regard to the natural gas tariff, it should be clarified that in the next rate case, the Project Company will be charged [an allocable share] of Company costs pertaining to the

[145] Tariff sections C(2) and C(3).

distribution service rather than only the incremental costs associated with the natural gas service. These costs would be flowed through the electric tariff so that the Project Company would be net revenue neutral.

VI. ADJUSTMENT OF FUEL CELL MWH TO REC/SREC RATIO REDUCTIONS IN DELMARVA'S RPS OBLIGATIONS

Under the REPSA Amendments, one MWh of production from a Fuel Cell Project can result in the reduction of one REC from Delmarva's RPS purchase obligations or one-sixth of an SREC, subject to a maximum reduction of SREC purchase obligation of 30% per year.[146] As explained in Section II.C of this report, Secretary O'Mara, in order to reduce the customer cost impact on Delmarva's customers, has proposed (after coordinating with Delmarva) to adjust the Fuel Cell Project MWh to REC/SREC ratios and SREC contribution cap. Under the REPSA Amendments, "The Secretary of DNREC may, after coordination with the Commission and [Delmarva], adjust the requirements of this section including permitting [Delmarva] participating in a Commission-approved project to exceed the percentages set forth in this section."[147] The Secretary's adjustments are as follows:

For the first 15 years, 1 Fuel Cell Project MWh will result in the reduction of 2 RECs of Delmarva's RPS obligations; applying the 6 RECs to 1 SREC ratio, 3 Fuel Cell Project MWh can result in the reduction of 1 SREC;

For the remainder of the tariff (approximately 6 years), 1 Fuel Cell Project MWh will result in the reduction of 1 REC; applying a 3 REC to 1 SREC ratio, 3 Fuel Cell Project MWh can result in the reduction of 1 SREC;

The SREC Contribution Cap will be 25% in Years 1-5, 30% in Years 6-15 and 35% in Years 16-21.

Determining the amount of RECs and SRECs to be reduced annually "would be determined through a process established by the Commission, in consultation with Delmarva and the DNREC, with priority given to minimizing customer impacts, avoiding Alternative Compliance Payments, and ensuring sufficient opportunity for in-state renewable energy economic development."[148]

Secretary O'Mara has proposed that his adjustments be adopted by the Commission in this proceeding.[149] Our analysis of the Fuel Cell Project and the proposed tariffs is based on the adjustments proposed by Secretary O'Mara.

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[146] Exceptions are where due to lack of SREC availability in the market, the alternative would be to incur Alternative Compliance Payments for SRECs or where the SREC obligation under REPSA is increased (and then only to the extent of the increase).

[147] Amendments Section 8, 26 Del. C. § 364(d)(1)b.

[148] Direct Testimony of Collin O'Mara pp. 6-7.

[149] Direct Testimony of Collin O'Mara at p. 8, lines 19-21.

VII. REQUEST FOR EXPEDITED CONSIDERATION

Bloom has stated that its request for PSC approval by October 18, 2011 is based on desire to begin construction before the end of the year and thereby establish eligibility for the Cash Grant in lieu of the ITC.[150] Bloom has stated it is negotiating term sheets with specific tax equity investors and that it expects to close on such financing shortly after Commission approval of the proposed tariff.[151] Bloom indicates that delay of Commission approval into November would make it more difficult to incur sufficient construction costs "and may prove to make it not possible."[152] The matter presented to the Commission for approval is highly complex with substantial long-term impacts on Delmarva ratepayers and the economy of the State of Delaware.

Based on a dialogue at a discovery conference held last month, it appears that Bloom has some flexibility in terms of the timing of a Commission decision. It appears a decision early in November would not pose substantial problems for Bloom and the Project Company with regard to financing the Fuel Cell Project but late November would likely be more problematic. We suggest that in response to the Staff consultant's report and prior to the hearing scheduled on October 18, Bloom and the project proponents express to the Commission realistically their timing concerns and constraints, giving due consideration to the high level of difficulty associated with the proposed project and tariffs and the very short period of time for the Commission to absorb the complex and voluminous information presented to it and to deliberate on the weighty issues presented.

[150] Testimony of Joshua Richman at 21, lines 5-7.
[151] Richman Response to Staff Data Request PSC-35.
[152] Richman Response to Staff Data Request PSC-39.

VIII. CONCLUSIONS AND RECOMMENDATIONS

In a short time, we have reviewed Delmarva's application for approval of proposed electric and natural gas tariffs pertaining to the proposed 30 MW Fuel Cell Project sponsored by Bloom Energy, the direct testimony in support of Delmarva's application, as well as responses to over 150 Commission staff data requests. Our assessment is that the Fuel Cell Project and proposed tariffs satisfy the minimum requirements for Commission approval set forth in the recent amendments to the Renewable Energy Portfolio Standards Act; provided, the Commission agrees with Secretary O'Mara's and Delmarva's approach, which we do not find to be unreasonable, that the comparison to be made between the Fuel Cell Project and the Bluewater/Delmarva power purchase agreement under the REPSA Amendments should be made on a $ per average residential customer per month basis (or on a $ per MWh amount of Delmarva customer purchases). While the expected net cost of the Fuel Cell Project is more expensive than the Bluewater project on a $/MWh of production basis, because the MWh output of the Fuel Cell Project would be less than half of that of the Bluewater Project, the impact on Delmarva distribution customers is substantially lower.

With regard to the merits of the Fuel Cell Project proposal, the Commission is required to consider the incremental cost of the Fuel Cell Project to Delmarva's ratepayers, taking into consideration several non-exclusive factors specified in the REPSA Amendments, including economic development benefits to the State of Delaware. A critical element of the Fuel Cell Project—and the key motivating force behind it from the State's perspective—is the proposal by Bloom Energy to build a manufacturing facility at the site of the former Chrysler plant with the expectation of creating up to 900 new jobs with attendant secondary effects that could potentially create over 1,000 additional jobs.

In our view, the "tie" to the manufacturing facility is extremely important. Due to the high cost of the Fuel Cell Project and the risk allocation under the proposed electric tariff that is highly favorable to the Project Company and unfavorable to ratepayers, we would recommend against approval of the Fuel Cell Project in the absent of the "tie" to the manufacturing plant. However, if the manufacturing plant is built and operates on a sustainable basis, the economic development benefits to the State of Delaware are estimated to be in the hundreds of millions of dollars per year while we estimate the net present value cost to ratepayers of the Fuel Cell Project under the proposed tariff to be approximately $113 million (absent additional costs due to Force Majeure Events). This is equivalent to $1.34/month for the average Delmarva residential customer ($1.40/month if the effect of the public utility tax on electric bills is considered).

Key questions are what are the risks (and associated consequences) of the proposed manufacturing facility (a) not being built or (b) being built but being shut down afterwards or not otherwise operating on a sustainable basis.

We have a strong concern that under the proposed tariff and based on Bloom's planned method of financing the Fuel Cell Project there is a substantial, uncovered risk that the proposed manufacturing plant may not be built and Delmarva's ratepayers may be subject to paying tens of millions of dollars of net costs over a 22-year period. This would be a very unsatisfactory result. This risk is due to three factors: (1) construction would start, and financing would be arranged for the Fuel Cell Project, by year's end to take advantage of the Treasury cash grant in lieu of the investment tax credit, while construction of the manufacturing plant is not planned until next spring; (2) the Project Company (now owned by Bloom, but in the future to be owned by a third party after Bloom's planned sale of ownership) would not be responsible for the failure of the manufacturing plant to be built; and (3) the REPSA Amendments and the proposed tariff allow 10 MW of the Fuel Cell Project to be manufactured outside of Delaware. While we have addressed these issues in some detail in Section III.E.2 of this report, there are open issues and a lack of clarity around the risks and consequences. We request that the project proponents, Bloom, Delmarva and Secretary O'Mara, address the following questions prior to the hearing scheduled for October 18:

- If the manufacturing plant is not built:
  - May the Project Company build only 10 MW of the Fuel Cell Project? If so, would Delmarva's ratepayers be obligated to pay under the proposed tariff for the service term?
  - May the Project Company build over 10 MW and up to 30 MW of the Fuel Cell Project? If the Project Company does so, what happens if the manufacturing plant in Delaware is not built and fuel cells over 10 MW are not manufactured in Delaware? How does Bloom and the Project Company plan to manage this risk?
- Will the agreement to be entered into by DEDO (or another state agency) and Bloom provide for a termination payment in the event the manufacturing facility is not built?
  - If so, what would be the amount of the termination payment?
  - When would payment be due?
  - Would the termination payment be distributed to Delmarva's customers?
  - What would be the security provided by Bloom, if any, to assure payment?
  - Would the agreement be in place before the Commission acts on the application to approve the proposed tariffs?
- Is there some other reasonable way to address this risk that the parties could recommend?

While this risk may be viewed as having a low probability of occurring, it is, in our opinion, important that it be addressed adequately from the ratepayer perspective.

Another key matter is, assuming that the manufacturing plant is built, that it will operate on a sustainable basis such that at least most of the expected employment and economic development benefits will be realized. In Section III.F, we have attempted to explore Bloom's prospects in its initial target market for the proposed manufacturing plant, the Northeast. We believe it would be helpful prior to the Commission hearing for Bloom to make a more focused presentation as to why it expects to be successful in manufacturing and selling its fuel cells on a sustainable basis and how it plans to overcome challenges, especially ones pertaining to the cost and marketability of its products.

Additionally, we have several suggested changes and requests for clarification regarding the proposed electric and natural gas tariffs, which are specified in Section V.C of this report. Under the REPSA Amendments, the Commission may only approve or disapprove the proposed tariffs. Hence, we request that Delmarva and Bloom, prior to the scheduled Commission, hearing respond to our requested modifications and clarifications.

Finally, we request prior to the scheduled Commission hearing that Delmarva and Bloom express realistically their schedule requests and constraints, giving due consideration to the difficulty and complexity of the matter that has been presented to the Commission for a decision in this proceeding.

Appendix A: REPSA Amendments—Senate Bill No. 124

SPONSOR: Sen. DeLuca & Rep. Gilligan ;
Sens. Blevins, Bushweller, Ennis, Hall-Long, Peterson, Simpson, Sokola, Sorenson, Venables, Cloutier, Connor; Reps. Barbieri, Bennett, Bolden, Carson, Heffernan, Hudson, Jaques, J. Johnson, Q. Johnson, Keeley, Kowalko, Lavelle, Lee, Longhurst, Miro, Mulrooney, Outten, Ramone, Schooley, Schwartzkopf, Scott, B. Short, Viola, D.E. Williams, D.P. Williams, Mitchell & Osienski

DELAWARE STATE SENATE
146th GENERAL ASSEMBLY

SENATE BILL NO. 124

AN ACT TO AMEND TITLE 26 OF THE DELAWARE CODE RELATING TO DELAWARE'S RENEWABLE ENERGY PORTFOLIO STANDARDS AND DELAWARE-MANUFACTURED FUEL CELLS.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF DELAWARE:

Section 1. Amend § 352, Title 26 of the Delaware Code by redesignating subsections (16) through (24) as subsections (18) through (26) respectively, and inserting new subsections (16) and (17) as follows:

"(16) "Qualified Fuel Cell Provider" means an entity that

a. By no later than the commencement date of commercial operation of the full nameplate capacity of a fuel cell project, manufactures fuel cells in Delaware that are capable of being powered by renewable fuels, and

b. prior to approval of required tariff provisions, is designated by the Director of the Delaware Economic Development Office and the Secretary of DNREC as an economic development opportunity.

(17) "Qualified Fuel Cell Provider Project" means a fuel cell power generation project located in Delaware owned and/or operated by a Qualified Fuel Cell Provider under a tariff approved by the Commission pursuant to § 364 (d) of this title.".

Section 2. Amend § 353, Title 26 of the Delaware Code by inserting new subsections (c) and (d) to read as follows:

"(c) The Commission shall develop rules to transition the REC and SREC procurement responsibility set forth in Section 354 (e) of this subchapter. The purpose of such rules shall be:

(1) to adequately protect electric suppliers that entered into contracts to provide RECs and SRECs to retail electric customers prior to the transition of REC and SREC procurement responsibility under Section 354(e) of this subchapter,

(2) to adequately protect against overpayment of the cost of RPS obligations for customers of electric suppliers who are parties to supply contracts that were entered into prior to the transition of REC and SREC procurement responsibility under Section 354(e) of this subchapter, and

(3) to adequately protect Commission-regulated electric suppliers and customers thereof from having to incur alternative compliance payments or other costs that would have been avoided but for the failure of an electric supplier to continue retiring RECs or SRECs associated with its retail supply contracts existing at the time of the transition of REC and SREC procurement responsibility under Section 354(e) of this subchapter. To the extent such protection involves a temporary reduction to the RPS obligation or to the price of an alternative compliance payment required of a Commission-regulated electric supplier made necessary by the failure described above, the Commission is authorized to make the necessary temporary reductions notwithstanding the RPS obligations otherwise required by this chapter.

(d) The Commission shall develop procedures for tracking the generation output of Qualified Fuel Cell Provider Projects such that energy produced by such projects shall fulfill the Commission-regulated electric company's State mandated REC and SREC requirements set forth in Section 354 of this subchapter as follows:

(1) fulfillment of the equivalent of 1 REC for each megawatt-hour of energy produced by a Qualified Fuel Cell Provider Project.

a. The Commission-regulated electric company can use energy output produced by a Qualified Fuel Cell Provider Project to fulfill a portion of SREC requirements at a ratio of 6 MWH of RECs per 1 MWH of SRECs. The Commission-regulated electric company may utilize a portion of energy output from a Qualified Fuel Cell Provider Project in any given year to fulfill no more than 30% of the SREC requirements unless:

1. due to lack of SREC availability in the market, the alternative would be to incur Alternative Compliance Payments, or

2. the SREC obligations set forth in Schedule I of Section 354 of this subchapter are increased, and then only to the extent necessary to fulfill the increased SREC obligations.

b. The Secretary of DNREC may, after coordination with the Commission and a Commission-regulated electric company, adjust the requirements of this section including permitting a Commission-regulated electric company participating in a Commission-approved project to exceed the percentages set forth in this section.

c. The right of a Commission-regulated electric company to use energy output produced by a Qualified Fuel Cell Provider Project to fulfill its REC and SREC requirements in accordance with this section shall not expire until actually applied to fulfill such requirements.

(2) The Commission-regulated electric company has the ability to apply the REC and SREC equivalent fulfillment benefits described in this Section for 20 MW in addition to the 30 MW set forth in § 364 of this title for future customer sited applications of Qualified Fuel Cell Provider fuel cells. Separate tariff provisions must first be approved by the Commission for such installations above the original 30 MW."

Section 3. Amend § 354(a), Title 26 of the Delaware Code by striking the word "sold" as it appears in the first sentence in said subsection, and inserting the word "delivered" in its place.

Section 4. Amend § 354(d), Title 26 of the Delaware Code by inserting the phrase "the Commission-regulated electric companies and, where applicable," immediately before "retail electricity suppliers" in the second sentence in said subsection, and inserting the phrase "with existing contractual electric supply obligations" immediately after "retail electricity suppliers" in the second sentence in said subsection.

Section 5. Amend § 354, Title 26 of the Delaware Code by inserting a new subsection (e) to read as follows:

"(e) Beginning with compliance year 2012, Commission-regulated electric companies shall be responsible for procuring RECs, SRECs and any other attributes needed to comply with subsection (a) of this section with respect to all energy delivered to such companies' end use customers.".

Section 6. Amend § 354(f), Title 26 of the Delaware Code by inserting the phrase "Commission-regulated electric company" immediately before "retail electricity supplier" in the first sentence in said subsection, and inserting the phrase "with existing contractual electric supply obligation" immediately after "retail electricity supplier" in the first sentence in said subsection.

Section 7. Amend § 364, Title 26 of the Delaware Code by deleting the words "customers of" in the Section Title.

Section 8. Amend § 364, Title 26 of the Delaware Code by designating the existing paragraph as subsection (a) and inserting new subsections (b) through (i) as follows:

"(b) All funds disbursed to a Qualified Fuel Cell Provider by a Commission-regulated electric company, including incremental site preparation costs incurred by Qualified Fuel Cell Provider, shall be collected from the entire Delaware customer base of such company through adjustable non-bypassable charges which shall be established by the Commission. A Commission-regulated electric company participating in a Qualified Fuel Cell Provider Project shall collect and disburse funds solely as the agent for the collection and disbursement of funds for the project and shall have no liability except to comply with the tariff provisions to be established as set forth in subsection (d) of this section.

(c) All miscellaneous costs arising out of Qualified Fuel Cell Provider Projects incurred by a Commission-regulated electric company, including, but not limited to, filing costs, administrative costs and incremental site preparation costs, shall be distributed among the entire Delaware customer base of such company through adjustable non-bypassable charges which shall be established by the Commission. Such costs shall be recovered unless, after Commission review, any such costs are determined by the Commission to have been incurred in bad faith, are the product of waste or out of an abuse of discretion, or in violation of law.

(d) Before a Commission regulated electric company may collect any charges on behalf of a Qualified Fuel Cell Provider Project that would entitle the Commission-regulated electric company to reduce its REC and SREC requirements as provided for in § 353 (d) of this title, the Commission must adopt tariff provisions applicable to such project.

(1) Tariff provisions enabling and obligating Commission-regulated electric companies, acting in the role of an agent for collection and disbursement, to collect charges on behalf of a Qualified Fuel Cell Provider Project shall be proposed jointly by the electric company and the Qualified Fuel Cell Provider and shall, at a minimum, provide for the following.

a. A project of 30 MW nominal nameplate, and future potential additions of up to an additional 20 MW nominal nameplate, not to exceed a total of 50 MW nominal nameplate or 1,152 Megawatt Hours per day averaged on an annual basis. The total allowable 50MW of nominal nameplate shall be reduced by any customer sited installations referred to in § 353 (d)(2) of this title or additional installations of Qualified Fuel Cell Provider fuel cells. Any additional MW beyond the 30MW project made pursuant to this Section and§ 353 (d)(2) of this title must be reviewed and approved by the Commission.

b. a term of service of at least 20 years from commercial operation of the completed Qualified Fuel Cell Provider Project.

c. the cost to customers of the Commission-regulated electric company for each MWH of output produced by the project which, on a levelized basis at the time of Commission approval, does not exceed the highest cost source for combined energy, capacity and environmental attributes approved by the Commission for inclusion in the renewable portfolio of the Commission-regulated electric company as of January 1, 2011.

d. adjustments to funds to be collected from customers and distributed to the Qualified Fuel Cell Provider that will also compensate the Qualified Fuel Cell Provider for its costs of fuel to produce such output and that will reduce compensation to the Qualified Fuel Cell Provider for any revenues received by the Qualified Fuel Cell Provider for such output sold in the PJM or any successor market.

e. the requirement that the Qualified Fuel Cell Provider must sell all energy, capacity, and ancillary services, produced by the project and any other output available or that becomes reasonably available to the Qualified Fuel Cell Provider during the term of the project into the PJM or any PJM successor market. To the extent any additional output produced by the project, including but not limited to any product or environmental attribute from the project becomes available for sale in the PJM Market, PJM successor market, or a market other than PJM or a PJM successor market, the Qualified Fuel Cell Provider and Commission-regulated electric company shall jointly propose additional provisions to the tariff designed to reduce the cost of the Qualified Fuel Cell Provider Project to customers of the Commission-regulated electric company.

f. the Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, collect from its customers, through a non-bypassable charge provided for in subsections (b) and (c) of this section, any positive difference between the sum of (i) the price for each MWH of output produced by the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project minus the amount received by the Qualified Fuel Cell Provider for the market sale of its output, and shall distribute such amount to the Qualified Fuel Cell Provider.

g. that the Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, distribute to its customers from the Qualified Fuel Cell Provider Project, through a distribution mechanism to be established in a tariff, any positive difference between the amount received by the Qualified Fuel Cell Provider Project for the market sale of its output minus the sum of (i) the price established for each MWH of output from the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project.

h. an average efficiency level that the fuel cells in a project must maintain.

i. a definition of the role of the Commission-regulated electric company solely as the agent of a Qualified Fuel Cell Provider Project, for the collection of funds and disbursement of such collected funds to Qualified Fuel Cell Provider and to its customers.

j. the mechanism through which the Commission-regulated electric company, on behalf of a Qualified Fuel Cell Provider Project, shall collect from its customers, through a non-bypassable charge provided for in subsections (b) and (c) of this section, any difference between the sum of (i) the price for each MWH of output produced by the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel

Cell Provider Project minus the amount received by the Qualified Fuel Cell Provider for the market sale of its output.

k. the mechanism through which the Commission-regulated electric company, on behalf of a Qualified Fuel Cell Provider Project, shall distribute to its customers, through bill credits, any positive difference between the amount received by the Qualified Fuel Cell Provider for the market sale of its output minus the sum of (i) the price established for each MWH of output from the project plus (ii) the cost of fuel to produce such output plus (iii) any costs incurred by the Commission-regulated electric company arising out of the Qualified Fuel Cell Provider Project.

l. a provision that protects a Qualified Fuel Cell Provider from any future changes to this subchapter that would prevent a Qualified Fuel Cell Provider that provides service under approved tariff provisions from recovering all amounts approved in such tariff. Such provision shall also include the obligation of the Commission-regulated electric company, in the event of any such change to this subchapter, to collect from its customers amounts necessary to disburse, and to disburse to the Qualified Fuel Cell Provider the full amount approved by the Commission in such pre-existing tariff for each MWH of output produced by the Qualified Fuel Cell Provider Project.

m. In the event of an event of force majeure that prevents the Qualified Fuel Cell Provider from supplying output from at least 80% of the capacity of the Qualified Fuel Cell Provider Project, or an interruption in fuel supply, in whole or in part, to the project, a mechanism through which,

1. during the event of force majeure, the Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, collect from its customers and transfer to the Qualified Fuel Cell Provider, a maximum of 70% of the price per MWH of output affected by the event of force majeure, and during an interruption in fuel supply, the Commission-regulated electric company shall, on behalf of a Qualified Fuel Cell Provider Project, collect from its customers and transfer to the Qualified Fuel Cell Provider 100% of the price per MWH of output affected by the interruption.

2. during the event of force majeure or interruption in fuel supply, the Commission-regulated electric company will continue to receive the full reduction in renewable portfolio standards that would have been provided by the output but for the event of force majeure or interruption in fuel supply.

(2) All tariff filings must be approved or denied by the Commission in whole, as proposed, without alteration or the imposition of any condition or conditions with respect thereto by the Commission. In determining whether to approve or deny the Tariff, the Commission shall first ensure that the provisions of Section 364 (d) (1) a.-m. of this Title have been satisfied. In addition, the Commission shall consider the incremental cost of the Qualified Fuel Cell Provider Project to customers, applying at least the following factors:

a. Whether the Qualified Fuel Cell Provider Project utilizes innovative baseload technologies,

b. Whether the Qualified Fuel Cell Provider Project offers environmental benefits to the state relative to conventional baseload generation technologies,

c. Whether the Qualified Fuel Cell Provider Project promotes economic development in the State, and

d. Whether the Tariff as filed promotes price stability over the project term.

(3) A Commission-regulated electric company and Qualified Fuel Cell Provider may jointly modify proposed tariff provisions prior to any final ruling by the Commission.

(4) Notwithstanding Section 306 of Title 26 or any other provision of the Delaware Code to the contrary, any changes in rates or charges necessary to collect funds for disbursements or costs addressed in subsection 364 (a)-(c) of this section through adjustable non-bypassable charges shall become effective thirty (30) days after filing, absent a determination of manifest error by the Public Service Commission. The Commission may allow changes in rates or charges related to such adjustable non-bypassable charges to become effective less than thirty (30) days after filing under such conditions as it may prescribe.

(5) Once approved by the Commission, such tariff provisions cannot be altered, nor may approval be repealed or modified, without the agreement of both the Commission-regulated electric company and the Qualified Fuel Cell Provider except that revisions to tariffs may be proposed by the Commission-regulated electric company alone where:

a. Such revisions have no adverse effect on the Qualified Fuel Cell Provider, and

b. Such revisions are for the purpose of complying with subsection (c) of this section.

(e) For purposes of this Subchapter, all fuel cell units of a Qualified Fuel Cell Provider in a fuel cell project under tariff with a Commission-regulated electric company shall be considered to have been manufactured in Delaware as long as:

(1) By no later than the second anniversary of commercial operation of the full nameplate capacity of a fuel cell project, or December 31, 2016, whichever is earlier, either (i) at least 80% of the installed nameplate capacity shall have been sourced from fuel cell units manufactured in a permanent manufacturing facility located in the State or (ii) no more than ten megawatts of nameplate capacity from a fuel cell project shall be manufactured outside of the State, and

(2) Fuel cell manufacturer has executed an agreement with the Delaware Economic Development Office that a termination payment shall be made by the fuel cell manufacturer in the event that it ceases manufacturing operations in the State.

(f) Notwithstanding any other provision of the Delaware Code to the contrary, amounts due to the Qualified Fuel Cell Provider and amounts collected by the Commission-regulated electric company on behalf a Qualified Fuel Cell Provider as a result of a Qualified Fuel Cell Provider Project, and any other costs incurred by a Commission-regulated electric company addressed in Sections 364 (a) through (c) of this title shall constitute revenue property when, and to the extent that, a tariff authorizing the revenue charges have become effective in accordance with this section, and the revenue property shall thereafter continuously exist as property for all purposes with all of the rights and privileges of this section for the period and to the extent provided in the tariff, but in any event until the end of the term of service of the Qualified Fuel Cell Provider Project.

(g) Notwithstanding any other provision of the Delaware Code to the contrary, any requirement under this section or a tariff under this section requiring that the Commission take action with respect to the subject matter of a project under this section shall be binding upon the Commission, as it may be constituted from time to time, and any successor agency exercising functions similar to the Commission and the Commission shall have no authority to rescind, alter, or amend that requirement in a subsequent order except as provided in this chapter.

(h) Notwithstanding any other provision of the Delaware Code to the contrary except as otherwise provided in this chapter, with respect to revenue property, the tariffs with respect to disbursements and costs arising out of the Qualified Fuel Cell Provider Project and recovery of costs addressed in Sections 364(a) through (c) of this title shall be irrevocable and the Commission shall not

have authority either by rescinding, altering, or amending the tariff provisions or otherwise, to revalue or revise for ratemaking purposes the disbursements and costs arising out of the Qualified Fuel Cell Provider Project, or the costs of recovering such costs, determine that the disbursements and costs of the Qualified Fuel Cell Provider Project are unjust or unreasonable, or in any way reduce or impair the value of revenue property either directly or indirectly by taking project revenue amounts, disbursements or costs arising out of the Qualified Fuel Cell Provider Project into account when setting other rates for the Commission-regulated electric company; nor shall the disbursements, amount of revenues or costs arising with respect thereto be subject to reduction, impairment, postponement, or termination. Except as otherwise provided in this section, the State of Delaware does hereby pledge and agree with the owners of revenue property and the Commission-regulated electric company as the agent for collecting and disbursement on behalf of a Qualified Fuel Cell Provider Project and in collecting costs incurred by the electric company addressed in Sections 364(a) through (c) of this title that the State shall neither limit nor alter the revenue property and all rights thereunder until the obligations, are fully met and discharged, provided nothing contained in this section shall preclude the limitation or alteration if and when adequate provision shall be made by law for the protection of the Qualified Fuel Cell Provider and the Commission regulated electric company.

(i) Notwithstanding Section 201 of Title 26 or any other provision of the Delaware Code to the contrary, the courts of this State shall have exclusive original jurisdiction over any dispute between a Qualified Fuel Cell Provider and a Commission-regulated electric company involving the interpretation of the obligations between them as contained in Commission approved tariffs required by Section 364 (d) of this subchapter.".

Section 9. This Act shall be effective as of the date of its enactment.

SYNOPSIS

This Bill allows the energy output from fuel cells manufactured in Delaware that can run on renewable fuels to be an eligible resource to fulfill a portion of the requirements for a Commission-regulated utility under the Renewable Portfolio Standards Act. In addition, this Bill makes Delmarva Power & Light responsible for the RPS obligations of all its customers, and creates a process to assure that any supplier contracts in place are grandfathered through the transition. Finally, this Bill creates a regulatory framework by which the Delaware Public Service Commission will review a Tariff to be filed by Delmarva deploying Delaware-manufactured fuel cells as part of a 30MW project. In determining whether to approve or deny the Tariff, the Commission shall among other factors, consider the incremental cost of the fuel cell project to customers, taking into consideration whether the project utilizes innovative baseload technologies, offers environmental benefits to the state relative to conventional baseload generation, enhances economic development in the State, and promotes price stability over the project term.

Appendix B: Experience and Qualifications

New Energy Opportunities, Inc.

New Energy Opportunities, Inc. is a consulting firm with a focus on the procurement and sale of electric power and other products from generation facilities, especially those using renewable resources. Barry Sheingold, President of NEO, has over 20 years of experience in the design and structuring of long-term contracts for the purchase and sale of electric power, the design of competitive procurements, evaluating bids, and oversight of competitive procurements, including considerable experience with competitive procurements for long-term contracts involving renewable energy projects. Mr. Sheingold was formerly Senior Vice President of Citizens Power LLC, the nation's pioneering electric power marketing company, where he served in a senior business capacity after serving as General Counsel. Previously, Mr. Sheingold worked for Delmarva Power and Light Company, Delmarva's independent power development affiliate, Delmarva Capital Technology Company, and the Federal Energy Regulatory Commission. He is a graduate of Boston College Law School (*cum laude*) and New College, now the honors college of the Florida university system.

NEO has provided consulting assistance in the renewable energy field in a variety of capacities and for different types of clients. Mr. Sheingold has performed, or is performing, an independent evaluator function for renewable energy RFPs in several states, including Delaware (2006 Delmarva Power In-State Generation RFP, with La Capra Associates and Merrimack Energy Associates), California (2009 Southern California Edison Company ("SCE") Renewable Energy RFP and 2007 Pacific Gas and Electric Company Renewables RFO, both with Merrimack Energy Associates), Hawaii (2008 Hawaiian Electric Company Renewable Energy RFP), Oklahoma (2008 Oklahoma Gas & Electric Company Wind RFP, with La Capra Associates), Utah (2008 Pacificorp Renewable Energy RFP, with Merrimack Energy), Arizona (2008 Arizona Public Service Distributed Energy Resources RFP, with Merrimack Energy) and Oregon (2003 Portland General Electric RFP, with Merrimack Energy). In this capacity, Mr. Sheingold has authored or co-authored a variety of reports.

Mr. Sheingold has also represented a variety of public clients involving the procurement of renewable energy under long-term contracts. In Delaware, Mr. Sheingold has served or is serving as Commission staff consultant in the review of (a) three land-based wind power purchase agreements entered into by Delmarva Power in 2008, (b) Delmarva's SREC purchase contract with the Dover Sun Park Project, and (c) the proposed SREC procurement pilot program in PSC Docket No. 11-399. Over the past two years, Mr. Sheingold has consulted for the Massachusetts Department of Energy Resources with regard to its collaboration with the Commonwealth's investor-owned utilities in the design and implementation of a competitive bidding process for energy and renewable energy

certificates from renewable energy generators under long-term contracts. In 2003, Mr. Sheingold was the lead consultant in providing the conceptual and detailed design for the Massachusetts Technology Collaborative's competitive bidding program for the procurement of renewable energy certificates, and options on renewable energy certificates, under long-term contracts. The purpose of this program—the Massachusetts Green Power Partnership—was to provide financing support for new generation facilities in a competitive, deregulated market where long-term contracts were very difficult for developers to obtain. In addition, Mr. Sheingold was the principal consultant in developing the economic evaluation criteria, evaluating the bids from an economic perspective, and advising on contract negotiations with the winning bidders. He collaborated with La Capra Associates in the conduct of the bid evaluation.

Mr. Sheingold has also advised the New York State Energy Research and Development Authority ("NYSERDA") in its program of procuring generation attributes from renewable energy projects under long-term contracts in implementing the New York Renewable Portfolio Standard, again working with La Capra Associates. He has advised the Town of Fairhaven, Massachusetts in the design of a competitive procurement, bid evaluation and contract negotiations involving the leasing of town land to a developer of a wind energy project and the purchase of power from the project. In 2003, he testified on behalf of Hydro-Quebec Distribution in the regulatory review of power contracts resulting from a competitive procurement with respect to confidentiality issues. He has assisted the State of Rhode Island, in conjunction with La Capra Associates, regarding a Request for Proposals for offshore wind projects. In 2010, he testified on behalf of the Nova Scotia Consumer Advocate regarding the proposal by Nova Scotia Power, Inc. to build a biomass-fired power plant.

For private clients, Mr. Sheingold has provided due diligence and other negotiation assistance regarding commercial arrangements associated with project development for onshore wind farms (Iowa, Texas, Colorado, New York, Vermont and Maine), offshore wind farms (Ireland) and other types of generation projects.

Mr. Sheingold has many years of relevant experience, both from a commercial and legal perspective. As Senior Counsel with Delmarva Power in the 1980s, he helped in developing the company's first competitive power procurement under long-term purchase contracts. The RFP was issued after Mr. Sheingold left the company in early 1989 to take the position of General Counsel and Vice President at Citizens Power, the nation's first independent electric power marketing company, where he played an important role in pioneering market-based ratemaking for power marketers (and later independent power producers) with the 1989 *Citizens Power* decision at the Federal Energy Regulatory Commission. At Citizens Power, Mr. Sheingold specialized in long-term contracts between generators and utilities and the restructuring of those contracts, working for both buyers and sellers and for Citizens Power acting as a principal. He advised clients in a variety of competitive power procurements in Massachusetts, Oregon, New Jersey, Indiana, California, Maryland, Nevada and elsewhere.

La Capra Associates, Inc.

La Capra Associates is an employee-owned consulting firm which has specialized in the electric and natural gas industries for more than 25 years. The firm's expertise includes power market policy and analysis (wholesale, retail, and renewable), power procurement, power resources planning, economic/financial analysis of energy assets and contracts, and regulatory policy. La Capra Associates has been involved in many aspects of the renewable energy sector over the past decade. As a firm, La Capra Associates has conducted a number of renewable resource potential and economic impact analyses for various states (Massachusetts, New York, North Carolina, Connecticut, South Carolina, and Arkansas). The company also has power markets modeling expertise, especially in the Northeast and Mid-Atlantic regions. La Capra Associates analyzes renewable energy certificate markets, by developing an understanding of project economics, tracking of proposed projects and RPS regulations. Furthermore, the firm provides transaction advice, financial modeling and asset valuation support to private and government entities seeking to sell renewable output and certificates and engage in purchases of renewable energy, including through long-term PPAs The firms has extensive experience in regulatory proceedings involving analysis of power purchase agreements and utility investment in renewable energy projects. La Capra Associates staff has provided testimony in a number of regulatory proceedings in the Northeast, including review of solar as a non-transmission alternative to the Maine Power Reliability Project and evaluation of the proposals of National Grid and Western Massachusetts Electric to purchase and install solar facilities throughout their service territories in Massachusetts.

Alvaro E. Pereira, Ph.D., a Managing Consultant at La Capra Associates, plays a major role in the firm's activities in the renewable energy sector. He has extensive familiarity with project development and market issues in the Northeast and has conducted and examined a number of market forecasts, including energy, capacity, and reserve markets, for use in renewable project analyses. He has hands-on experience with power markets modeling, financial modeling, and power project economics. In addition to working with NEO on the Dover Sun Park Project, and the proposed SREC procurement pilot program in PSC Docket No. 11-399, Dr. Pereira has examined the viability of an off-shore wind facility for the Town of Hull and has provided testimony regarding the solar installation proposals of National Grid and Western Massachusetts Electric in Massachusetts. For private clients, Dr. Pereira provides advisory services related to power and REC procurement and the feasibility of signing long-term PPAs. He has advised the Massachusetts Water Resources Authority regarding the entry into a 20-year PPA for solar and is currently advising Amtrak regarding a similar PPA for a solar facility in Pennsylvania. Prior to joining La Capra Associates, Dr. Pereira was at the Massachusetts Division of Energy Resources for nearly 9 years as the head of a group responsible for economic and technical analyses of policies, programs, and regulatory filings. Dr. Pereira also served as Senior Lecturer at the Massachusetts Institute of Technology where he taught graduate-level courses on Regional Economic Impact Analysis and Transportation

Economics. Dr. Pereira received a Ph. D. in regional economics at the Massachusetts Institute of Technology.

Birch Tree Capital, LLC

John Harper is a senior finance professional who founded and leads Birch Tree Capital, LLC, an independent financial advisory firm helping clients finance renewable power projects. Mr. Harper has over 25 years of experience in structuring project equity and debt for power and other infrastructure projects. He assists national, state, and local public entities on shaping clean power financing incentives and sourcing clean power for their constituents. The firm advises strategic and institutional investors and project developers on structuring equity and debt financing for specific projects. Birch Tree Capital is experienced in the challenge of clean power companies financing projects deploying innovative clean power technology. From 2007-2009, Mr. Harper was Treasurer and Vice President, Finance for Ze-gen, a venture capital-backed clean power company, where he closed venture debt and Series B equity investments and directed internal corporate finance activities. Mr. Harper advises the National Renewable Energy Laboratory on financing for solar power projects and was the lead author for a major 2007 Lawrence Berkeley National Laboratory report on wind project financing structures. Prior to Birch Tree Capital, John financed electric power projects for Electricité de France, ABB, Wärtsilä, and for the Overseas Private Investment Corporation. He is an advisor to the New England Clean Energy Council and member of the American Council on Renewable Energy. He holds a B.A. from Pomona College and a M.A. in Law & Diplomacy from the Fletcher School of Law & Diplomacy at Tufts University.