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Our Ref: B-R28

POSTED ON WWW.RAB.BM

12 May 2017

Regulatory Authority
1st Floor, Craig Appin House
8 Wesley Street
Hamilton HM 11

Attention: Nigel Burgess, Senior Manager Electricity Analysis and Planning

Dear Sirs,

Re: Response to Consultation Document 17-0316: Comments on Regulatory Authority Emergency General Determination

Bermuda Electric Light Company Limited ("BELCO") hereby submits its response to the Regulatory Authority's (the "Authority") consultation document entitled, "Consultation on the Regulatory Authority (Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme) Emergency General Determination" dated 16 March 2017 and updated on 17 and 24 April 2017 (the "Consultation"). As requested by the Authority, BELCO's responses to the questions raised in the Consultation are set out below using the Authority's numbering.

1. What is your view of the how Solar PV has evolved in Bermuda? Please provide views on the uptake of this technology.

The history of the evolution of Solar PV in Bermuda is complex and lengthy. BELCO does not propose to repeat the entire history here and only includes a summary below, but for the sake of completeness, a chronology setting out BELCO's involvement in Solar PV renewable energy in Bermuda from 2009 is provided in the Appendix hereto (the "Chronology").

Solar PV was first introduced as a source of renewable energy generation in Bermuda in 2009 and has proven to be a popular option for Bermuda's residents. In 2009, the Department of Energy of the Government of Bermuda introduced the Solar Photovoltaic Rebate Initiative (the "SPRI") which included the provision to residents who installed Solar

PV panels on their homes with up to $5,000 for such installations. As the rebates paid to residents far exceeded the $500,000 initially allocated, the SPRI was terminated in 2014.

BELCO's net metering scheme (the "Scheme") also exceeded expectations. Recognizing the emerging value of Solar PV renewables for the community, BELCO unilaterally introduced the Scheme in 2010. It was intended that the Scheme would be reviewed after the entry of 200 participants, but the review did not come until more than 300 participants had entered the Scheme.

After reviewing the Scheme in 2016, BELCO continued to operate the Scheme but closed it to new entrants. At the same time, BELCO proposed for new residential and commercial Solar PV entrants a new scheme which would see its participants receive transitional rate treatment (the "Transitional Scheme"). Both the Scheme and the Transitional Scheme would continue to operate in tandem until regulations implementing the provisions of the Electricity Act 2016 ("EA") could support another more permanent approach. The Energy Commission (the "EC"), which then regulated energy in Bermuda, was informed of BELCO's plans with respect to the Scheme and of the Transitional Scheme by way of a letter dated 15 August 2016 (the "August Letter") and a supplemental letter dated 16 September 2016 (the "September Letter").[1] BELCO awaited approval of the Transitional Scheme.

Bearing in mind that the Scheme was never intended to continue indefinitely, the further reasons for the Scheme's closure to new entrants were set out in BELCO's August Letter. Those reasons were largely economic (as were the Government's reasons for unilaterally ceasing the SPRI). In particular, the original entrants to the Scheme were compensated for excess monthly generation at the sum of the highest tier retail rate plus the Fuel Adjustment Rate, and this resulted in a subsidy to the Original Entrants (as defined in the next paragraph) above the economic benefit of the power generated. It was also argued that the avoided cost treatment was the measure required by the EA.

Despite suggestions in the Determination (as defined below) that BELCO has ceased payments in relation to Solar PV energy systems in Bermuda, BELCO has never ceased any payments to the initial entrants to the Scheme or to those residents who had demonstrated that they had commenced construction of Solar PV systems on or before 15 August 2016 (together the "Original Entrants"). After all, the Scheme was not terminated and was simply closed to new entrants.

Given the transition of electricity regulation to the Authority in October 2016, the Authority did not provide a response in connection with the future of the Scheme or the Transitional Scheme until more than six months later through the Emergency General Determination entitled, "Emergency General Determination pursuant to Section 66(2) of the Regulatory

[1] Copies of those letters may be found at: https://www.gov.bm/sites/default/files/BELCO-Report-20160815.pdf and http://belco.bm/images/stories/pdf/belco_net_metering_filing_sept162016.pdf

Authority Act 2011 Concerning Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme" dated 2 March 2017 (the "Determination"). Prior to 2 March 2017, stakeholders were hamstrung.

Solar PV provides diversity of power generation in Bermuda and is a cleaner energy source when compared with traditional sources. Recent events, including the delay in the Authority providing a response to BELCO's Transitional Scheme and the migration of Original Entrants to the Authority's revised form of BELCO's Transitional Scheme, have led to confusion and uncertainty for stakeholders. It is hoped that such confusion and uncertainty will be resolved swiftly for the economic and environmental betterment of Bermuda.

2. Looking to the future, how important do you believe Solar PV is for Bermuda? If a respondent views Solar PV as important please provide your views on what its costs and benefits are, how these should be quantified, and how these should be reflected in the framework for electricity regulation.

BELCO believes that solar generated power, both utility-scale and in distributed generation, should form a part of a diversified generation portfolio for Bermuda. While not all of Bermuda's generation needs can be met through solar generation given its interruptible nature, the use of this renewable resource should be utilized to the extent it is cost effective and fair to BELCO's ratepayers.

Presently, the cost per unit of energy produced by Solar PV systems is more expensive (due to its limited capacity factor) and more volatile (due to its intermittent nature) than traditionally-generated electricity. In BELCO's Integrated Resource Plan filed with the EC on 30 June 2016, it was noted that use of Solar PV would be most economic if large-scale community Solar PV options were made available to all customers.

In terms of its benefits, Solar PV energy provides diversity of generation and is a cleaner source of energy.

BELCO believes that the costs and benefits of Solar PV in Bermuda should be quantified through a study analyzing the same.

3. **Should there be capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within a formal licensing framework?**

Save that each case will necessitate a consideration by BELCO as to whether the grid has capacity to accept the energy generated without a resultant negative impact on the grid and other electricity customers, there should be no limit on system sizing.

BELCO notes that the EA already provides that the licence threshold for generation is to be prescribed by regulations and that licences are contemplated only for bulk generators (those generators with capacity above the licence threshold). Through this framework, BELCO can be partially assured that those customers who ought not to benefit from feed-in-tariffs will be excluded and required to negotiate power purchase agreements. To that

end, BELCO provisionally suggests that the licence threshold be set at 0.5 MW subject to a study which determines an alternative minimum threshold.

Residential Solar PV generators who are not installing and using Solar PV systems for financial gain, should not be disincentivized by any requirement that they obtain licences.

a. If so, who should be responsible for assessing the system sizes and their limits (BELCO, Department of Planning, RAB, etc.)

BELCO should be responsible for assessing the system sizes and their limits. As the Transmission, Distribution and Retail Licensee, BELCO will be negotiating the power purchase agreements and Standard Contracts (both defined in the EA) with customers and will be best placed to assess the system and ensure compliance with the Grid Code (as also defined in the EA).

b. Should Solar PV system sizing for a customers' premises be limited to the prior 12-month consumption of a residence/business and/or should it be based on forecasted consumption?

For the reasons set out above, system sizing should be based on neither the prior 12-month consumption of a residence/business nor forecasted consumption.

4. The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commission recommendations of October 2016 (see the Determination for detail). What are your views on this transitional measure?

Clarifications

Prior to BELCO stating its views on the transitional measure, BELCO believes it is necessary to clarify some of the history surrounding the Determination[2].

In its August Letter, as part of the Transitional Scheme, BELCO requested approval for an avoided cost methodology to apply to entrants to the Transitional Scheme. It was proposed that this avoided cost feed-in-tariff (the "Avoided Cost Rate") would be available on a first come, first served basis for two years but would be capped at 350 new customers. By way of an example based on current costs, BELCO explained that as at the date of the August Letter, the Avoided Cost Rate would be $0.1736 per KWh. The Original Entrants, as continuing participants in the Scheme, would receive the rate that they had always received – the highest retail tariff rate plus the Fuel Adjustment Rate. Further details about the avoided cost methodology, including the intended treatment of different classes of customers within the Transitional Scheme and the timing of compensation, is set out in the August Letter and the September Letter.

Although there were some oversights further explained below, the Determination initially appeared to take on board BELCO's Transitional Scheme. The appearance that BELCO's

[2] The following represents a synopsis of events, but full details are set out in the Chronology.

recommendation had been taken on board was soon clarified, however, when the Authority then released a Clarifying Order on 17 April 2017 (the "Order"). While the Determination had provided that **excess energy** was to be compensated in a particular manner, in the Order, the Authority stated that **all energy** exported to the grid was to be sold at a rate of $0.1736 per KWh. This change in direction by the Authority represented a markedly different financial outcome for the Original Entrants and prospective participants in the Transitional Scheme.

BELCO's Views

BELCO's views on the transitional measure in its current form are neutral save that (1) the Avoided Cost Rate should be updated on a monthly basis; (2) the transitional measure, and any more permanent measure to follow, should not initially apply to the Original Entrants in the Scheme; and (3) the Determination incorrectly defined the Commercial Renewable System Excess Energy Rate (the "CRSEER").

(1) Monthly Update

It should be noted that BELCO never proposed a rate of $0.1736 per KWh. On page 4 of the September Letter, BELCO wrote, "[t]he tariff will be recalculated monthly based on projected kilowatt hour sales, fuel and lubricant costs and grid losses and will be subject to monthly review by the regulator as is the Fuel Adjustment Rate ("FAR")." The rate of $0.1736 per kWh simply represented the worked through result of the methodology BELCO had proposed. Customers should be able to benefit from changes in projections and relevant costs. BELCO had also noted that the methodology should be altered as advanced metering is deployed to allow a more refined approach.

(2) The Avoided Cost Rate Should Not Initially Apply to Original Entrants

While BELCO believes that the Avoided Cost Rate should apply to entrants in the Transitional Scheme, it also believes that the Original Entrants, who form part of the Scheme, should continue to enjoy the benefit they enjoyed prior to revocation of that benefit by the Authority on 2 March 2017. The Scheme never ended, so despite indications to the contrary by the EC and the Authority, it was never suggested by BELCO that the Original Entrants should lose the rate which had incented them to engage in renewable energy generation at the outset.

Original Entrants had a legitimate expectation that they would be able to recover their investment, and BELCO proposes that they continue to benefit from the rate they had erstwhile enjoyed until 7 years from the date of their execution of an agreement with BELCO. After that period, the Original Entrants will be migrated to the feed-in tariff determined in accordance with the EA. This period of 7 years represents the approximate period required in order for these investors to realize the return on their investment. As the Authority notes itself in Paragraph 4(3) of the Schedule to the Determination, "when the Scheme was originally implemented

BELCO created an expectation on the level and frequency of the payments to be received and customers made important financial decisions based on these expectations."

BELCO believes that the Authority has unnecessarily opened itself up to legal action by the implementation of the transitional measures set out in the Determination in a manner contrary to what was proposed by BELCO in the August Letter and the September Letter.

(3) Incorrect Definition of the CRSEER

The Determination defined the CRSEER as the, "the sum of BELCO's highest retail rate plus the Fuel Adjustment Rate." This is incorrect, as the CRSEER is in fact strictly comprised of the avoided fuel costs and was only paid to commercial solar PV customers. Residential PV customers received the sum of BELCO's highest retail rate plus the Fuel Adjustment Rate.

5. What level and type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed-in tariff for electricity provided by Solar PV? In particular:

a. The Authority intends to mandate full accounting separation between BELCO's (i) generating, and (ii) transmission, distribution and retail activities. Please provide your views on specific aspects of BELCO's operational activities that are relevant to the cost transparency and related determination of the feed-in tariff rate?

The specific aspect of BELCO's transmission, distribution and retail activities which is relevant to the cost transparency and the related determination of the feed-in-tariff is the sum of the avoided transmission losses. The specific aspects of BELCO's generation activities relevant to the cost transparency and related determination of the feed-in tariff rate are the avoided fuel costs, taxes and avoided lube oil. Other relevant aspects could be captured in the marginal cost of service study BELCO proposes below.

b. What levels of cost element transparency would you expect within a BELCO feed in tariff for Solar PV?

BELCO believes that the appropriate level of transparency would be achieved through the Authority's annual request of a marginal cost of service study to be produced by BELCO.

6. What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs? Alongside any general comments by respondents please provided responses to the following:

a. Should BELCO's Solar PV Metering Scheme reflect a cost-benefit methodology or an avoided cost methodology?

Given that the electricity sector is now governed by the EA and the Regulatory Authority Act 2011, BELCO believes that the tariff methodology for any Solar PV scheme should be

developed in a manner which is consistent with the governing legislation. Section 36 of the EA provides as follows:

> *36 The Authority shall determine the feed-in tariff in accordance with the methodology set by general determination and in accordance with the following principles—*
>
> *(a) the rate shall seek to allow compensation for, at most—*
>
> *(i) the actual cost of generation that the TD&R Licensee avoids by purchasing power from distributed generation; and*
>
> *(ii) an estimate of any economic benefits from distributed generation;*
>
> *(b) the term of validity of the tariff shall be at least equal to the expected useful lifetime of the system used and maintained efficiently.*

BELCO further reiterates its comments on this point as more particularly set out on page 13 of its August Letter located at: https://www.gov.bm/sites/default/files/BELCO-Report-20160815.pdf and pages 8 - 9 of its September Letter located at: http://belco.bm/images/stories/pdf/belco_net_metering_filing_sept162016.pdf.

b. What cost rate design for Solar PV participants is best suited to incentivizing greater utilization of cleaner energy sources and technologies in Bermuda?

The feed-in tariff must be determined in accordance with the legislatively-determined requirements set out in Section 36 of the EA. Any other incentives would need to exist outside the present regulatory framework. While the EA appears to contemplate one feed-in tariff for all sources of renewable energy, BELCO notes its view that different sources of renewable energy have different costs and the Authority should consider whether to implement more than one feed-in tariff.

c. What other factors should be considered in determining the cost rate design for feed in tariffs?

As stated above, the EA provides the basis for the determination of the feed-in tariff.

7. Should Solar PV or other renewable energy programs be incentivized within a specific regulatory framework for renewables in Bermuda?

The EA provides that one of its purposes is to promote the use of cleaner energy sources and technologies, including alternative energy sources and renewable energy sources. The EA further provides that one of the functions of the Authority is to carry out the EA's purposes. Should there be no other means available to the Authority to fulfill its function, then it, or the Minister, may take the view that it is necessary to incentivize Solar PV or other renewable energy programs through a specific regulatory framework. If invited, BELCO would participate in any consultations on such matters.

8. In your view, are there any barriers to Solar PV or other forms of renewable generation investment?

a. If so, what are these barriers?

Each form of renewable generation will be impeded by its own barriers, but with respect to Solar PV renewable generation investment, the barriers are the high cost of the technology, the low capacity factor and the extreme variability of the generation.

b. How could they be removed to enable further investment?

BELCO believes that possible solutions to encourage further investment include the following:

- utility-scale solar PV investment;
- incenting of battery storage and dispatch, as was contemplated by the EC in its Net Metering Inquiry Response presented to the Minister of Economic Development on 11 October 2016, but at BELCO's substations or central hub sites; and
- community solar farm programs which would lower costs and make Solar PV more accessible to all customers.

BELCO looks forward to the outcome of this public consultation and to working with the Authority to advance Solar PV and other renewable energy solutions on the island.

Yours faithfully,

Sean Durfy
President and Chief Executive Officer

Appendix

Chronology Relating to BELCO's Involvement in Solar PV Renewable Energy

2009 – The Department of Energy of the Government of Bermuda (the "Department") introduced the Solar Photovoltaic Rebate Initiative (the "SPRI").

2010 – BELCO introduced its solar photovoltaic net metering scheme (the "Scheme").

2014 – The Department suspended the SPRI.

15 August 2016 – BELCO advised the Energy Commission (the "EC") that it would close the Scheme to new entrants and proposed a new scheme (the "Transitional Scheme"). A copy of the letter (the "August Letter") may be found at: https://www.gov.bm/sites/default/files/BELCO-Report-20160815.pdf

26 August 2016 – Under Section 5(1) of the Energy Act 2009, the Minister of Economic Development (the "Minister") requested that the EC inquire into BELCO's actions with respect to the Scheme.

16 September 2016 – As per the Minister's request, BELCO submitted additional information to the EC to support the inquiry. A copy of relevant letter is located at: http://belco.bm/images/stories/pdf/belco_net_metering_filing_sept162016.pdf

11 October 2016 – the EC presented to the Minister of Economic Development a report entitled "Net Metering Inquiry Response" (the "EC Response"). A copy is located here: https://www.gov.bm/sites/default/files/Energy-Commission-Net-Metering-Inquiry-Response111016.pdf. The EC Response made recommendations relating to BELCO's Transitional Scheme.

26 October 2016 – A press release issued by the Ministry of Economic Development entitled "Report on the Inquiry into BELCO's proposed Termination of the Net Metering Scheme," a copy of which may be found at: https://www.gov.bm/articles/report-inquiry-belco%E2%80%99s-proposed-termination-net-metering-scheme, indicated that the EC had recommended that the Regulatory Authority (the "Authority") should, as a matter of priority, "conduct a more thorough Solar PV economic and market study to create a comprehensive rate determination methodology."

28 October 2016 – The Electricity Act 2016 became operative and the Authority assumed regulatory oversight of the electricity sector. Given that the EC had not responded to the August Letter, the Authority became responsible for considering the same.

16 December 2016 – BELCO sent a letter to the Authority with respect to certain matters that were pending or had arisen since 28 October 2016, including the Transitional Scheme and requested that the Authority give consideration to the recommendation made by the EC (the "December Letter").

22 December 2016 – the Authority acknowledged BELCO's December Letter and said it would be addressing the Transitional Scheme during the course of establishing certain standards, methodologies and procedures.

17 January 2017 – In a compliance filing, BELCO raised with the Authority the impasse relating to the Transitional Scheme.

26 January 2017 – the Authority asked BELCO to provide additional information about the Transitional Scheme (the "Information").

6 February 2017 – BELCO provided the Information to the Authority.

13 February 2017 – In response to conversations with various solar equipment providers, BELCO circulated a letter to a number of them stating in part:

> "Pursuant to the Act, BELCO's request for approval of its new feed-in-tariff for new solar PV customers (the "Approval Request"), which had been pending before the EC, was transferred to the Authority for consideration.
>
> The Authority has only governed the electricity sector for a short time and is currently in transition. It is aware of BELCO's Approval Request, but to date, BELCO has not been granted any necessary approvals in connection with the Approval Request or the Matter and is unable to proceed with any schemes relating to either. We understand that the Authority is required to give due consideration to the Matter and the Approval Request before reaching any related decisions."

Communications with solar equipment providers continued.

14 February 2017 – BELCO submitted to the Authority a copy of the letter that had been sent to the solar equipment providers.

2 March 2017 – The Authority issued an Emergency General Determination entitled, "Emergency General Determination pursuant to Section 66(2) of the Regulatory Authority Act 2011 Concerning Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme" (the "Determination") that provided for the adoption of transitional measures relating to the Scheme. A copy of the Emergency General Determination is not separately posted on the Authority's website but may be found at Annex 1 of the first version of the Consultation (as defined below) found here: http://rab.bm/index.php/k2-information/ele-consultations/emergency-general-determination-solar-net-metering/1484-17-03-16-consultation-on-emergency-general-determination-solar-net-metering/file

9 March 2017 – BELCO, in writing, raised with the Authority factual inaccuracies in the Determination and the practical steps BELCO would need to take in order to comply with the Determination. Specifically, BELCO noted the following:

- Despite the Authority's contention that BELCO had ceased payments in relation to all Solar PV energy systems, those customers who had executed a Small Scale Renewable

Generator Interconnection Agreement (the "Agreement") with BELCO between 2010 and 14 August 2016 and those customers who had been able to demonstrate having commenced construction of systems on 15 August 2016, continued to receive payments.

- As per the Agreement, BELCO could not implement the Authority-mandated compensation mechanism changes without first providing existing customers with 30 days' notice.

- The Agreement needed to be amended to become workable for new customers.

10 March 2017 – The Authority responded to BELCO directing BELCO to implement the obligations within the Determination and confirmed that the transitional measures were applicable to systems between 0.15MW and 0.5MW.

16 March 2017 – The Authority published the first version of the consultation document, entitled "Consultation on the Regulatory Authority (Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme)." The deadline for responses was set at 27 April 2017 (the "Consultation"). A copy of that first version of the Consultation may be located at: http://rab.bm/index.php/k2-information/ele-consultations/emergency-general-determination-solar-net-metering/1484-17-03-16-consultation-on-emergency-general-determination-solar-net-metering/file

20 March 2017 - As contractually required under the Agreement, BELCO posted a notice on its website that certain changes to the compensation mechanism had been necessitated by the Determination. That notice can be found here: https://belco.bm/index.php/services/rules-a-rates

20 March 2017 – BELCO wrote to the Authority in response to the Authority's letter of 10 March 2017. It confirmed that it would comply with the Determination but noted the ways in which it would be unable to comply, as a matter of law, unless it made certain required changes to the Agreement. A copy of the Agreement was attached for the Authority's better understanding.

10 April 2017 – BELCO wrote to the Authority to highlight the typographical errors and factual inaccuracies in the Consultation (the "10 April Letter").

17 April 2017 – The Authority issued a Clarifying Order regarding the Determination which stated, in part: *"For the avoidance of doubt,* ***all energy exported to the grid*** *by Scheme Participants will be sold to BELCO at a rate of $0.1736 per KWh. All energy imported from the grid by Scheme Participants shall be sold by BELCO at BELCO's standard approved tariff, inclusive of fuel surcharges. These payments shall be reconciled on a monthly basis and in the event of a credit to the Solar PV Participant, BELCO will provide a monthly payment to the Solar PV Participants,"* (the "Order").

17 April 2017 – the Authority issued the second version of the Consultation that corrected the typographical errors that had been highlighted by BELCO in the 10 April Letter. That version may be found here: http://rab.bm/index.php/k2-information/ele-consultations/emergency-general-

determination-solar-net-metering/1487-17-04-17-net-metering-egd-consultation-document-version2-clean/file

18 – 20 April 2017 – BELCO sought clarity from the Authority over the discrepancy between the directive in the Determination and that in the Order. More specifically, the Determination directed BELCO to pay certain amounts to Solar PV Participants "in respect of any excess energy generated," while the Order directs BELCO to sell all energy exported to the grid by program participants at a rate of 17.36 cents/kWh.

The Authority ultimately confirmed to BELCO that, *"For the avoidance of doubt, **all energy exported to the grid** by Scheme Participants will be sold to BELCO at a rate of $0.1736 per KWh. All energy imported from the grid by Scheme Participants shall be sold by BELCO at BELCO's standard approved tariff, inclusive of fuel surcharges. These payments shall be reconciled on a monthly basis and in the event of a credit to the Solar PV Participant, BELCO will provide a monthly payment to the Solar PV Participants."* This correspondence is contained and summarised in the Ex Parte Communication (as defined below).

19 April 2017 – BELCO advised the Authority that BELCO would require at least two weeks to implement the billing system changes that had been necessitated by the Order. Additionally, having previously given 30 days' notice to existing customers in respect of the changes set out in the Determination, the Authority was informed by BELCO that the new change would require an additional 30 day notice cycle.

21 April 2017 – BELCO wrote to the Authority in compliance with Section 73(2) of the Regulatory Authority Act 2011 (the "Ex Parte Communication") in connection with the conversations held between BELCO staff and the Authority between 18 and 20 April (referenced above). A copy of the Ex Parte Communication is located at: http://rab.bm/index.php/consultations-landing-menu/ex-parte-communications/emergency-general-determination-solar-net-metering-1/1498-belco-letter-to-ra-dated-21-april-2017-b-23/file

24 April 2017 – the Authority published version 3 of the Consultation – located at: http://rab.bm/index.php/k2-information/ele-consultations/emergency-general-determination-solar-net-metering/1490-17-04-24-net-metering-egd-consultation-document-version3/file – which BELCO understands extended the deadline for responses to 12 May 2017.

5 May 2017 – As required under the Agreement, BELCO posted on its website notice of the changes to the Agreement that had been necessitated by the Order. A copy of the notice may be found here: https://belco.bm/index.php/services/rules-a-rates

Claire A Smith
19 Hinson's Island
Paget

26 April, 2017

Regulatory Authority of Bermuda
Hamilton

RE: Response to Matter17-03-16 Transitional Measures for Bermuda Electric Light Company Solar Net Metering Scheme

Its is my impression that BELCO has demonstrated a lack of forward thinking for the last 20 years, despite lots of encouragement to the opposite. An energy expert friend of mine had a meeting with past CEO Vince Ingham over 12 years ago urging him to bring solar hot water heating to the island. The ROI on this technology make it extremely viable. Nothing was done. IN the same vein, BELCO could have offered to finance solar panels on their customers roofs, with a billing system that makes payback easy, and again, financially viable. This was also not done. Instead BELCO sat under a cosy blanket of requesting rate increases and mostly receiving them. There is no incentive for them to run a more efficient business, and no incentive for them to encourage their customers to use less electricity. As well by encouraging alternative energy they are shooting themselves in the foot. Its not surprising that BELCO is fighting against solar energy and net metering because they are more concerned with selling more power.

Answers to questions:

1. *What is your view on how Solar PV has evolved in Bermuda? Please provide views on the uptake of this technology.*
   I think that solar PV energy production has not yet reached 1% of the total Mwatt demand in Bermuda. This is dismal especially considering the amount of sunshine we get here, and also the high rate of power. Putting up solar panels is a good investment, and also fuels a local industry hiring a lot of people.

2. *Looking to the future, how important do you believe Solar PV is for Bermuda?*

   I think its very important that Bermuda do our part to combat global warming, particularly given our vulnerability to rising seas. At the same time, reliance on fossil fuels, a resource we know will run out, doesn't seem very sensible. It gives me great pleasure to know my power is being generated in a non polluting way, and that my panels contribute to reducing my carbon footprint on the planet.

   3.
   Should there be capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within the formal licensing framework?

   I don't think there should be any capacity limits. More clean power is a good thing and should be encouraged.

3. The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commissions recommendation of October 2016. What are your views on tis transitional measure?

   I support the return of the reinstatement of net-metering as was in place when I installed my panels 3 years ago until there is far more capacity installed. I do not agree that the rate should be fixed at $0.175. It is not clear to me if this amount truly encompasses all the variable costs of production. The uptake of solar PV has been very low and I would suggest that it is in Bermuda's economic interests to revert to the higher fed-in rate, until the numbers become significant.

4. What type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed-in tariff for electricity provided by Solar PV.

My facilities charge on my bill is $39.95 a month. Before I put panels on my roof my bill was running about $140 a month. This means that BELCO is collecting about 28% of my bill for what exactly? I find this facilities charge, if you multiply that by the approximate 20,000 households, this comes to $9.6 million dollars a year. This is a lot of money to charge on top of an already high rate for power.
BELCO should be completely transparent to everyone.

5. What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs?

   In the short and medium term a net-metering scheme that incentivizes solar PV participation without unduly impacting BELCO should be favored. I believe that in the short term (during the review period) that would mean the return of the CRSEER programme. In the long term continuation of the simple net-metering program would incentivize participants to a greater extent than a dual metering system.

6. Should Solar PV or other renewable energy programs be incentivized within a specific regulatory framework for renewables in Bermuda?

   I believe it is generally in Bermuda's interest to incentivize all renewables.

7. In your view are there any barriers to Solar PV or other forms of renewable generation investment?

The largest barrier is that people don't have enough capital to invest in solar panels. They are a good investment if you have the money. As mentioned above, it would be possible to launch a solar panel fund in conjunction with BELCO where Bermudians could invest in the fund which installs panels on peoples rooves, and BELCO collect the payments through their existing billing system.

http://belco.bm/images/stories/pdf/belco_net_metering_filing_sept162016.pdf

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13th May, 2017

Re: Response to Consultation Document 17-03-16

Dear Sirs

I am writing in response to the above consultation document. I have not attempted to answer every question on the document, but hopefully my views below provide answers to several of the questions.

Background

My wife and I are building a new house. In June 2016, after seeking quotes from several suppliers and evaluating the economic basis of our investment, we decided to invest in a solar installation. We aimed to install a system that would produce enough electricity to cover on average the majority, but not all, of our electricity needs. In August 2016 we became aware that BELCO, without any prior notice, decided to change the basis on which solar customers were billed. However, based on various communications by BELCO, we understood that the net effect of the proposed changes would be a change from a 6 monthly netting period to a monthly netting period. Although the return on our investment was materially worse than the initial indications we nevertheless decided to proceed with our solar installation and filed for a planning permission in September 2016. In late April 2017 we became aware of the Regulatory Authority's Emergency General Determination (EGD) and associated consultation document. The sequence of communication around the EGD was frustrating. There was no attempt to reach solar installation permit holders to communicate changes. Furthermore the wording of the EGD document as well as subsequent clarification documents issued by the RAB is ambiguous. In my reading at least, various documents appear to contradict each other. Up until last week we, and our solar suppliers, did not have a clear understanding of the proposed tariff basis on the EGD. Based on our current understanding of the tariff basis proposed in the EGD, if this is tariff was in place at the time of evaluating our investment in solar energy it is highly unlikely that we would have proceeded with a decision to invest in a solar installation.

Views on the importance of Solar Installations in Bermuda (questions 1, 2, 7, 8,)

I believe that both for strategic and environmental reasons encouraging the adoption of solar energy is very important to Bermuda.

1. Bermuda currently relies mainly on imported oil for it's energy needs. At the same time Bermuda is blessed with a good deal of sunshine throughout the year. It would make good strategic sense to limit the dependency on an imported resource especially as the price can be subject to wide fluctuations. Encouraging the private sector to adopt a sustainable technology that uses Bermuda's natural resources is good strategy.
2. Environmental concerns. Solar energy generation is clean and environmentally friendly in contrast to the current oil based facilities in Bermuda. One only has to be downwind in Hamilton on a windy day to feel the difference!
3. Despite an initial investment required I believe that solar energy will prove to be a cheaper form of energy thus eventually reducing the high cost of electricity in Bermuda, a major contributor to the high cost of living.

Bermuda, in my limited non-expert experience, has been a slow adopter of solar energy. I can only compare with my country of origin (Cyprus) where the adoption of solar occurred much earlier. Solar energy adoption in Cyprus has been encouraged by government through significant subsidies. Cyprus is also an island with no natural energy resources but also blessed with plentiful sunshine. In the early stages of adoption, the feed in tariff was significantly ***in excess of*** the local electricity tariff rates. So solar users could not only offset their own solar production against their consumption they were actually paid an additional amount for producing clean solar energy ! Several years of following initial adoption the tariff system was modified to a net metering system similar to what Bermuda operated until 2016. (Note: there were of course limits to the capacity of installation roughly equal to the projected consumption of the house, so residential customers could not abuse the system)

This is the only other case I am familiar with but it demonstrates that for strategic reasons the government did not adopt a narrow mind-frame of "avoided cost" but positively encouraged adoption. Bermuda has a long way to go by comparison. If the feed in tariff basis (FIT) proposed in the EGD becomes permanent, then Bermuda will be going in completely the opposite direction. Adoption of an FIT at an avoided cost basis (whatever the true avoided cost may be) does not reflect any wider benefits that solar adoption may bring. While I am not an expert in quantifying these benefits I am convinced the answer is not zero.

Problems with the proposed EGD tariff (questions4 and 5)

The most obvious problem is that no residential customer who cares about the return on their investment will decide to invest in solar energy. The math simply does not work. Depending on consumption patterns you will probably not recover your investment, or at best barely break even, over the useful lifetime of the systems (which I assume is somewhere in the range of 18 to 20 years). When the opportunity cost of the time value of money is taken into account, this is a no brainer. In addition owners that have already taken the decision to invest face an immediate unexpected loss.

In addition the FIT does not reflect important aspects of production and consumption of electricity and as such can be unfair.

1. For most residential Solar users, energy is produced during the daytime hours and consumed throughout the 24 hour day but with peaks in the evening hours. It appears to me grossly unfair to sell most of the production to BELCO at effectively 40% of the rate at which you will buy it only hours later. This is particularly offensive when one takes into account that BELCO gets the extra production at the time when it most needs it. So they effectively have less need to use their higher cost "peak time" production capabilities. Their marginal "avoided costs" must be considerably higher than what they represent.
2. Most residential users size their systems for their average needs. However, there is a seasonal pattern to the production and consumption of electricity that means in some months the net balance of own production/consumption changes materially. By averaging over a month, in a similar fashion to point (1) above BELCO benefits at the expense of solar owners.
3. Part of the problem is the fact that electricity in Bermuda is charged on a tiered basis with the highest tier being significantly more expensive than the lowest tier. What matters in tiered systems are the marginal rates. By adopting a FIT methodology solar system owners bear all the additional expense that their top tier marginal total consumption implies while they get no benefit from the fact that their net total consumption effectively moves them to a lower tier rate.
4. In all your questions there seems to be a presumption that some form of FIT is the right way forward. While I can see the argument that residential customers should not profit from selling electricity produced over and above their own average consumption, it appears to me that it would be grossly unfair to penalize solar users just because they produce electricity only during daytime hours or during the "wrong" month. Some form of netting seems to be a much more sensible solution.

Process (question 4)

Perhaps my most severe criticism revolves around process. During my business career I have been involved in multiple investment decisions involving many millions or even billions of Dollars. In addition to calculating expected returns you have to calculate risks. Very high up on the risk list is the stability of the regulatory environment and the scope for unexpected surprises. The whole process I have observed does not inspire confidence in the Regulation of the Electricity in Bermuda. It will inevitably damage future investment decisions whatever the outcome of this consultation. I highlight below number of items that I found surprising:

1. BELCO is allowed to announce a change in their metering system with immediate effect without any warning or prior consultation. I would have expected at the very least some grace period after which the application of the new method would apply.

2. The RAB issues an EGD that goes ***far beyond*** what I understand BELCO had asked for and is ***far more detrimental*** to solar energy users. I believe that in most cases, particularly when consultation is sought, maintenance of the status quo up until all the responses are received and reviewed would be the norm. It would then be highly unusual to make decisions apply retrospectively.
3. The EGD applies retrospectively to all users. It would be more appropriate if it applied to prospective future planning applications at some date after the ECG was issued. Thus investment decisions taken under previous regime are not impacted but future investors (i.e. future planning applications) can factor the prospective change in their calculations.
4. The communication to current users and planning application holders has major weaknesses. No attempt was made to reach them and documents issued by the RAB are ambiguous. The effect is a rushed consultation process.
5. Although this is an emergency determination, there is no timeframe for resolution following the consultation.

In conclusion I believe that an FIT system that only considers "avoided costs" is both unfair to solar users and against Bermuda's long-term interests. Despite my frustrations about the change process I am glad that consultation with all stakeholders was sought. I have given my views in good faith and I hope you take into account.

Yours sincerely

Costas Miranthis

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Re: Response to Consultation Document 17-0316: Comments on Regulatory Authority Emergency General Determination

11 May 2017

Dear Regulatory Authority,

I write in response to the above-captioned "Emergency General Determination" (EGD). As background, about two years ago my family made a material investment in a household PV system for environmental and financial reasons. We do not "make money" on our system – we still pay a meaningful BELCO bill each month, and pay attention to our energy usage.

This EGD should be cancelled or withdrawn for the following reasons:

1. It conflicts with an existing contract between my family and BELCO which laid out the commercial arrangement between us, and provided the certainty that was required in order to finance our PV system over a long time horizon (e.g. 20 years). The decision to make this investment was not taken lightly, and we considered many factors including our mortgage, the current state of other financial investments available to us, and the rate structure that would govern our PV investment, as outlined in our contract with BELCO. The EGD violates key assumptions in this contract underlying our investment decision and essentially deprives of us significant financial assets that would have been put to other uses.
2. The EGD severely discourages if not completely prevents investment in renewable energy in Bermuda, when in fact we should be encouraging any sort of self-sufficiency we can create on our small island.
3. This investment in the PV industry has created a new industry and class of jobs in Bermuda that offers meaningful employment opportunities in a highly technical field that is a massive growth industry all over the world. This is significantly negatively affected by the EGD's negative impact on PV investment in Bermuda.
4. The EGD will encourage people who nevertheless still want PV systems to use their storage such as batteries, eliminating the benefit to BELCO of having residential PV systems delivering power to the grid during the day at a peak demand times.
5. The retroactive nature of the EGD would cause significant bills to be presented customers for the past 5 months which they were not able to plan for or anticipate financially.
6. Even if one were to agree in principle with the EGD, the 'avoided rate' proposed in the EGD is far too low. The fuel cost should adjust in the same was as it adjusts for end users e.g. adjustment rate. In addition, it should cover other overhead such as amortization for equipment, maintenance, etc., that can be avoided by reducing the amount of energy required to be generated.

7. The EGD goes over and beyond what BELCO was even asking for, and seems to be a giveaway to BELCO at the same time ruining PV owner's investments. I note that today's 'Business' section in the Royal Gazette calls out BELCO's record profit increases and increased dividends to shareholders. So it seems doubtful that BELCO is suffering due to the PV industry.
8. The EGD doesn't even seem to be understood by Government and the RAB, based on misleading and confusing information provided by those entities.

Below are my answers to the consultation questions:

1. The PV industry in Bermuda has been a good opportunity as Bermuda's island nature, sunshine, and high cost of imported fuel make it a good fit for renewable energy sources. See also #3 above.
2. See #3 above. Bermuda should think strategically about its energy independence and encourage a diverse and robust set of energy sources for the island.
3. It would not be unreasonable for residential customers to not expect to be able to 'make money' out of installing a PV system. It would be preferable to have a neutral third party involved in this. However, assessing the system sizes is a very complicated topic and it may be simpler to just cap the financial gains to the systems available to residential users so they are disincentivized to build large systems than appropriate for their home. Formal licensing seems excessive given all the other regulation required to get a PV system installed (planning, building permits, inspections, etc.).
4. For my views on the transitional measure see points 1-8 in my first section.
5. I would expect fully transparent information on BELCO's rates and the various components, from financing to amortization to overheads and fuel costs.
6. This is a leading question. The economic basis for PV in Bermuda should encourage investment and strategic energy capabilities for the Island, while allowing individuals and businesses to make sensible and reliable investment decisions with confidence and certainty as to the outcomes.
7. Yes.
8. Yes (a) volatile and confusing rule-making such as outlined in the EGD that conflicts with existing long-term commercial agreements; and potentially regulatory capture with the influence of BELCO on the RAB decision making and 'view of the world'. (b) think carefully, move judiciously, and respect existing agreements.

Thank you for giving me the opportunity to respond.

Regards,

Douglas S. J. De Couto, Ph.D., J.P.

Regulatory Authority of Bermuda

Response to Consultation Document 17-0316

(Transitional Measures for Bermuda Electric Light Company Ltd. Solar Net Metering Scheme) Emergency General Determination

I wish to be clear that I strongly support the analysis and conclusions made by BAE (Bermuda Alternate Energy Ltd.) that have been submitted to the RAB. My own comments are as follows:

Questions for Consultation

Question 2 I consider solar PV to be a very important renewable non-carbon source of electricity generation. There are indisputable adverse environmental effects associated with continued use of fossil fuels. There are economic costs associated with the importation of foreign fuels either oil or gas and the inherent price and supply vulnerabilities that this creates. There is a moral responsibility to acknowledge the deleterious effects of fossil fuel usage that is local, global and intergenerational.

The continuing development of renewable energy systems, both generation and storage, and the improving cost effectiveness of these technologies will continue worldwide and I would hope that there is the political will to foster a supportive local regulatory framework that can benefit from these advances.

Question 4 I consider the transitional measure to be extremely counter-productive if in fact the aim is to promote or even enable the use of solar PV. It is inappropriate to make such sweeping changes PRIOR to consultation. It has, in my view, created a lack of confidence in both the process and the intent. A material disadvantage has been created for many of us who have made significant capital expenditures expecting an ongoing contractual relationship with BELCO to be grandfathered. It also has the unintended consequence of incentivising increased electrical consumption (something many of us are trying to limit) and doing so during the peak demand period.

Question 5 The $594,395 'subsidy' that BELCO claims to have incurred needs to be thoroughly reviewed and independently audited. This is important , in my view, because it is central to the question: who is subsidizing who and how the net-metering/FIT discussion is considered as it relates to their Tiered rate system and evaluation of generating costs. Additionally, I believe it can be used as a PR tool to promote an anti-renewable mindset by arguing that solar PV is detrimental to many Bermudians. That is potentially damaging to the future prospects for renewables in Bermuda since it is ultimately a political decision.

Sincerely,

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Erich W. Hetzel
15 Hinson's Island
Paget

27 April, 2017

Regulatory Authority of Bermuda
Hamilton

RE: Response to Matter 17-03-16 Transitional Measures for Bermuda Electric Light Company Solar Net Metering Scheme

There are numerous statements contained in BELCO's 16 September, 2016 letter to the Energy Commission that deserve discussion. Some of these look forward two or more years. However, I am limiting my comments in the Response mainly to the Emergency Order, even though we have to assume details found in Belco's letter formed part of the rational of the RA in formulating this order.

Under the EA, one of the primary purposes of the RA is to "promote the uses of cleaner energy sources and technologies…" Given Bermuda's isolation and present dependence on foreign fossil fuel imports, promoting the use of cleaner energy is a matter of urgent national importance. Bermuda's situation is actually dire due to Bermuda's and the world's reliance on fossil fuels. Though we fail to acknowledge this fact, rising sea level is the largest medium term threat to Bermuda. The effects of rising sea level are already beginning to affect our shores. While the ability of Bermuda as an entity to impact on climate change is minimal, Bermuda can do its part on a per capita basis to reduce CO_2 emissions. In addition, decreasing our dependence on foreign fuels will decrease our balance of payments and help stimulate our economy. At the individual level, the return on investment on solar PV can be very good for the individual homeowner. Unfortunately, Bermuda's adoption of solar PV is embarrassingly low. Given the very high cost of our electricity, which accelerates the payback time and also considering the amount of sunlight we receive the Solar PV penetration would be expected to be much higher. Government should establish a national plan and a establish target penetration for solar and or wind generation in Bermuda and the RA should support that effort.

BELCO made a unilateral decision in August 2016 that negatively impacted the future adoption of solar PV and the Return on Investment of the initial solar installations. Despite BELCO's claim to the contrary, any change that increases the payback period will likely result in a decreased penetration. What has been proposed by the RA is to accept BELCO's calculation of the avoided cost rate of $0.1736 per KWh as compensation for power fed into the grid by solar PV. I applaud the fact that the proposal reestablishes the net metering scheme for both new and existing PV customers. However, I do not feel that the RA should accept BELCO's avoided cost calculation

until the financial data is studied in greater detail. In the interim period, the RA should reestablish the status quo as it was prior to August 2016. This would fulfill the RA's mandate to "promote the use of cleaner energy sources..." Any changes to the Solar PV programme, feed-in tariff, or other details should be based on a fact driven review conducted by the RA.

It should be noted that BELCO has referred to the payments made to Solar PV to customers ($594,395 as of September 2016) as a 'subsidy' and has further argued that this is unequitable and amounts to a subsidy to Solar PV customers. To begin, this amount was paid over six years. The $100,000 per annum is an inconsequential amount of BELCO costs, or revenues. This amount may not even reach the level of materiality on BELCO's financial statements. In addition, those payments are compensation to PV electric suppliers for electricity that was in turn sold to other customers. Unless I am misunderstanding BELCO's statements, those monies were therefore largely recovered – less transmission losses. Lastly, the well-respected Brookings Institution concluded that studies demonstrated that net-metering benefits all rate-payers and is not a subsidization of Solar PV users (https://www.brookings.edu/research/rooftop-solar-net-metering-is-a-net-benefit/). In conclusion I find this issue to be a red herring.

In BELCO's comments and responses from the RA, there is one important fact that has been overlooked in the discussion of economic costs of fossil fuel generation. All the costs discussed to date are short-term economic costs. There is no allowance for the long-term, or even medium-term economic costs of fossil fuel generation. Those costs would include the projected direct costs of rising sea levels; the real costs of increased acidification of the oceans; the costs related to environmental impacts of fuel transportation; the costs to local health from burning fossil fuels; and other direct and indirect costs that should be accounted for. What we are conveniently doing in Bermuda and the rest of the world is forcing future generations to subsidize our dependence on fossil fuels. While we would like to wish away those costs, the reality is that someone in the future will have to pay for our continuing over reliance on fossil fuels today.

Answers to questions:

1. *What is your view on how Solar PV has evolved in Bermuda? Please provide views on the uptake of this technology.*
   When Bermuda's population and businesses were growing, BELCO was very concerned about not being able to meet the generation requirement of the expanding Bermuda market. BELCO saw renewables and conservation as a possible way to forestall investment in new generation capacity, which is a costly and risky investment. Consequentially, BELCO encouraged customers conserve and to install Solar PV. BELCO used the first 200 (now 325+) Solar PV customers to investigate net metering and explore the management of residential generation issues. To encourage the installation of Solar PV, BELCO included a very attractive energy buy-back scheme. With the reduction in population and revenues declining for many years, BELCO sees no business need to encourage the development of renewables (or conservation). Simply put, I believe it is a fair assumption that as a business, BELCO would like electricity usage to increase to increase top line revenues and its bottom line. That is a business position, which is fair enough. However, though we are mutually dependent, what is good for BELCO may not necessarily be good for Bermuda.

   Reiterating what I stated above, Bermuda's adoption of solar PV is embarrassingly low. Given the very high price of our electricity and considering the amount of sunlight we receive, our penetration would be expected to be higher. For example Solar PV penetration rates are reported at 16.5% in Australia, with the state of South Australia, producing 39% of its total generation by solar and wind. Arizona has an overall solar penetration d 5.8% with some cities having penetrations as high as 30%. Solar penetration rates are 7% in sunny Belgium.
   (http://www.renewablessa.sa.gov.au/files/151026-esaa-submission.pdf; http://theconversation.com/factcheck-qanda-is-australia-the-world-leader-in-household-solar-power-56670;).

   By BELCO's stated rate of up take of "7 to 8 customers per month", Bermuda would not reach 100% residential solar PV penetration for over 250 years. Government should establish a national target and plan for solar and or wind generation in Bermuda and the RA should support that effort. Bermuda could produce as much as 20% of its electricity from solar PV (my own estimate). It should be noted that solar PV could also be largely financed by individuals; private companies; or through some distributed financing means, rather than relying on a large capital outlay by a power company, which would have to be financed.

2. *Looking to the future, how important do you believe Solar PV is for Bermuda?*
   Solar PV is critical to our future. At the economic level every net dollar we save through the utilization of solar PV versus purchasing foreign oil stimulates our economy. From the standpoint of energy security (fuel cost and availability) if we could move towards

energy neutrality, it would provide Bermuda with an increased level of security. In a world that will one day either run out of fossil fuels, or no longer be able to afford the environmental costs to burn them this is critical. I also believe that Bermuda should do its per capita part to decrease the effects of greenhouse gases on the planet. This is critical because within a few generations our low-lying areas, including the airport, may be underwater.

In the second part of the question, it is unclear what 'costs' the RA are interested in elucidating in this question. The hard costs of solar PV are relatively low and I would imagine that it compares extremely favorably to traditional oil and gas generation facilities in terms of ROI, especially since solar PV might be largely accomplished with low levels of financing.

One cost not included in solar PV is the cost of maintaining the electric grid. From the business and energy security standpoint, Bermuda needs to support its electric grid and the company that operates the grid needs to be fairly compensated for its investment assuming it is well run. Unfortunately, as both the sole generator and grid operator, BELCO are conflicted in any effort to have consumers conserve electricity. In addition, as a monopoly, BELCO is not incentivized to seek efficiencies. This may be evidenced by Bermuda's high electricity rate – one of the highest in the world. One solution could be to split BELCO into two separately owned and operated companies. One would be a company that owned and operated the grid; and the second, a generation company. These entities could be regulated as envisioned in the Electricity Act 2016. The grid company could buy power from all electric suppliers at a fair rate. Those generation sources could include solar, wind generators and fossil fuel generators. In this later case rather than depending on a legacy monopoly for creative business advances, we could look to the market to see if others could construct innovative solution for power generation. Of course this is a complex issue and requires careful analysis.

3. *Should there be capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within the formal licensing framework?*

NO. There should be no limits on generation capacity on individual customer's premises, except as required for safety, or planning considerations. This suggestion is completely contrary to the stated objective of the RA. The Bermuda Government should be encouraging individual homeowners to install the maximum number of solar panels possible in order to decrease Bermuda's dependence on fossil fuels. That may present an opportunity to individuals to in effect, become a cottage industry thru power generation - this should be encouraged. I see no negative to that situation. This will provides individual with an opportunity and increases Bermuda's energy independence. If BELCO is split into a generation company and a grid operator, there may be other technologies that present opportunities to individuals and companies to feed power into the grid in an economically beneficial means. Whether those are small distributed

residential power systems, or larger scale commercial power systems they should be encouraged. BELCO noted that there is a differential uptake in Solar PV in the US based on median income levels. Government should be encouraging participation at all economic levels, as the ROI at the personal level in Bermuda could be significant.

4. *The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commissions recommendation of October 2016. What are your views on tis transitional measure?*

   As stated above, I support the reinstatement of net-metering and the reimbursement for electricity fed back into the grid. I do not agree that the rate should be fixed at $0.175. It is not clear to me if this amount truly encompasses all the variable avoided costs of production. For example I do not see a line item for avoided capital costs – though it is mentioned. Secondly, if Bermuda had a significant amount of production from solar PV (and possibly wind), then because BELCO uses multiple generators, it is likely that the life-time of the equipment would be reduced; the maintenance requirements on the equipment reduced; and the man-power required reduced. I do not see an accounting for those potential savings. Lastly, at this juncture the uptake of solar PV has been very low and I would suggest that it is in Bermuda's economic interests to revert to the higher feed-in rate, until the numbers become significant and or the issues has been more completely studied. It is also concerning that this rate has been fixed, so not taking into account fluctuations in this amount.

5. *What type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed-in tariff for electricity provided by Solar PV.*

   At this time BELCO is a monopoly supplier of electric power to Bermuda – except for the small amount now generated by PV and one (?) wind generator. As such BELCO should be completely transparent at the financial level to the regulator. Furthermore, as a public owned monopoly, I see no reason that BELCO financial information should be made confidential from the public. Only full transparency will allow the regulators and the public to make informed decisions.

   As BELCOs own proposals are based on a separation of costs between its various activities, this level of detail is critical to the discussion.

6. *What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs?*

   BELCO's feed-in tariff should reflect a cost-benefit methodology (CBM) rather than avoided cost methodology. CBM as I understand it, more fully takes into account both short term and long term costs associated with energy production. Those include technical aspects; costs; environmental and social impacts; energy security; socio-

economic welfare; and sustainability. CBM would provide a more accurate analysis of the issues.

A net-metering scheme that incentivizes solar PV participation without unduly impacting BELCO's reliability should be favored. I would believe that in in the short term (during the review period) that would mean the return of the CRSEER programme. In the long term, continuation of the simple net-metering program would incentivize participants to a greater extent than a dual metering system. In the US 41 of 50 states require net-metering and the well respected Brookings Institution reports that studies show that net-metering provides net benefits to all rate-payers (https://www.brookings.edu/research/rooftop-solar-net-metering-is-a-net-benefit/).

7. *Should Solar PV or other renewable energy programs be incentivized within a specific regulatory framework for renewables in Bermuda?*

I believe it is generally in Bermuda's interest to incentivize all renewables. That stated, not all renewables present the large ROI opportunity that Solar PV does. Simply stated some renewables may not be well suited to Bermuda, so Government might choose not to financially encourage those to the extent of solar PV. Each technology would have to be examined on its own merits. The other renewable technology that is closest today to being economically viable in Bermuda is wind. Though difficult as it is to believe on some days, we do not have sufficient constant winds in Bermuda to make wind generation viable based on a short-term economic analysis. However, if we consider wind under a long-term model, or CBM, wind might be considered in Bermuda. The obvious advantage of wind is that it is not diurnal.

The lowest 'hanging fruit' in this discussion may not actually Solar PV, but solar water heat. Though solar water is outside of the discussion of the Emergency Order, eliminating traditional electric water heaters would be a great start to decreasing electric usage in Bermuda. The Government and the RA should be encouraging their installation.

In the EC's Net Metering Inquiry Response of October 11, 2016, recommendation 5 stated: *The Government is to be encouraged to give serious consideration to establishing a policy regarding importation and utilization of power storage solutions with a view to grant tax relief concessions for such power storage solutions as soon as possible.*

I would be concerned that if the RA decreased the feed-in tariff to the extent whereby home owners became incentivized to purchase battery storage systems to store excess power, rather than selling that excess into the grid. The reason for my concern is that lead-acid and other battery technologies have their own set of environmental issues. A CBM model of storage technologies may well indicate that it Bermuda would be better served by incentivizing grid feed-back over battery storage.

8. *In your view are there any barriers to Solar PV or other forms of renewable generation investment?*

   The largest barrier is still capital for most families and businesses. With the significant ROI however, in many circumstances individuals need only to be shown that Solar PV is a good investment. For those who do not have the adequate capital, Government might introduce an energy bank that would finance investments in renewables.

George F. Hutchings
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Response to Consultation Document 16-0819

To whom it may concern,

I have a 14 Kw PV system installed at my home and in which I invested in excess of $61,000 (after the rebate). The PV system commenced electrical generation in May 2014. On average, our home uses 40,000 kWh per year and our solar panels generate about 20,000 kWh per year which leaves BELCO supplying about 20,000 "net" kWh per year. Over the past 3 years, BELCO has never "paid" me for electricity although BELCO "delivers" on average about 2,181 kWh of electricity per month to me and BELCO "receives" on average about 514 kWh of electricity per month from me. Thus, I net purchase about 1,667 kWh per month. Never has "REC" kWhs exceeded "DEL" kWhs in any given month.

I am personally troubled by the Emergency General Determination (EGD) Consultation Document dated March 16th, 2017. In short, it is grossly unclear precisely what is being considered and how I will be personally affected by it.

Based upon when I installed my PV panels, I was under the belief that I would be grandfathered by any new net metering agreement issued by BELCO. Suddenly that wasn't the case even though BELCO never asked for the arrangement that is now under consideration. According to the EGD (6.1(b)(ii)), as of January 1st, 2017 I will receive $0.1736 / kWh for "excess energy generated and not consumed……and which they sold to BELCO". I interpret that to mean the 514 kWh which BELCO receives from me on average per month will be credited back to me at $0.1736 even though I am always a net purchaser of energy from BELCO each and every month. I originally understood that the only time the $0.1736 rate would come into play was when "REC" amounts exceeded "DEL" amounts in any given month and "cash" exchanged hands. I made an investment on the basis that the net metering arrangement would allow me to offset "REC" amounts against "DEL" amounts at the prevailing rates charged by BELCO. I never entered into this arrangement with the thought that I would only receive 40% of the prevailing rates for the brief times I was pushing energy back into the grid just so long as net/net I wasn't cashing a check.

I completely get that if someone sized a PV system to be a net seller to BELCO then some pricing modifications are in order. But I sized my system to "offset" about 50% of my total consumption. I never once thought about or felt it was a good idea to "over" produce.

As a result, I urge the Regulatory Authority to rethink how the $0.1736 will be applied and to be specific by using examples to show the scenarios when it will apply. Until that occurs, I am just guessing how the EGD will affect me.

Sincerely yours,

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George F. Hutchings
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Questions:

1. I am glad it has been adopted and I think Government should find ways for more Bermudians to adopt it.
2. I think Solar PV is very important for Bermuda.
3. I don't think personal PV systems should be sized to receive cash from BELCO. Limits should be placed on a home based upon its historical consumption such that BELCO is never cutting a check to a household unless the house is unoccupied.
4. It was poorly designed and it is not clear how it will be applied.
5. Not qualified to answer these questions
6. Not qualified to answer these questions
7. Yes, but only if it serves a larger social/economic purpose.
8. The only barrier I see right now is uncertainty and lack of clarity relative to the framework the RA has yet to develop.

CONSULTATION ON THE TRANSITIONAL MEASURES FOR BERMUDA ELECTIC LIGHT COMPANY LIMITED SOLAR NET METERING SCHEME

RESPONSE TO CONSULTATION DOCUMENT 16-08-19

INTRODUCTION

Combined Engineering Technologies is pleased to provide responses to this very important consultation for Bermuda, BELCO, and all renewable energy producers. Bermuda is at a cross roads when it comes to renewable energy, specifically Photovoltaic (PV) distributed generation. Whilst implementing new policy, it is important to consider and analyze the potential benefits and costs of that policy to society and the impacted stakeholders. This should not be lost in the conversations which we hope will follow soon.

As such, it is CET's position, that all PV energy producers should have cost-effective, reliable access to the grid, and fair feed-in-tariffs of which should be implemented in the best interest of all in Bermuda.

QUESTION 1

1. What is your view of how Solar PV has evolved in Bermuda? Views on whether the uptake of this technology has been beneficial for some or all stakeholders as well as whether there remains substantial untapped potential for installation of solar systems and other renewable energy systems in Bermuda would be welcome.

   -Solar PV has been slowly embraced in Bermuda however, it is important for Bermuda because this will provide a more sustainable option than fossil fuels. In addition to contributing to Bermuda's responsibility to reduce the carbon footprint for the energy it consumes, Solar PV will also provide jobs and a viable educational tool. In order to ensure that the uptake of this technology is beneficial for all stakeholders I would encourage strategizing with The Bermuda college and workforce development in formulating a renewable energy training program that will educate and provide standards for all stakeholders (Planning, Government, consumers, RA, The Banks etc..).

QUESTION 2

2. Looking to the future, how important do you believe Solar PV is for Bermuda? If a respondent views Solar PV as important please provide your views on what its costs and benefits are, how these should be quantified, and how these should be reflected in the framework for electricity regulation.

-The uptake of this technology has been beneficial for some stakeholders specifically those with means or disposable income. Bermuda would be wise to adopt practices that

other jurisdictions have implemented such as with the U.S. Government's first push for Solar. We should look at the continued growth and benefits that other jurisdictions have experienced

QUESTION 3

3. Should there be capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within a formal licensing framework?

   -CET does not think there should be limits. See below (b).

   a. If so, who should be responsible for assessing the system sizes and their limits (BELCO, Department of Planning, RAB, etc.)

      -Irrespective of the response to this question, an independent body should be responsible for evaluating system sizing. IT SHOULD NOT BE BELCO…

   b. Should Solar PV system sizing for a customers' premises be limited to the prior 12-month consumption of a residence/business and/or should it be based on forecasted consumption?

      -CET believes that there should be no cap, as long as, the grid can safely handle the energy proposed for grid connection, can safely do so. This will also potentially assist in reaching the solar PV energy mix described in the Governments Energy policy.

QUESTION 4

1. The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commission recommendations of October 2016 (see the Determination for detail). What are your views on this transitional measure?

   -It would appear that the Regulatory Authority feels that the former Energy Commission's recommendation is reasonable. CET thinks that in the spirit of good faith, BELCO should have been instructed to continue the original payment scheme while it consulted on and came to a full quantitative conclusion of what BELCO should pay for energy supplied to the grid.

QUESTION 5

1. What level and type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed-in tariff for electricity provided by Solar PV? In particular:

   a. The Authority intends to mandate full accounting separation between BELCO's (i) generating, and (ii) transmission, distribution and retail activities. Please provide your views on specific aspects of BELCO's operational activities that are relevant to the design of BELCO's requirements as regards accounting separation, cost transparency and determination of the feed-in tariff rate?

      -CET thinks that accounting separation is absolutely required as BELCO is the most profitable business held by the Ascendant group of companies. As costs that

should otherwise be excluded from the rate-base, could be passed onto rate payers, thus increasing the cost of electricity. CET believes that BELCO should be able to earn a reasonable rate of return, but only on its relevant cost base. Ultimately, if the cost base allowed in the rate is correct, it follows that the feed-in-tariff will be closer to being reasonable.

b. What type of cost element transparency would you expect within a BELCO feed in tariff for Solar PV?

QUESTION 6

1. What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs? Alongside any general comments by respondents please provided responses to the following:

a. Do you believe that BELCO's Solar PV Metering Scheme should reflect a cost-benefit methodology or an avoided cost methodology?

-CET thinks that Solar PV metering should reflect a cost benefit methodology. There is ample justification, notwithstanding the Government of Bermuda's Energy Policy, but also many studies in the US that we will share.

By the end of 2015, regulators in at least 10 US states had conducted

studies to develop methodologies to value distributed generation and net metering, while other states conducted less formal inquiries, ranging from direct rate design or net-metering policy changes to general education of decision makers and the public. What do the commission-sponsored analyses show? A growing number show that net metering benefits **all** utility customers:

- 2013 Vermont's Public Service Department
- 2014 study commissioned by the Nevada Public Utility Commission
- 2014 study commissioned by the Mississippi Public Services Commission
- 2014 Minnesota's Public Utility Commission
- 2015 Maine Public Utility Commission

Similarly, a growing number of academic and think tank studies have found that solar energy is being undervalued and that it delivers benefits far beyond what solar customers are receiving in net-metering credits.

Regulators and utilities need to engage in a broader and more honest conversation about how to integrate distributed generation technologies into the grid island wide, with an eye toward instituting a fair utility-cost recovery strategy that does not pose significant challenges to solar adoption, which the later and current General Determination will inevitably accomplish.

Until broad changes are made to the increasingly outdated and ineffective current utility business model, which is built largely around **selling increasing amounts of electricity**, net-metering policies should be viewed as an important tool for encouraging the integration of renewable energy into Bermuda's energy mix as part of the transition beyond fossil fuels. To that end, the Regulatory Authority should explore and implement reforms that arrive at more beneficial and equitable rate designs that do not prevent solar expansion.

b. What cost rate design for Solar PV participants will incentivize the Bermudian population to use more cleaner energy sources and technologies?

See above response to question (a).

c. What other factors should be considered in determining the cost rate design for feed in tariffs?

- Adopt a rigorous and transparent methodology for identifying, assessing, and quantifying the full range of benefits and costs of distributed generation technologies

- Undertake and implement a clear, transparent, and precise "value of solar" analytic and rate-setting approach that would compensate rooftop solar customers based on the benefit that they provide to the grid.

- Implement a well-designed decoupling mechanism that will

encourage utilities to promote energy efficiency and distributed generation technologies like solar PV, without seeing them as an automatic threat to their revenues.

- Move towards a rate design structure that can meet the needs of a distributed resource future
- Move towards a performance-based utility rate-making model for the modern era.

QUESTION 7

1. Should Solar PV or other renewable energy programs be incentivized in Bermuda? If so, what methods or programs would be best suited.

   -Bermuda should look at re-implementation of solar rebates from the Government as well as incentives driven by BELCO. For example, possible rebates for LED residential lighting, installation of solar water heating, energy efficient appliance, and other potential incentives such as land tax credits for distributed solar PV.

QUESTION 8

2. In your view, are there any barriers to Solar PV or other forms of renewable generation investment?

   a. If so, what are these barriers?

      - Appropriate land mass for the deployment of distributed solar PV

- The Planning process for solar PV appears to be a barrier (rules not consistent), and present a further cost burden

b. How could they be removed to enable further investment?

-These and other barriers can be removed or reduced by having a clear and transparent approach to solar PV deployment. Again, incentives could be a springboard to further deployment if for example land tax for sites that deploy solar PV.

Regulatory Authority of Bermuda

Response to Consultation Document 17-0316

(Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme) Emergency General Determination

QUESTIONS FOR CONSULTATION

1. What is your view of the how Solar PV has evolved in Bermuda? Please provide views on the uptake of this technology.

To properly evaluate the evolution of Solar PV in Bermuda it is necessary to look at the Bermuda case in the context of Global Solar PV evolution and in particular PV evolution in comparable or similar Island nations.

In our letter to the RAB of 6th January, 2017 we included the following information, which you should already have on file. We would be happy tp provide additional copies if required:

"We suggest that the RAB examine the economic benefits that have resulted in the widespread adoption of distributed generation in Hawaii. We further suggest that the review should be geared more specifically to the Island of Maui, because its population is approximately 2.5 times that of Bermuda and therefore its traditional generation technologies are similar as well.

For your reference, we have included the following documents from Hawaii:-

A. *Hawaii's Cumulative Installed PV Summary as of September 30, 2016*
B. *Hawaii's Cumulative Installed PV Summary as of December 31, 2015*
C. *Maui Electric's Web Pages on Tripling Distributed Solar by 2030*
D. *HECO's Sustainability Report 2015*

From these documents you can see that Maui already has 89.6 MW of distributed solar capacity and they are looking to triple this by 2030. Yet as far as we can determine, it appears that Maui Electric have not had a price increase since 2013. By contrast, BELCO has already received a huge rate increase in 2016 as well as a substantial increase in their Facilities charge in 2014. Yet according to BELCO, our adoption of distributed solar is only approximately 2.8 MW. Also as far as we can determine, Maui Electric's residential rates including fuel surcharge and their facilities charges are far below BELCO's. To us this demonstrates that an island the size of Bermuda could have much higher adoption of distributed PV without having to incur all the price increases that BELCO have been granted. Would this not be a huge economic savings for all of BELCO's customers? Furthermore, the Sustainability Report shows that Hawaii and its utilities are fully committed to 100% of electricity from renewable by 2045. Yet BELCO is advocating the huge investment in LNG, which if Bermuda were to match Hawaii in renewables adoption, would leave us with substantial stranded assets that would impose huge economic costs on the next generation of Bermudians and residents of Bermuda.

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Please note that the Public Utilities Commission in Hawaii ended residential net metering there in October 2015. Based on attachment B above, we can conclude that there was approximately 70 MW of distributed PV installed in Maui when net metering was ended, 64% residential and 36% commercial. Given that Hawaii and other states still enjoy a federal tax credit for installing solar PV, we have to ask why is Bermuda proposing to end net metering after only approximately 1.8 MW of residential solar has been installed?

Based on the latest information available to us, we estimate Bermuda currently has only 2.8 Megawatts of installed distributed solar PV, of which approximately 1.0 MW is commercial.

Residential Solar PV Evolution

We estimate there are approximately 350 installed residential systems, giving an average of 5.1 kW per system, which agrees closely with our own empirical data. With the earliest installations dating to around 2009 this gives us an average install rate of 44 per annum. Looking at it another way, there are 32,100 residential valuation units in Bermuda[1], each of which is eligible for a solar PV installation however, at this time only 1% of potential residential adopters have chosen to invest in a Solar PV system.

Commercial Solar PV Evolution

To our knowledge there are only 9 commercial solar PV installations in Bermuda (excluding BELCO's own in-house system), totaling approximately 1 installed Megawatt.

2 are smaller Fuel Stations, 1 Private School, 1 Hardware Store, 1 Liquor Company, 1 Warehouse, 1 Insurance /Real Estate Company, 1 Investment company and 1 Supermarket.

With 3700 registered commercial units[2] this represents an adoption rate of just 0.0025%.

Government Buildings Solar PV Evolution

There are no Government Buildings installed at this time.

2. Looking to the future, how important do you believe Solar PV is for Bermuda? If a respondent views Solar PV as important please provide your views on what its costs and benefits are, how these should be quantified, and how these should be reflected in the framework for electricity regulation.

Because of time constraints we have submitted our 'Response to Question 2' as an additional and separate document to be read in conjunction with this document.

3. Should there be capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within a formal licensing framework?

We assume that this question is specifically related to Residential Systems and in our experience, there are two overriding factors that typically influence solar capacity:

i) **Traditional 'Bermudian Architectural Roof Design'.**
   a. This dictates major elements of residential design and construction and is already strictly regulated by The Department of Planning. The 'Bermuda Cottage & Bermuda Roof' style of construction, comes with multiple small 'Hip' rooves and a unique water catchment system, which places angled gutters directly across the majority of useable roof faces.

[1] Land Valuation Statistics – December 2016
[2] Land Valuation Statistics – December 2016

b. Both of these elements significantly restrict PV installation from large areas of the overall roof area and typically do not allow for either large scale or efficiently located solar installations.
c. This results in complex multiple array and multiple orientation PV installations in Bermuda that are not commonly seen in other countries but are required here to overcome the physical constraints of the typical Bermuda roof design and are themselves significant constraining factors on the overall size of installations.
d. It is also a major contributing factor to the overall cost of a PV system, which in turn becomes a further limiting factor.

ii) **The almost total lack of Energy Efficiency Standards and/or Regulations in Bermuda.**

a. Historically there has been virtually no effort in Bermuda to institute standards or regulations related to energy efficiency and residential building codes are no exception. The typical Bermuda home is poorly insulated, badly oriented and filled with appliances and devices that consume unnecessarily high amounts of electricity.
b. In addition, the nature of our 'bi-seasonal' climate puts high power demands on homes and businesses to maintain a comfortable indoor environment for lengthy periods throughout the year. As a result we have peak power demands during the summer months that put a significant strain on our traditional fossil fuel based power source and result in the use of highly inefficient generation devices (Gas Turbines) to manage the peak load.

The combination of the two factors outlined above has the effect of firstly constraining the size and capacity of the vast majority of residential PV systems. And secondly, placing demands on them that result in the majority of installed systems being somewhat undersized in relation to overall demand.

We acknowledge that there are instances where owners/installers have significantly oversized PV systems in an effort to create financial gain, and we as a company do not support this approach. However, these systems are certainly not the norm and while we disagree with their objective, we feel that the additional power contribution to the overall peak demand helps to balance and compensate for the majority of residential PV systems that are limited in capacity by the constraints we have already identified.

For all of the above reasons we do not support the concept of an additional layer of bureaucracy to create a 'formal licensing agreement' for PV systems as they are already regulated by a comprehensive set of international standards, including: NEC Electrical codes; UL- Compliance Codes; and Bermuda Building Codes.

Indeed the imposition of an additional licensing framework would be a further disincentive to the adoption of solar PV as it would further increase the so called 'soft costs' of a system, which are already disproportionately high in Bermuda in relation to the overall system costs.

a. If so, who should be responsible for assessing the system sizes and their limits (BELCO, Department of Planning, RAB, etc.)

Because we do not support the concept of imposing 'artificial capacity limits' by definition, there is no requirement to devise a body with responsibility for the same.

While we have assumed that the major thrust of the question is related to residential PV we do recognize the need for larger (commercial PV systems) to be assessed in relation to their interconnection point to the grid, to ensure the localised BELCO infrastructure can accommodate the connection. This process however must not become a vehicle for BELCO to unreasonably deny access and requires a simple and rapid arbitration process to be triggered in the event of a dispute.

b. Should Solar PV system sizing for a customers' premises be limited to the prior 12-month consumption of a residence/business and/or should it be based on forecasted consumption?

This is essentially the same question as previously answered and is associated with capacity limits, of which we are not in favour. Once again, it is the addition of yet another cumbersome layer of bureaucratic oversight that would be both difficult and expensive to administer, and in all likelihood would be mainly inaccurate. Solar PV systems have a minimum lifespan of 25 years and in Bermuda household demographics are constantly changing, particularly with the high percentage of travel and overseas schooling that are commonplace, and the relocation of family members in and out of the 'homestead'. Thus, imposing a 'forecasted' or 'historical usage' model would cause sizing in many instances to be based on data that could be both inaccurate and out of date as well as constantly changing throughout the lifetime of the system.

4. The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commission recommendations of October 2016 (see the Determination for detail). What are your views on this transitional measure?

The effect of the transitional measures mandated by the EGD, and originally prescribed by way of a set of recommendations by the former Energy Commission, have been both instantaneous and devastating to the survival of the renewable energy industry in Bermuda. It is particularly painful that these measures have been implemented after the industry has struggled through over 6 months of indecision since the original BELCO proposal, and bear very little relation to the original requests submitted by them as early as August, 2016.

As a direct result of the EGD, Interim Orders the Renewable Energy Industry is suffering from:

- Massive business interruption, caused by widespread confusion and mistrust;
- The inability to calculate valid Return on Investment calculations with any certainty of long term financial accuracy or security;
- Interruption of cash flow;
- Contract delays, Downsizing and Cancellation of pipeline systems;
- Inability to conduct ongoing sales activities (residential);
- Consequential loss of income;
- Unsold high value inventory;
- An unprecedented demand on resources to conduct 'communication' & 'damage control' exercises.

Our views on the Transitional Measure are as follows:

- It was reckless in the extreme to mandate a sweeping set of changes prior to conducting a comprehensive consultation process with the stakeholders. Prudence would dictate that information gathering and consultation should always precede the introduction of sweeping changes;

- Our preliminary enquiries indicate that there is very little evidence from the documentation available that the 5 recommendations made by the Energy Commission, and subsequently adopted by the RAB, were founded in quality research and evaluation. Indeed, the recommendations bear little resemblance to the original submission by BELCO and there is very little supplementary information given to indicate how the information they were able to gather led them to the set of recommendations they eventually arrived at. We have been reliably informed that both the content and quality of the minutes and other parts of the paper trail is severely lacking.

- It also of great concern that the RAB, despite being specifically recommended to do so, **as a matter of priority**, by the EC, under 'recommendation #3' has not carried out:
  " a more thorough and complete solar PV economic and market study be carried out by the Regulatory Authority as a matter of priority, with a view to establishing sustainable policies and power purchase rate determination methodology. The new policies and rate determinations should be in accordance with the Government's mandated industry policies and the Electricity Act 2016."
  We sought a meeting with the RAB in January 2017 to discuss the concerns of the Solar Industry and provided them, in advance, with significant amounts of detailed information on the state of the industry. However, despite all our efforts, we were only given approximately 30 minutes of their time and had no opportunity to exchange the bulk of the information we had prepared.

- Basic principles of Rate Setting dictate that a comprehensive set of Social, Environmental and Economic factors are an inherent part of the process and it cannot be simply regarded as a mathematical process. It is our opinion, that these basic principles have not been applied and are in direct contradiction of the Electricity Act[3] and therefore the set of Interim Orders cannot be allowed to stand.

- It is our opinion that the Interim Orders are clearly in contradiction of the following sections of the Electricity Act:
  Purposes of this Act (Page 7)
  6 The purposes of this Act include the following, namely, to seek—
  (a) to ensure the adequacy, safety, sustainability and reliability of electricity supply in Bermuda so that Bermuda continues to be well positioned to compete in the international business and global tourism markets;
  'Interim Orders' removes the financial viability of a sustainable energy source
  (b) to encourage electricity conservation and the efficient use of electricity;
  'Interim Orders' not only encourages increased usage of self-generated electricity, but also encourages that usage during periods of 'peak demand' which is detrimental to the overall price efficiency of the grid.

[3] Section 36 (a) (i) & (ii) of the Electricity Act

(c) to promote the use of cleaner energy sources and technologies, including alternative energy sources and renewable energy sources;

'Interim Orders' is a huge disincentive to the use of cleaner energy sources and technologies and has brought the entire renewable energy industry to a standstill. Any continuation of the present situation will result in the complete failure of the industry with the accompanying loss of employment and expertise. This in turn will leave those who have invested in cleaner and renewable energy sources with 'technically and financially stranded assets.

(d) to provide sectoral participants and end-users with non-discriminatory interconnection to transmission and distribution systems;

We regard the proposed interconnection terms as financially discriminatory toward those who have, in good faith, made significant financial investments in renewable energy systems.

(e) to protect the interests of end-users with respect to prices and affordability, and the adequacy, reliability and quality of electricity service;

Clearly, 'Interim Orders' does the opposite for those end users that have already invested in sustainable technology. It also removes any incentive for financially viable future investment in the same.

(f) to promote economic efficiency and sustainability in the generation, transmission, distribution and sale of electricity.

Distributed Solar PV is both efficient and sustainable and reduces not only peak generation costs but also transmission and distribution costs.

- Contractual relationships exist between the approximately 350 'legacy' net metered customers and BELCO. From the evidence available, BELCO were not seeking to disadvantage these legacy customers or invalidate their contracts by way of their application to institute a revised form of net metering for new customers, after the August 15th press release. The RAB by their actions have essentially superseded the contracts that existed and overruled the terms that were jointly agreeable to the two parties and in doing so have caused significant financial damage to the legacy participants.
- The only customers that are not financially disadvantaged by these interim orders are typically high net worth homeowners, with properties that have a higher than average electricity consumption, and where demand for electricity consistently exceeds the maximum solar output throughout the day. Because these customers will never have excess production during daylight hours they will not be subject to the massively reduced export rate.
- A likely unforeseen consequence of the RAB's orders is that it has inadvertently introduced 'time of day billing' for solar producers and will actively encourage them to maximise their electricity consumption during the daylight hours of peak solar production. By programming devices: pool pumps, water heaters, dryers etc., to operate only during daylight hours they can maximise their self-consumption. However, the downside of this type of usage is that peak solar production also coincides directly with the period of maximum demand and is when the grid could most benefit from the addition of surplus power from independent solar sources. Without this influx of additional solar energy during peak demand there will be a greater need to run the most inefficient and expensive gas turbine 'peaking engines' increasing the overall cost per kWh of the electricity produced by BELCO, which is obviously contrary to the primary goals of conserving energy and reducing demand

BELCO's original filing of September 16th 2016 sought to make 2 major changes to the existing net metering program:

i) Changes to the frequency of the calculation of NET POSITION from BI-annual to Monthly

'Net Position' in kWh, is defined as:
The total of DEL (delivered) kWh by the utility to the customer, in timeframe 'X'
MINUS
The total of REC (received) kWh by the utility from the customer, in timeframe 'X'
= NET POSITION

- Timeframe 'X' was originally a bi-annual period in which the rolling total, if ***in credit to the customer*** was settled and re-set to zero. The revised BELCO filing requested that Timeframe 'X' be revised to a rolling monthly or 'billing cycle' period and then be settled, ***if in credit to the customer,*** and re-set to zero.
- In question 3 we provided considerable detail on the sizing of PV systems and the difficulties, in typical installations, of providing adequately sized systems to offset the bulk of the owner's electricity billing.
- One of the most important characteristics of a well-designed and properly sized residential PV system is the ability to create a POSITIVE NET POSITION, or put another way, be a net exporter of kWh's, during the Spring and Fall months of the year.
- This POSITIVE NET POSITION helps to buffer the significantly higher demand during summer when air conditioning systems come into play and during the winter months when solar production is significantly lower and heating is sometimes required.
- Thus, while a customer may be NET POSITIVE at certain times of the year their annual position is normally NET NEGATIVE. We have scrutinized our installed base and do not see any examples of customers who are likely to be NET POSITIVE on an annual basis. We do not dispute that exceptions may exist, but we contend they are extremely rare.

i) Valuation of surplus electricity, after the calculation of NET POSITION at the revised 'Avoided Fuel Cost' rate of $0.1736 per kWh

- In total contrast to BELCO's filing, the RAB's interim orders completely remove any calculation of a NET POSITION from the equation. And all kWh's produced by solar that are not immediately consumed by the property, at the time of production, are valued at the Avoided Fuel Cost rate of $0.1736.
- By completely removing the cycle for calculation of a NET POSITION, from the equation, the customer who exports the majority of their solar production during the day back to the grid has been given an immediate 60% reduction in the value of each kWh they produce.
- Assuming their system is correctly sized to produce just enough electricity to match their average monthly consumption, they would now need to generate 2.5X more electricity to achieve financial parity.
- A likely unforeseen consequence of this approach is that it actively encourages customers to 'over-consume' and use additional electricity, increasing demand during those periods when they know they are likely to create a NET POSITIVE

position. Obviously, this is contrary to the primary goals of conserving energy and reducing demand.

We have provided 3 tables that show the financial impact on customer billings for 'small', 'medium', and 'larger' PV systems under the RAB Interim Orders.
Each table has 3 'Monthly Usage Profiles' on the left hand side as follows: LOW, MEDIUM & HIGH.

- These relate to how much of the solar electricity is consumed by the house *at the time of production*. So a house with a lot of constant load, air conditioning, pool & other pumps, hot water etc., which would be typical of a house with part of the family at home during the day, will have a 'HIGH' monthly usage of the kWh's produced by solar and will only export a small percentage of the solar production.
- In contrast, a house with no one at home during the day and minimal load, perhaps only a refrigerator and a few communication devices, will have a 'LOW' monthly usage of solar energy *at the time of production* and will export the majority of the solar production.
- As the tables show, in the worst case scenario, customers are looking at monthly increases in their BELCO bills of over 310%, despite having PV systems that are not sized to create a NET POSITIVE POSITION.
- We have also attached a 4th table that summarises each of the 3 systems and shows 'typical' solar production totals per month (right most column) for a system of that size.

5. What level and type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed-in tariff for electricity provided by Solar PV?

Because of the Q & A format of this consultative document there is a strong implication, based on the wording of the questions, that a Feed In Tariff (FIT) is the only appropriate solution. In our opinion, this is not the case, and we refer to the following:

In our letter to the RAB of 6th January, 2017 we included the following information, which you should have on file:

"THE INCLINED BLOCK STRUCTURE AND COST SUBSIDIES*: In our previous letter of 3rd October we outlined that residential customers here who are close to net zero consumers due to their PV production (net importing or exporting less than 250 kWhs/month) are actually subsidizing BELCO due to the trading of first block electricity, which is then often resold by BELCO to a close neighbor at third block rates. This represents a 113.5% mark up on the first block rate at the new 2017 rates, whereas it was a 104.4% mark up under the 2016 rates.*

We respectfully suggest that the RAB should ask BELCO how many of the existing 325+/- net meter customers are typically within 250 kWhs +/- of zero net consumption per month in order to quantify the magnitude of this subsidization of BELCO by these near net zero customers. It would also be helpful to know how many net metering customers never get down to the second block of net consumption and how many are net exporters in excess of 250 kWhs per month? Alternatively, the RAB could ask BELCO for details of $594,395 subsidy that they claim to have incurred over six years, broken down by residential inclined block rate, as we assume that 100% of this subsidy is for residential customers. This should give some indication of the magnitude that solar customers are subsidizing BELCO. This should also be

compared to how much free solar energy they received from commercial customers prior to the introduction of the CRSEER and from those commercial customer that are not on the CRSEER. Please note that the total amount refunded by BELCO to net metered customer in five years was only $42,870.00. How does this compare to the solar energy that they credited to PV customers at the first block rate and sold to their neighbors at the third block rate?

We reiterate that the huge difference in BELCO's inclined block residential rates makes this subsidization of BELCO by certain net metering customers unique to Bermuda. BELCO has cited and continues to cite numerous overseas jurisdictions where net metering has ended because it was genuinely being subsidized by other rate payers, but due to our inclined block rates this is not the case here for near net zero customers. Also, while BELCO has cited on page 12 of their September 16th letter that three US states have voted to end net metering, Florida and California have voted to retain net metering. The latter two states have far larger populations than the three cited by BELCO. Also BELCO has cited other examples of feed in tariff rates that have been reduced or eliminated, but they have not provided the data for the residential rates in those jurisdictions to show how much the FITs were being subsidized.

***RETAIL AND FEED IN TARIFF SETTING PRINCIPLES**: We note that there is nothing in the new Act that stipulates that net metering must be replaced by a feed in tariff. BELCO has asserted that net metering should end because one rate class should not be subsidizing another, but clearly some net metering customers are subsidizing BELCO and by extension subsidizing other rate classes. Therefore we suggest that there is nothing in the Act that stipulates that residential net metering must end, so long as we have an inclined block rate structure with such high differences in cost as presently exist."*

In particular: a. The Authority intends to mandate full accounting separation between BELCO's (i) generating, and (ii) transmission, distribution and retail activities. Please provide your views on specific aspects of BELCO's operational activities that are relevant to the cost transparency and related determination of the feed-in tariff rate?

In our letter to the RAB of 6th January, 2017 we included the following information, which you should have on file:

***"AVOIDED COST MODEL**: We are pleased to see that the RAB has sought proposals for an audit process for separating the accounts of the TD&R licensee from the BG licensee divisions of BELCO. We trust that this is your first step in arriving at an avoided cost to the TD&R licensee that is substantially higher than just the cost of avoided fuel, as we outlined in our previous letter. However in our previous letter, time did not allow us to address the second cost benefit under section 36 (b) of the Act, the economic benefits of distributed generation."*

5 - b. What levels of cost element transparency would you expect within a BELCO feed in tariff for Solar PV?

In our opinion, the FIT that the RAB is trying to mandate is totally inadequate, does not come close to the true avoided cost to the TD&R licensee and therefore does not comply with the requirements of the EA.

Firstly the FIT proposed by BELCO was calculated in July 2016 when the fuel adjustment rate was only $0.0875/kWh. Since that time, we assume there has been a gradual increase in the price of oil and know that the Customs' duty on BELCO fuel has recently been increased. The April 2017 FAR was $0.105/kWh which is both significantly higher than when BELCO proposed the $0.1735/kWh FIT rate and also significantly higher than the April 2016 FAR. So why have these fuel price increases not been included in the FIT rate? We would like to provide more detail, on this item, but as the BELCO FAR applications have no longer been published since the RAB took over from the EC, we have no recent detailed information on BELCO's fuel costs to refer to. Please note that the fuels costs per kWh contained in BELCO's Marginal Fuel Cost Table of their letter of September 15th for the East Power Station (EPS), Old Power Station (OPS) and Gas Turbines (GT) were listed at $0.0976, $0.1481 and $0.2106/kWh respectively. These rates are far lower than those listed in Table B.3 of the NESP which are $0.15, $0.21 and $0.24/kWh respectively. These represent cost differences of approximately 50 % for the EPS and OPS, but only 14.3% for the GT generators. So are BELCO artificially discounting the cost of fuel per kWh in their proposed FIT, or are the values in the NESP table too high? This important metric for the determination of the FIT should be independently audited by individuals with the qualifications and experience to verify the calculations are correct.

Secondly, the avoided cost model proposed by BELCO is their perception of the avoided cost to the Bulk Generation Licensee (BGL), therefore it does not comply with the requirements of the act.

Items missing from the proposed avoided cost to the TD&R licensee (TD&RL) include the following costs to the BGL:

- Generator amortization costs, these range from $0.02 to $0.04/kWh according to Table B.3 of the NESP.
- Generator O&M costs that are listed at $0.01/kWh in the same table.
- Overhead costs to the BG licensee including administration cost, IT costs, taxes, health insurance costs, social insurance costs, building rent or amortization cost, employment tax costs, oil pollution remediation costs, advertising costs, etc. etc.
- Profit of the BGL.

Based on the above, the true avoided cost to the TD&R licensee will obviously be much higher than the one proposed by BELCO and incorporated into the EGD FIT. Because this $0.1736 rate does not include all of the above other costs incurred by the BGL, it does not reflect the true cost to the TD&RL. Additionally it does not include for any of the economic benefit cost of renewable generation as allowed for in the EA. Therefore this rate does not comply with the requirements of the EA and should be considered illegal in our opinion. Furthermore, we estimate that it could take up to two years from now to obtain truly auditable separate accounts from the BGL and TD&RL, therefore the RAB will be trying to enforce an underpriced and therefore illegal FIT on the solar industry for up to two and a half years before a FIT that complies with the EA can be established. This will ruin the residential solar industry here in that time and it will take far longer for potential solar customers to regain faith in the RAB's ability to administer fair, equitable and long term FITs, as required by the EA, before we see new investment in the industry. Therefore we urge the RAB to reinstate the modified net metering program for new customers proposed by BELCO except with 6 month rolling credits and to restore the original net metering scheme to existing customers that are eligible for grandfathering.

6. What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs?

- The key to financially viable residential solar PV is to ensure that the homeowner can buy back the same amount of kWh's, that they exported during the day, at the same rate as they were sold. However, once the homeowner becomes a 'net exporter of kWh's it is entirely reasonable that the 'excess energy' is sold at a lower rate. This would be in keeping with the true concept of self-sustainability and help homeowners to become energy independent without exploiting BELCO by having oversized residential PV systems.
- Existing Net Metered customers are already paying a premium for this enhanced facility in the form of a Facilities Charge of $39.95 per month that is disproportionately high given their typical overall low monthly kWh consumption.

Alongside any general comments by respondents please provided responses to the following: a. Should BELCO's Solar PV Metering Scheme reflect a cost-benefit methodology or an avoided cost methodology? b. What cost rate design for Solar PV participants is best suited to incentivizing greater utilization of cleaner energy sources and technologies in Bermuda? c. What other factors should be considered in determining the cost rate design for feed in tariffs?

In our answer to question 2, we pointed out how the aspirational matrix in the NESP is fundamentally flawed because the consultants who wrote it did not adequately research the Bermuda renewable energy resources and how to tie them into the grid. We believe the same consultants were employed in the drafting of the EA and it was they that pushed for the avoided cost methodology that is written into the act. Again, we believe that they did not adequately research the PV market in Bermuda, nor the existing BELCO rate structure. We have previously submitted to the RAB and the EC that the huge differences in the 3 residential and 3 small commercial rate blocks, along with the huge facilities charges are such that many solar customers are already subsidizing BELCO by trading large blocks of energy at the first block rate, which BELCO then sells to near neighbors at the third block rate, plus fuel adjustment. This translates to a potential profit of 180% for BELCO on a fairly simple transaction. In all other jurisdictions that have or had net metering, the difference between block rates is much smaller, as is the fuel adjustment charge, which translates to a much smaller profit for the utility. Indeed, in those jurisdictions with a single block rate, there is no profit for the utility on this type of transaction. This is why other jurisdictions have been abandoning net metering, but the reasoning does not apply here. That is why BELCO is proposing to grandfather existing net metering customers and move new customers to a net metering scheme up to the point of becoming net exporters.

Our recommendation is that the RAB should abandon the FIT that the EC recommended on the basis that the EC had neither the resources, time or expertise to analyze a fair and reasonable FIT to both PV owners and BELCO, nor did they have the legal authority to do so. The fact that the RAB has just regurgitated the EC's recommendations also clearly indicates that the RAB has not had the time and resources to analyze this FIT. We further recommend that we move back to the net metering scheme proposed by BELCO, with the exception of monthly netting of credits. The original 6 month rolling credit arrangement should be retained for existing customers at the very least.

Failing the reinstatement of net metering with minor modifications, we are totally puzzled by the RAB's question 6 a above. The EA clearly mandates that the FIT should include both an avoided cost component and an economic benefit component. Our answer to question 2 clearly identifies multiple economic benefits of distributed solar including lower BELCO bills for all customers, if we have wide scale adoption of distributed solar.

Other cost-benefit considerations should include whether smaller PV system owners should receive a higher FIT than larger system owners because of economies of scale, which is a quite common practice in other jurisdictions.

7. Should Solar PV or other renewable energy programs be incentivized within a specific regulatory framework for renewables in Bermuda?

The global trends are abundantly clear and the growth of renewable energy is increasing at an exponential rate. Bermuda has fallen significantly behind other developed nations in the charge to replace outdated fossil fuel burning generation facilities with environmentally responsible renewable technologies.

The 2011 White Paper made an excellent first attempt at defining long term targets for moving Bermuda forward but sadly, the document has since been largely ignored. A regulated framework for transition to a predominately de-carbonised generational mix would certainly be very desirable for the long term good of Bermuda. But, as we have stated in other parts of this document, the creation of such a framework requires a clearly articulated long term renewable energy policy and the associated 'political will' to enact it.

8. In your view, are there any barriers to Solar PV or other forms of renewable generation investment?

Yes.

a. If so, what are these barriers?

1. Without doubt the most significant barrier to solar PV investment is the lack of financial stability for investors, which has been created by some or all of the points below;
2. The imposition of non-negotiated, unannounced and now retroactive changes by 3rd parties including: BELCO; Government; Energy Commission; and RAB that significantly diminish the value of the investment. Examples are:
   2.1 Removal of Solar Rebate Program without consultation or notice
   2.2 Removal of Net Metering Program without notice or consultation
   2.3 Imposition of retroactive 'Interim Orders' without notice or consultation
3. Lack of political will to embrace the inevitable changes in technology that will, in the foreseeable future, render fossil fuel based power generation near to obsolete in the worlds developed nations;
4. Mistrust on the part of potential investors about Governments true level of commitment to the introduction of clean renewable technologies and the lack of clear direction on national energy policies;
5. Fragmented policies, rulings and recommendations by various government and quasi-governmental agencies including Customs, Planning, Department of Energy, Energy Commission and Regulatory Authority that clearly demonstrate the lack of a single cohesive Energy Policy;
6. Protectionist Policies and Conflicts of interest, that have in the main served to protect the status quo rather than move with the times, and have left Bermuda far behind other developed countries in the adoption of clean renewable energy.
7. Excessive layers of bureaucracy that significantly add to the so called 'soft costs' of PV systems.
8. High cost of solar PV systems in Bermuda, which are directly attributable to each of the above barriers.
9. The biggest barrier for BELCO's Commercial Demand customers is the artificially low second and third block rates for energy for these customers. The third block rate of only $0.0862/kWh is only 25.64% of the residential third block rate and only 26.5% of Small Commercial's third block. At this very low third block rate paid by bigger hotels, the hospitals and bigger supermarkets, solar PV cannot provide an attractive return on investment. The Commercial Demand second

energy block rate of $0.1629/kWh, which is the tail block rate paid by most large office buildings, is only 48.5% of the residential third block rate, or 50.1% of the small commercial tail block rate. Combined with the demand charges. This low second block rate for most office buildings again lengthens the ROI for solar PV to the point that most office buildings cannot justify investing in solar PV. Ironically, it is these same office building that are probably the biggest contributor to BELCO's costly peak summer demand identified in our answer to question 2.

b. How could they be removed to enable further investment?

Quite simply! Predictability and Trust are the very foundation of financial investment, along with an attractive rate of return over a guaranteed period. None of these elements are now present in the Bermuda renewable energy domain.

SUMMARY

CONCLUSIONS

The Emergency General Determination and the associated Interim Orders have dealt a catastrophic blow to the entire Renewable Energy Industry in Bermuda. Severe financial damage has already been caused to the Industry as a result, and under the current conditions it is simply a matter of time before these small local companies cease to exist.

The measures have totally undermined the public's trust and confidence in the regulatory process and will inevitably result in robust legal challenges.

The measures are completely at odds with all previously stated governmental positions on the desirability of embracing renewable energies for the greater good of our Island and for the protection of our children's future.

There are at least 350 families that have made very significant and well intentioned financial investments, the value of which has now been significantly diminished and it is reasonable to assume that there will be a significant political backlash as a result.

COMMUNICATION

Preparing our response to the consultation document has been an extremely challenging and unnecessarily time consuming task, due to the format and content of the information, both written and verbal, that has been provided. As late as 05th May, 2017 we were forced to make major revisions to some of the most significant elements of our response as differing interpretations of the specific meanings of critical phrases in both the original Emergency General Determination (EGD), versions 1, 2, & 3, and the 'Clarification Order' of 17th April, 2017, were acquired.

In conversation with the Director of the Department of Energy on the 4th May, 2017 it became clear that the Department of Energy had arrived at a significantly different interpretation of the meaning of the EGD document than we had. So, in an effort to seek a final clarification, the Director interceded on our behalf, to acquire directly from the RAB, what we understood at the time to be, the 'definitive and final' interpretations of the problematic sections of the text.

To ensure transparency, we have provided the complete text of the relevant part of the email from the Director of the Department of Energy below:

From: The Director – Department of Energy, May 3rd 2017, 1:32 pm.
To: Bermuda Alternate Energy

"Thanks again for your call this morning, I do understand your predicament. I've just spoken to the RA, and here's what they have confirmed that EGD- and the clarification order- intended:
The ONLY thing that changes due to the EGD is the amount paid by BELCO for energy flowing to the grid **over and above what is offset by the customer's use**. That now changes from full retail value to the 17.36 cents per kWh. In other words, if my solar PV system produces 1000 kWh in a month, and I use 800 kWh in that same month, my bill will only be my facilities charge, and what I will expect to be paid from BELCO is 200 kWh x 17.36 cents.
Let me know it that helps you, and again, I appreciate your concerns and our frank and open conversation. Please let me know if there's anything else I can help with."

Within 24 hours of receiving the above 'clarification', which we are told came directly from a member of the RAB team, we subsequently received another email from the Director indicating that:

"It appears I was misinformed",

"I'd apologize if in fact I were at fault, but I could only give you the information given me- which was appreciably quite different from this."

These interchanges illustrate quite clearly that there is not only, mass confusion in the industry, but also, significant confusion within Government and the Department of Energy, and now it seems also between the staff within the RAB itself, over the precise meaning and intent of the documentation they have produced.

In addition to the very confusing wording of the primary documents, we are also concerned that the consultation procedure has not been properly communicated to either, the major stakeholders (solar PV owners), or other interested parties. It seems that the onus, for onward communication has been left primarily up to the individual Solar Installation companies.

We have made diligent efforts to handle a communications exercise of this magnitude, and coordinate the exchange of information to our customers, in both a timely and accurate manner. However, our resources have been severely challenged and we have incurred very significant manpower costs, due to not only the volume of questions, but also the constantly changing interpretations of the content.

We are also aware that one solar installation company has not been communicating with some of their customers for quite some time, and may not be actively engaged in business. It is safe to assume therefore, that a percentage of the major stakeholders are totally unaware of the retroactive changes that could potentially cause them financial hardship.

There are a number of sources where a complete list of stakeholder contact information could have been sourced including: BELCO; Department of Planning; and possibly Department of Energy.

Feedback from our customer base has also indicated:

(i) The submission format is overly cumbersome and the requirement for all submissions to be provided electronically should be considered discriminatory to those who are not comfortable with electronic media. We are aware that some customers have preferred writing and/or lobbying their MP's, The Premier, The Minister and others directly, rather than composing an electronic submission.

(ii) There is also a common theme that the Q & A format of the consultation that has been used is undesirable as it greatly limits the scope of information being solicited through the use of 'leading questions' that 'guide' rather than 'open' the narrative.

ATTACHMENTS BELOW:

Financial Impact Table – 5 kW System

BELCO NET METERING COMPARED TO PROPOSED FIT SYSTEM FOR A 5 KW PV SYSTEM, LOW, MEDIUM & HIGH KWH							May-17
BAE Bermuda Alternate Energy LIMITED		METER REGISTER	MONTHLY KWHS	GROSS BILL WITH FACILITIES CHARGE	NET BILL WITH DISCOUNT	GROSS COST PER KWH INCLUDING FACILITIES	PER KWH AFTER DISCOUNT
5 KW PV WITH LOW MONTHLY KWHS USED	OLD NET METERING	DEL	650	$246.66	$237.74	$0.3795	$0.3658
		REC	545	$169.99	$164.35	$0.3119	$0.3016
		NET	105	$68.01	$65.16	$0.6477	$0.6206
	NEW FIT 2017	DEL	650	$246.66	$237.74	$0.3795	$0.3658
		REC	545	$97.20	$92.34	$0.1784	$0.1694
		FIT NET	105	$149.46	$145.40	$1.4234	$1.3848
		% INCREASE		119.76%	123.14%		
5 KW PV WITH MEDIUM MONTHLY KWHS USED	OLD NET METERING	DEL	1250	$509.42	$490.51	$0.4075	$0.3924
		REC	395	$117.53	$113.72	$0.2975	$0.2879
		NET	855	$333.27	$321.10	$0.3898	$0.3756
	NEW FIT 2017	DEL	1250	$509.42	$490.51	$0.4075	$0.3924
		REC	395	$70.45	$66.93	$0.1784	$0.1694
		FIT NET	855	$438.97	$423.59	$0.5134	$0.4954
		% INCREASE		31.72%	31.92%		
5 KW PV WITH HIGH MONTHLY KWHS USED	OLD NET METERING	DEL	2050	$866.18	$833.64	$0.4225	$0.4067
		REC	195	$52.11	$50.53	$0.2673	$0.2591
		NET	1855	$779.22	$750.00	$0.4201	$0.4043
	NEW FIT 2017	DEL	2050	$866.18	$833.64	$0.4225	$0.4067
		REC	195	$34.78	$33.04	$0.1784	$0.1694
		FIT NET	1855	$831.40	$800.60	$0.4482	$0.4316
		% INCREASE		6.70%	6.75%		
NOTE THE ABOVE RATES ARE BASED ON THE FOLLOWING:							
A SOLAR PV FACILITIES CHARGE OF $39.95 PER MONTH							
THE NEW REGULATORY AUTHORITY CHARGE OF $0.00475/KWH							
THE 2017 THREE RESIDENTIAL BLOCK RATES							
THE APRIL 2017 FUEL ADJUSTMENT OF $0.105/KWH							

Financial Impact Table – 10 kW System

BELCO NET METERING COMPARED TO PROPOSED FIT SYSTEM FOR A 10 KW PV SYSTEM, LOW, MEDIUM & HIGH KWH						May-17	
BAE Bermuda Alternate Energy LIMITED		METER REGISTER	MONTHLY KWHS	GROSS BILL WITH FACILITIES CHARGE	NET BILL WITH DISCOUNT	GROSS COST PER KWH INCLUDING FACILITIES	PER KWH AFTER DISCOUNT
10 KW PV WITH LOW MONTHLY KWHS USED	OLD NET METERING	DEL	1350	$554.02	$533.40	$0.4104	$0.3951
		REC	1140	$420.42	$405.38	$0.3688	$0.3556
		NET	210	$96.07	$92.37	$0.4575	$0.4399
	NEW FIT 2017	DEL	1350	$554.02	$533.40	$0.4104	$0.3951
		REC	1140	$203.32	$193.15	$0.1784	$0.1694
		FIT NET	210	$350.70	$340.25	$1.6700	$1.6202
		% INCREASE		265.04%	268.35%		
10 KW PV WITH MEDIUM MONTHLY KWHS USED	OLD NET METERING	DEL	2600	$1,111.46	$1,069.53	$0.4275	$0.4114
		REC	890	$308.93	$298.16	$0.3471	$0.3350
		NET	1710	$714.56	$687.81	$0.4179	$0.4022
	NEW FIT 2017	DEL	2600	$1,111.46	$1,069.53	$0.4275	$0.4114
		REC	890	$158.73	$150.79	$0.1784	$0.1694
		FIT NET	1710	$952.72	$918.74	$0.5571	$0.5373
		% INCREASE		33.33%	33.57%		
10 KW PV WITH HIGH MONTHLY KWHS USED	OLD NET METERING	DEL	3600	$1,557.41	$1,498.43	$0.4326	$0.4162
		REC	390	$115.78	$112.04	$0.2969	$0.2873
		NET	3210	$1,383.48	$1,331.16	$0.4310	$0.4147
	NEW FIT 2017	DEL	3600	$1,557.41	$1,498.43	$0.4326	$0.4162
		REC	390	$69.56	$66.08	$0.1784	$0.1694
		FIT NET	3210	$1,487.85	$1,432.36	$0.4635	$0.4462
		% INCREASE		7.54%	7.60%		
NOTE THE ABOVE RATES ARE BASED ON THE FOLLOWING:							
A SOLAR PV FACILITIES CHARGE OF $39.95 PER MONTH							
THE NEW REGULATORY AUTHORITY CHARGE OF $0.00475/KWH							
THE 2017 THREE RESIDENTIAL BLOCK RATES							
THE APRIL 2017 FUEL ADJUSTMENT OF $0.105/KWH							

Financial Impact Table – 15 kW System

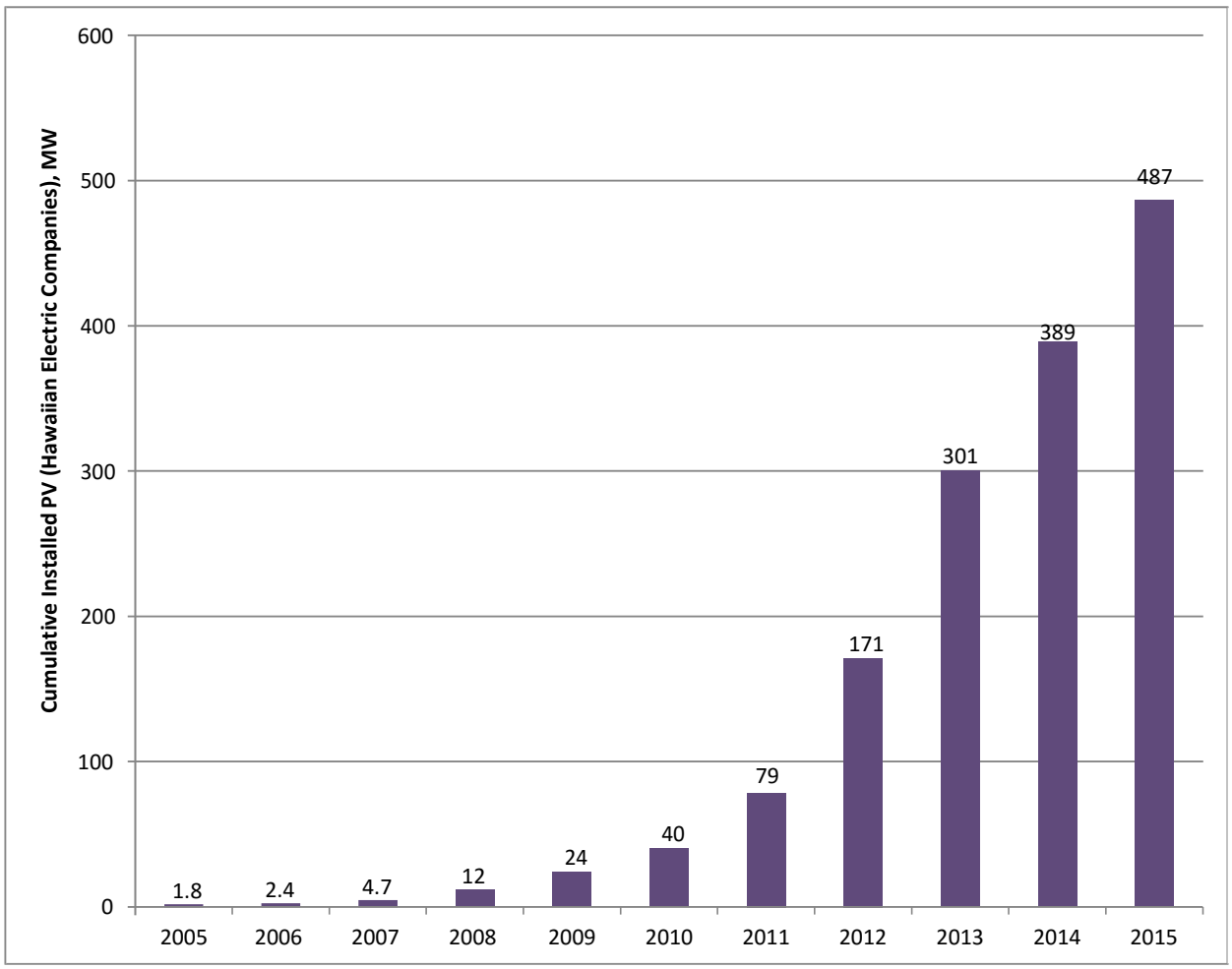
BELCO NET METERING COMPARED TO PROPOSED FIT SYSTEM FOR A 15 KW PV SYSTEM, LOW, MEDIUM & HIGH KWH						May-17	
BAE Bermuda Alternate Energy LIMITED		METER REGISTER	MONTHLY KWHS	GROSS BILL WITH FACILITIES CHARGE	NET BILL WITH DISCOUNT	GROSS COST PER KWH INCLUDING FACILITIES	PER KWH AFTER DISCOUNT
15 KW PV WITH LOW MONTHLY KWHS USED	OLD NET METERING	DEL	1950	$821.59	$790.75	$0.4213	$0.4055
		REC	1635	$641.16	$617.69	$0.3921	$0.3778
		NET	315	$129.50	$124.68	$0.4111	$0.3958
	NEW FIT 2017	DEL	1950	$821.59	$790.75	$0.4213	$0.4055
		REC	1635	$291.60	$277.02	$0.1784	$0.1694
		FIT NET	315	$529.99	$513.72	$1.6825	$1.6309
		% INCREASE		309.27%	312.05%		
15 KW PV WITH MEDIUM MONTHLY KWHS USED	OLD NET METERING	DEL	3850	$1,668.89	$1,605.66	$0.4335	$0.4171
		REC	1285	$485.08	$467.57	$0.3775	$0.3639
		NET	2565	$1,095.85	$1,054.52	$0.4272	$0.4111
	NEW FIT 2017	DEL	3850	$1,668.89	$1,605.66	$0.4335	$0.4171
		REC	1285	$229.18	$217.72	$0.1784	$0.1694
		FIT NET	2565	$1,439.71	$1,387.94	$0.5613	$0.5411
		% INCREASE		31.38%	31.62%		
15 KW PV WITH HIGH MONTHLY KWHS USED	OLD NET METERING	DEL	6500	$2,850.66	$2,742.25	$0.4386	$0.4219
		REC	435	$131.52	$127.22	$0.3023	$0.2925
		NET	6065	$2,656.67	$2,555.68	$0.4380	$0.4214
	NEW FIT 2017	DEL	6500	$2,850.66	$2,742.25	$0.4386	$0.4219
		REC	435	$77.58	$73.70	$0.1784	$0.1694
		FIT NET	6065	$2,773.08	$2,668.55	$0.4572	$0.4400
		% INCREASE		4.38%	4.42%		
NOTE THE ABOVE RATES ARE BASED ON THE FOLLOWING:							
A SOLAR PV FACILITIES CHARGE OF $39.95 PER MONTH							
THE NEW REGULATORY AUTHORITY CHARGE OF $0.00475/KWH							
THE 2017 THREE RESIDENTIAL BLOCK RATES							
THE APRIL 2017 FUEL ADJUSTMENT OF $0.105/KWH							

Summary Table

5 KW SOLAR SAMPLE HOUSEHOLD'S NET METERING VS FIT METERING						
	TOTAL CONSUMPTION (KWH)	DELIVERED BY BELCO (KWH)	RECEIVED BY BELCO (KWH)	NET CONSUMPTION (KWH)	SELF CONSUMED (KWH)	TOTAL SOLAR PRODUCED (KWH)
LIGHTER USER	750	650	545	105	100	645
MODERATE USER	1500	1250	395	855	250	645
HEAVY USER	2500	2050	195	1855	450	645
10 KW SOLAR SAMPLE HOUSEHOLD'S NET METERING VS FIT METERING						
	TOTAL CONSUMPTION (KWH)	DELIVERED BY BELCO (KWH)	RECEIVED BY BELCO (KWH)	NET CONSUMPTION (KWH)	SELF CONSUMED (KWH)	TOTAL SOLAR PRODUCED (KWH)
LIGHTER USER	1500	1350	1140	210	150	1290
MODERATE USER	3000	2600	890	1710	400	1290
HEAVY USER	4500	3600	390	3210	900	1290
15 KW SOLAR SAMPLE HOUSEHOLD'S NET METERING VS FIT METERING						
	TOTAL CONSUMPTION (KWH)	DELIVERED BY BELCO (KWH)	RECEIVED BY BELCO (KWH)	NET CONSUMPTION (KWH)	SELF CONSUMED (KWH)	TOTAL SOLAR PRODUCED (KWH)
LIGHTER USER	2250	1950	1635	315	300	1935
MODERATE USER	4500	3850	1285	2565	650	1935
HEAVY USER	8000	6500	435	6065	1500	1935

Cumulative Installed PV -- As of Dec. 31, 2015

	Number of PV Systems			PV Capacity, MW		
	Number	% Residential	% Commercial	Capacity	% Residential	% Commercial
Hawaiian Electric	41,568	97%	3%	343	63%	37%
Hawai'i Electric Light	9,664	94%	6%	69.8	65%	35%
Maui Electric	9,320	93%	7%	73.6	64%	36%
Total	60,552			487		

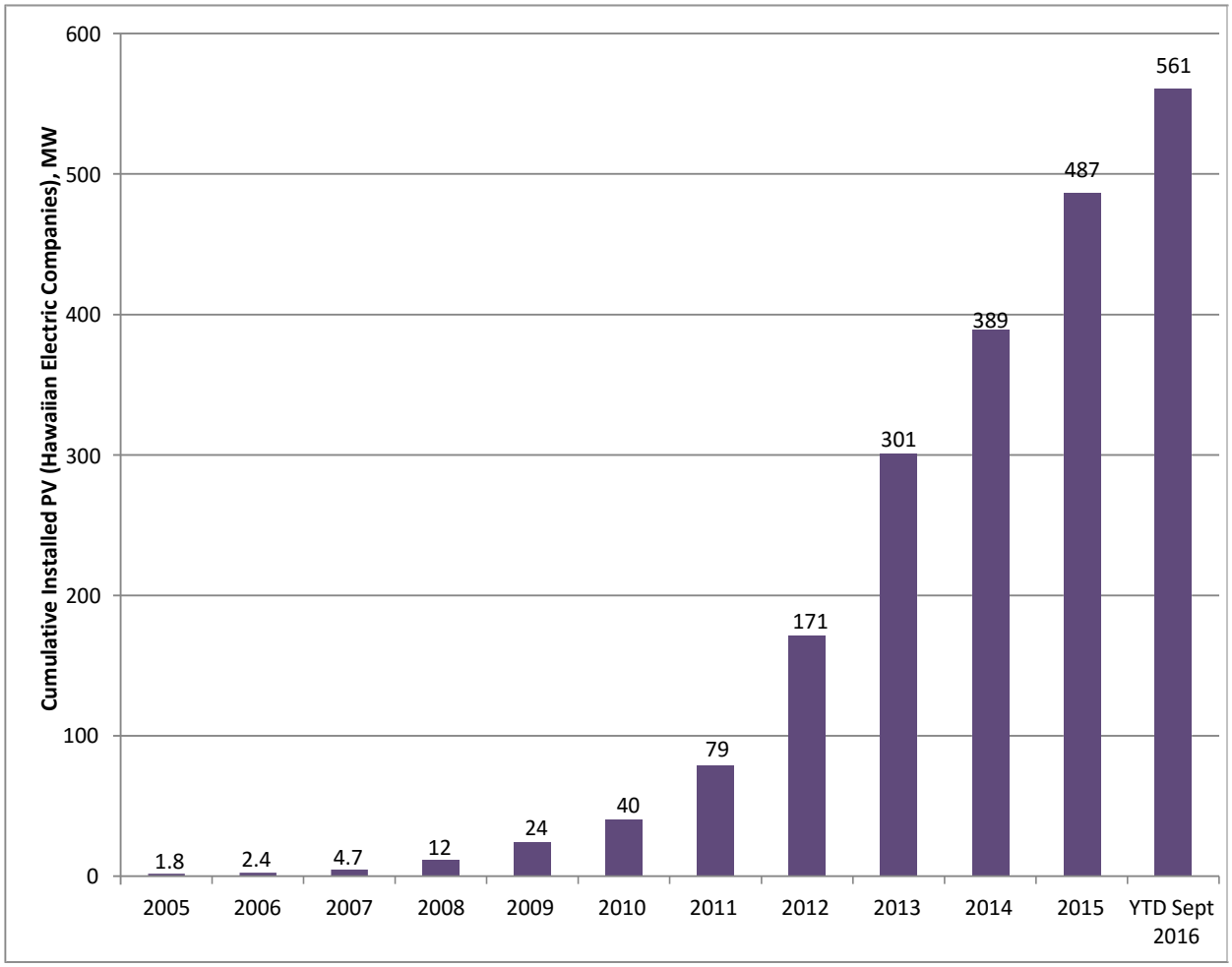


Data subject to change

Hawaiian Electric
Maui Electric
Hawai'i Electric Light

Cumulative Installed PV -- As of Sept 30, 2016

	Number of PV Systems			PV Capacity, MW		
	Number	% Residential	% Commercial	Capacity	% Residential	% Commercial
Hawaiian Electric	45,789	97%	3%	392	62%	38%
Hawai'i Electric Light	10,910	94%	6%	79.3	66%	34%
Maui Electric	10,996	93%	7%	89.6	63%	37%
Total	67,695			561		



Data subject to change

Hawaiian Electric
Maui Electric
Hawai'i Electric Light

Regulatory Authority of Bermuda

Response to Consultation Document 17-0316

(Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme) Emergency General Determination

12th May, 2017

6. What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs?

I have already spent more hours than I care to count assisting in the preparation of my companies (Bermuda Alternate Energy Limited) submission to this consultation document. A very large part of that exercise has been assisting our customers to understand the complexities of the entire mechanism that dictates the exchange of electricity between an Independent Power Producer and Utility. It seems there are 4 very fundamental issues at the heart of the entire process:

i. The Utility (BELCO) does not want Solar PV systems to be sized in a way that makes them Net Exporters of Energy and the financial implications that entails;
ii. Residential Power Producers want to enjoy the full value of their investment and have a vehicle to exchange the power they produce in a fair and equitable way with the utility.
iii. Residential Power Producers want to make their investment based on an attractive rate of return and a stable long term set of conditions that are not subject to indiscriminate change.
iv. The mechanisms for assigning a value to a unit (kWh) of traded solar electricity are inherently complex and typically require constant intervention or adjustment to ensure they are equitable to all of the interested parties.

There are very good reasons why solar generated power is particularly valuable in both the 'seasonal' and 'daily' timeframes in which it is produced and this availability profile can be used very effectively to help balance 'peak demand' and reduce overall generating costs. Because all of this has been covered in great detail in our corporate submission, I will not make any attempt to reiterate the reasoning here.

Rather than focus solely on the more traditional solutions to achieving a 'well balanced valuation' for the traded unit of electricity I would like to propose an alternative solution that I believe solves most, if not all, of the fundamental issues.

Firstly, I would remove the actual monetary valuation from the process and simply treat each solar kWh of electricity as a 'tradeable' and 'bankable' commodity with a true value of 1kWh of electricity, irrespective of time of production or time of use.

The residential power producer has the option of either consuming the kWh in real time as it is produced or, depositing it with the utility for later withdrawal. There is no time limit on the term of the deposit and there is also no monetary value to the units deposited.

Thus, there is no financial settlement required for excess units that are left 'on deposit.'

Obviously, the residential power producer can only withdraw the same number of units that have been deposited and once that limit is reached additional units are billed, by the utility, at the standard retail rates in force at the time. The payment for the banking service is borne by the existing 'Facilities Charge', which can easily be 'tweaked' to accommodate changes that may be required.

I see a number of significant advantages to this system:

1. There is no complexity involved other than recording the number of 'banked units', which is already done by the existing Net Meter;
2. Correct sizing of the system becomes very important and there is no incentive to 'oversize' for financial gain as excess units 'on deposit' have no monetary value;
3. The Utility has immediate access to potentially large amounts of additional kWh's of power during peak demand in the summer months. A large percentage of which will most likely not be withdrawn until periods of much lower demand, in the evenings, weekends and during the less sunny winter months;
4. The system has all the advantages of traditional Net Metering without the financial complexities of rate setting and the costs associated with levels of bureaucratic oversight.

I think it is very significant that this proposal can de described quite simply on two sheets of paper whereas, all the models involving the more traditional complex rate setting methods that assign 'value' require much weightier documentation. I believe that this simplified model would address the concerns of almost all the existing solar PV customers and would provide an extremely attractive model for the financing of future projects. In addition, I think it protects the Utility from abuses and profiteering and guarantees them a source of inexpensive peak demand power.

Looking to the future, the model could become even more attractive to the utility 'if and when' we move to a more sensible 'time of day billing' model as the solar kWh units would be inherently more valuable when banked than when withdrawn. Again, any potential imbalance could be subtly adjusted via the facilities charge.

I trust you will take the time to give it your full consideration.

Sincerely,

Nicholas Duffy.

'Glencot'

1 Crada Glen

Paget PGO3

Whale Watch House
47 Wreck Road
Sandys
SB 01

The Regulatory Authority of Bermuda, 12th May, 2017
Craig Appin House, 1st Floor BY E-mail
8 Wesley Street
Hamilton HM 11

Attn. Mr. Nigel Burgess, Senior Manager Electricity Analysis & Planning

Re: Response to Question 4 of Consultation Document 17-0316.

Dear Sirs,

Although I have made other submissions on behalf of a Solar Installation Firm, this is my personal submission in relation to question 4 on your above referenced EGD. My wife and I originally invested in a small solar PV system in 2010, then added a considerably larger system in 2014, with further additions in 2016.

Question 4: The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commission recommendations of October 2016 (see the Determination for detail). What are your views on this transitional measure?

Answer: In my opinion, the FIT recommended by the EC and imposed by the RAB clearly violates item 36 (b) of the Electricity Act that mandates that the validity of any tariff paying for renewable energy should be valid for at least the useful lifetime of the system. Therefore as I executed an Interconnection Agreement with BELCO in 2014 and my system comes with a 25 year performance warranty, I should entitled by law to the original net metering rate until at least 2039. In addition to this long term stability of feed in rates for distributed generators mandated under the EA, best practise in numerous other jurisdictions mandates long term stability in the rates with only gradual small changes. I refer you to "A Policymaker's Guide to Feed-in Tariff Policy Design" published by the National Renewable Energy Laboratory of the U.S. Department of Energy, available at http://www.nrel.gov/docs/fy10osti/44849.pdf . This document incorporates best practice principles from numerous jurisdictions, including the EU, which has decades of experience in these matters.

Furthermore, I refer you to the following paragraph taken from section 5.2 of the National Electricity Sector Policy of Bermuda (NESP):

"Prior to issuing any determination, the Regulatory Authority holds consultations that provide an opportunity for analysis and comments to be submitted by all interested

parties: the Electric Utility, IPPs, and end users (including those who are distributed generators at a residential, commercial, or industrial scale)."

Clearly had the RAB adhered to the above referenced clauses of the EA and the NESP, we would not be in this horrible mess that has brought the whole residential renewable industry here to a grinding halt.

With regard to the impact of your EGD on my most recent BELCO bill, under the net metering scheme the bill after discount was $18.71, as I net exported 55 kWhs for the month. By my calculation, my bill would rise to $95.10 under your proposed FIT, after discount. This represents an increase in my bill of 408%. This is hardly a gradual change recommended by the NERL's Policy Guide! Under the proposed FIT, for this billing cycle I would pay BELCO $1.729 per net exported kWh, plus the privilege of being connected to the grid. For the same $95.10 monthly bill after discount, a frugal non-solar BELCO customer could consume 284 kWhs, which works out to an average of $0.3349/kWh after discount. So how does the RAB possibly justify why I should pay $1.729 per net exported kWh when a non-solar customer pays only $0.3349/kWh per imported kWh? This perfectly demonstrates that the EC and RAB clearly did not conduct any meaningful FIT rate analysis in relation to how BELCO three tiered block of energy and facilities charges work! Otherwise they never would have proposed such a one sided rate structure that clearly dis-incentivises solar PV.

You have put the solar industry in this mess because clearly the EC had neither the time, resources, or legal authority to establish a FIT which BELCO had not applied for and the RAB did not hold the consultations stipulated in the NESP prior to issuing your determination. Furthermore, the EC held no public consultations on the FIT that they eventually came up with, which is entirely different from what BELCO applied for.

I assume that there are perhaps in excess of 150 BELCO customers that made investments in solar PV systems in the 2009 through 2014 time period. Many of these invested when the cost per watt was almost double today's pricing, but this higher price was partially offset by the solar rebate program that operated until approximately 2014. Those customers that just missed the solar rebate in 2014 invested when the fuel adjustment rate was as high as $0.19/kWh, which was sufficient to still make solar a reasonable investment. When the price of oil dropped dramatically in 2015, many of these customers saw their ROIs considerably lengthened. My wife and I invested in solar to both do our part in reducing global warming and to enjoy low BELCO bills when I retire in a few years. The RAB's EGD, seeks to burden us with much higher BELCO bills which are totally unjustifiable and discriminatory.

We respectfully urge you to immediately amend your EGD to:

1. Grandfather all existing BELCO PV customer's with the prior net metering

system in accordance with what BELCO requested.

2. Mandate net metering for all new solar PV customer up to the point where they become net exporters over 6 months, with a higher interim FIT of perhaps $0.2500/kWh. This rate more accurately reflects the avoided cost to the TD&R licensee required by the EA.
3. Force BELCO to install net meters for those new customers mentioned in 2 above.

Any delay in making these amendments will greatly increase the likelihood of the complete implosion of the residential solar PV industry here, with disastrous long term consequences.

Yours faithfully,

Chris Nash, P. Eng.

RENEWABLE ENERGY • EFFICIENCY • CONSERVATION

The Regulatory Authority of Bermuda,
Craig Appin House, 1st Floor BY E-mail
8 Wesley Street
Hamilton HM 11

12th May, 2017

Attn. Mr. Nigel Burgess, Senior Manager Electricity Analysis & Planning

Re: Response to Question 2 of Consultation Document 17-0316.

Dear Sirs,

We are pleased to submit the following answer to question 2 on the above referenced consultation document. Due to the length and complexity of this answer, we are submitting it separately from our answers to the other 7 questions.

Question 2. Looking to the future, how important do you believe Solar PV is for Bermuda? If a respondent views Solar PV as important, please provide your views on what its costs and benefits are, how these should be quantified, and how these should be reflected in the framework for electricity regulation.

Response to Question 2: In our professional opinion, Solar PV, particularly distributed solar, is the single most important renewable energy technology available in Bermuda to accomplish the six purposes of the Electricity Act (EA), plus the four objectives and vision of The National Electricity Sector Policy of Bermuda (NESP). Solar PV, particularly distributed solar is the only renewable energy used in Bermuda with significant market penetration and it is also the one renewable that can reduce the cost of electricity here with more widespread adoption in the near to mid-term future. We note that this claim about solar reducing the cost of electricity here is at odds with the views expressed by the previous CEO of Ascendant Group, so we will provide the data and facts that support our claim.

To understand how the wide scale adoption of solar PV can reduce the cost of electricity, we first have to look at how the fuel costs of BELCO peak summer demand are made up. Figure 1 is the last published daily load profile that we have on record from BELCO. This graph is taken from a public presentation that BELCO made in early 2011. Although maximum summer demand has fallen slightly since this was published, we expect that by 2019 it will be back close to these levels with the completion of Morgan's Point and the St. George's Hotels, plus the completion of the new airport terminal. Also, we expect that BELCO has had to reduce the loading on their high use diesels further with time, thus requiring more gas turbine use per peak MW of generation. The two oldest generators in BELCO's East Power Station (EPS) will reach 30 years of service this year and were originally due to be retired this year.

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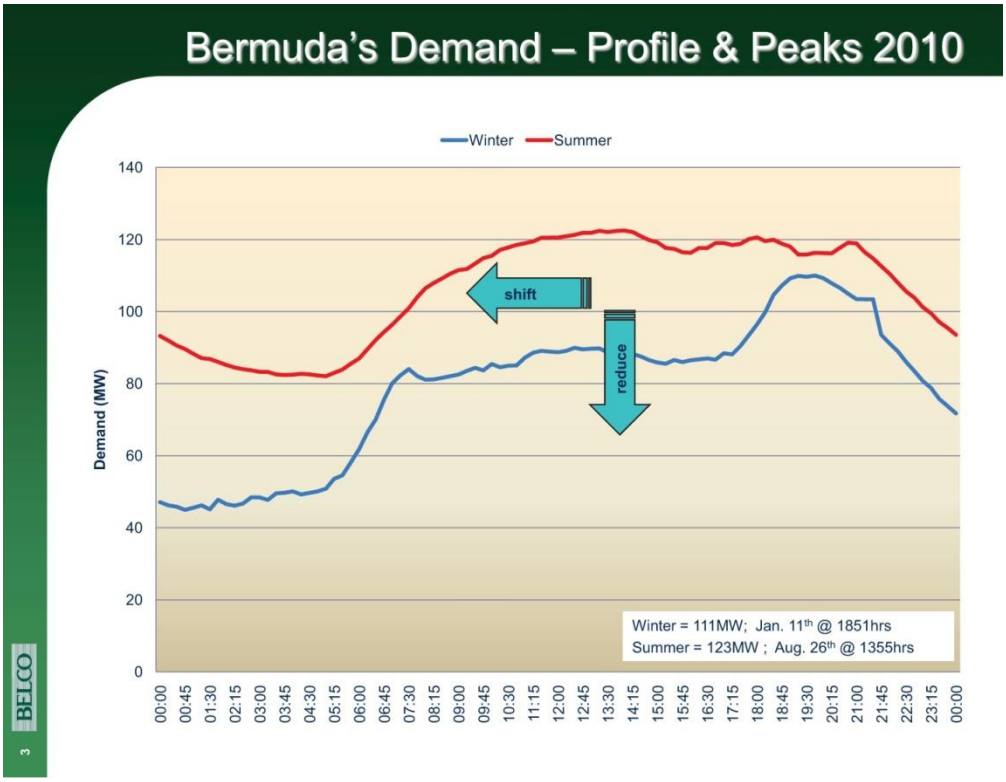

Figure 1

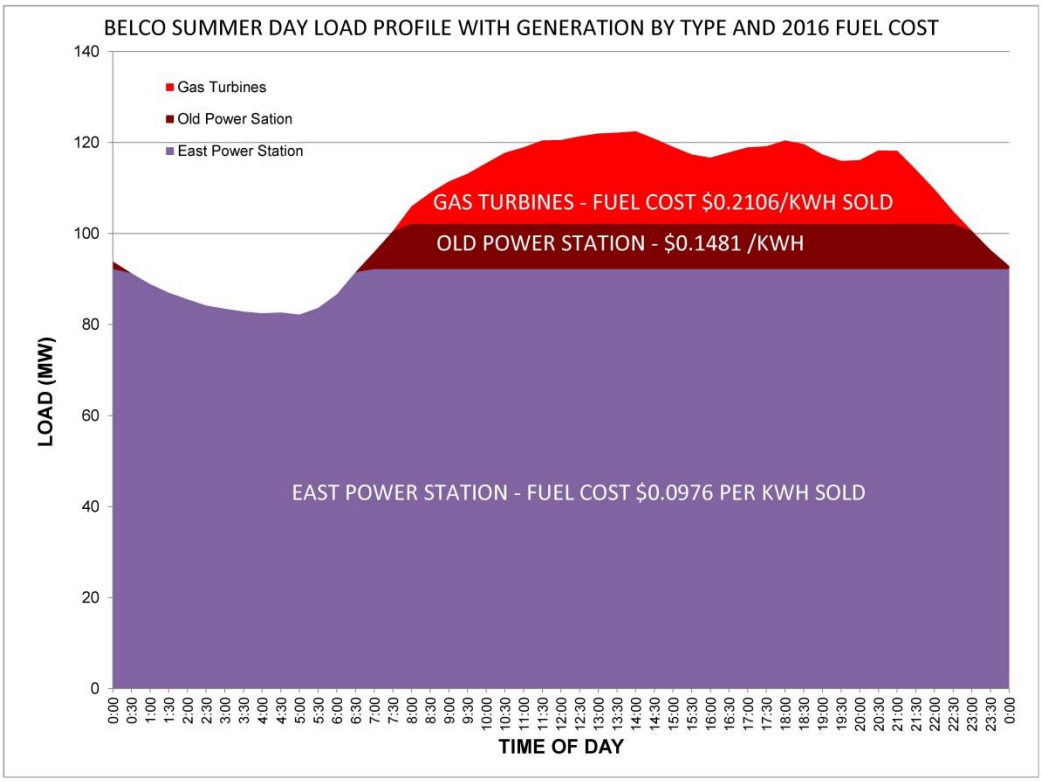

Figure 2

BAE
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Figure 2 takes the same summer peak demand curve and breaks down the generation by the three types that BELCO utilizes. The first of these are the base load diesel generators of their East Power Station, which burn #6 heavy fuel oil. Based on the heat rates listed in BELCO's Full Marginal Fuel Cost Table contained in their filing to the EC dated 16 September 2016, BELCO rates the efficiency of these generators at 39.62%. Because these are their most efficient generators, burning the less expensive, more energy dense fuel oil, the fuel cost per kWh generated is the lowest. The second is their older diesels in the Old Power Station that burn #2 ULS diesel. At 36.84% efficiency, these units are slightly less efficient than the East Power Station and the fuel is far more expensive even though it has a lower heat content. The third type is their gas turbine units which also burn #2 ULS diesel. Based on BELCO's published heat rates these generators are only 25.9% efficient, meaning they are by far the most expensive generators in terms of fuel cost per kWh generated, which is why they are only used during peak load times, as per Figure 2.

The increased fuel costs by the gas turbines in the peak summer months results in the higher fuel adjustment rates that we see in these months every year. Table 1 shows a history of BELCO Fuel Adjustment Rates (FAR) since 2011. Fuel costs have varied widely since 2011, but the table shows a consistent pattern where the peak summer fuel adjustment rates range from $0.0175 to $0.0600 per kWh higher than either preceding or following winter months. Therefore, if Bermuda were to deploy enough solar PV to offset most of this peak summer FAR, this could translate to 4% to 8% savings in almost all residential and small commercial summer billings. For commercial demand customers the savings for these few months could be in the 5% to 11% range. No other near to mid-term renewable technologies can match this level of savings to all BELCO customers.

In addition to the higher BELCO bills caused by the use of these gas turbines, because of their low efficiency, these generators produce far more carbon dioxide (CO2) per kWh than the other two types. Therefore any renewable technology that can reduce the use of these gas turbines satisfies most, if not all of the Purposes of the EA and the Objectives of the NESP.

BELCO FUEL ADJUSTMENT HISTORY FROM 2011 THROUGH 2017

CALENDAR MONTH	2017 FUEL ADJUSTMENT $/KWH	2016 FUEL ADJUSTMENT $/KWH	2015 FUEL ADJUSTMENT $/KWH	2014 FUEL ADJUSTMENT $/KWH	2013 FUEL ADJUSTMENT $/KWH	2012 FUEL ADJSUTMENT $/KWH	2011 FUEL ADJUSTMENT $/KWH
JAN	$0.0800	$0.1000	$0.1200	$0.1550	$0.1650	$0.1750	$0.1350
FEB	$0.0800	$0.1000	$0.1200	$0.1450	$0.1750	$0.1750	$0.1350
MAR	$0.0900	$0.0975	$0.1250	$0.1550	$0.1800	$0.1750	$0.1350
APR	$0.1050	$0.0900	$0.1250	$0.1600	$0.1800	$0.1750	$0.1350
MAY		$0.0765	$0.1150	$0.1650	$0.1700	$0.1750	$0.1350
JUN		$0.0765	$0.1150	$0.1675	$0.1800	$0.1950	$0.1415
JUL		$0.0875	$0.1300	$0.1775	$0.1800	$0.2050	$0.1480
AUG		$0.0875	$0.1300	$0.1850	$0.1850	$0.1975	$0.1600
SEP		$0.1050	$0.1300	$0.1900	$0.1900	$0.1975	$0.1725
OCT		$0.1020	$0.1250	$0.1750	$0.1850	$0.1900	$0.1750
NOV		$0.0950	$0.1200	$0.1750	$0.1700	$0.1600	$0.1750
DEC		$0.0860	$0.1125	$0.1300	$0.1700	$0.1700	$0.1750
ANNUAL AVERAGE	**$0.0888**	**$0.0920**	**$0.1223**	**$0.1650**	**$0.1775**	**$0.1825**	**$0.1518**
HIGH-LOW DIFFERENCE	**$0.0250**	**$0.0285**	**$0.0175**	**$0.0600**	**$0.0250**	**$0.0450**	N/A

Table 1

So now let's look at how much solar PV that Bermuda would need to offset most if not all of the gas turbine use by BELCO and whether this would have potential to destabilize the grid as some pessimists claim.

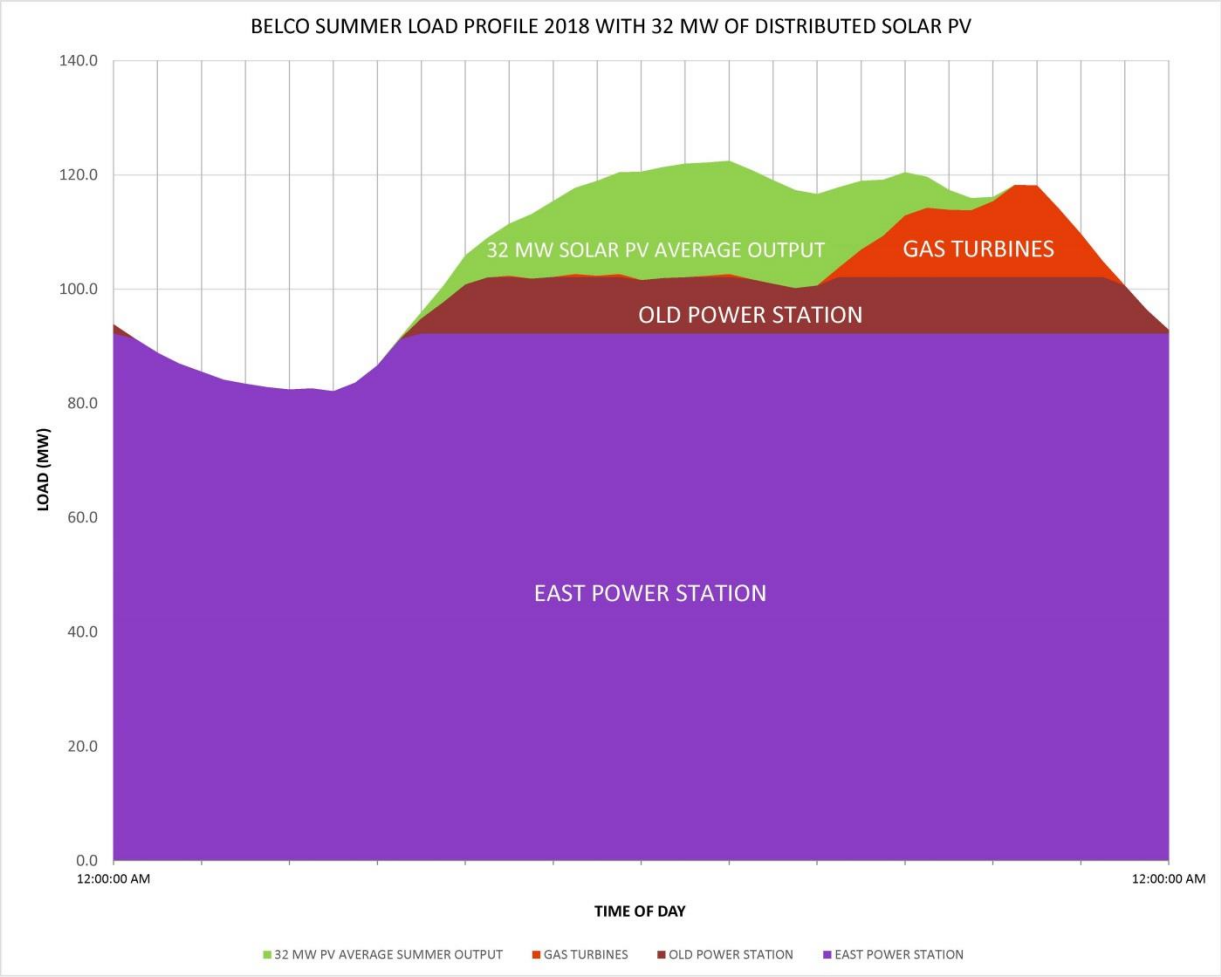

Figure 3

Figure 3 is the same summer peak load profile used in Figure 2, but with the output of a combined 32 MW of solar PV. This could represent the combined output from the proposed 6 MW solar farm plus 28 MW of distributed Solar. To arrive at the bell curve for the solar output, we modelled the curve based on the actual daily output of a 10.2 kW residential system as shown in Figure 4, based on a nearly cloudless day on July 13th 2016. The sample system consists of a mixture of pitched roof modules facing approximately South-East and South West, plus some nearly flat verandah roof modules also facing South East. To approximate the average summer performance including clouds, the extrapolated data for the cloud free day was multiplied by 73%, based on average values for the whole month of July 2016.

Comparing Figure 2 and Figure 3, we can clearly see that a combined 32 MW of solar PV on an average summer day virtually eliminates the need to run BELCO's gas turbines on a peak summer day from 8 am to 4 pm. On a cloud free summer day, the 32 MW of solar PV would even eliminate a good portion of the Old Power Stations (OPS) diesels on a peak day. On less

than peak days, even average solar performance would eliminate a good portion of the OPS units.

The portion of the peak summer load curve from 4 pm to 11 pm that would still require gas turbines could be mostly offset by additional solar capacity combined with energy storage. Given the huge advances in battery and other energy storage technologies, this total elimination of BELCO's gas turbines could probably be accomplished in five to ten year's time, if there is widespread adoption of distributed solar, plus a reasonable amount of energy storage. Thus the high fuel cost, maximum CO2 emissions of the gas turbines could be eliminated by solar PV and energy storage within 10 years.

So let's look at the question of grid stability with a total of 32 MW of solar PV deployed in Bermuda. At present there is approximately 3 MW of combined residential and commercial solar PV installed in Bermuda, so we would need to increase this by almost a factor of 11 to get to 32 MW. A great example of where this level of distributed solar has already been installed is the Island of Maui in Hawaii. Maui has a population two and a half times Bermuda's and in the fall of 2016, they already had 80 MW of distributed solar installed without significant grid issues. To reach the same level of solar penetration per unit of population, it just happens Bermuda would need 32 MW of distributed solar. But Maui and the other Hawaiian Islands are not planning to stop at this level of PV adoption. The State and Hawaii Electric Company (HECO) have ambitious plans to triple the use of distributed solar by 2030. This is in conjunction with numerous other renewable energy technologies widely used in Hawaii including wind, hydr-electric, biomass, geothermal and possibly ocean thermal. With this wide scale adoption of renewable energy technologies and the huge financial cost of LNG infrastructure, please note that in 2016 HECO withdrew its application for using LNG for power production on some of the other larger islands in the state.

Figure 4

With regard to the stability of output from distributed solar system in these summer months, please note Figure 4 shows the daily output of a 10.2 kW system on July 13th, 2016. The graph shows that this was nearly a cloud free day. Figure 5 shows the month's energy production for the same system. Please note that the daily solar energy output fell to close to 50% of the peak output on only two days in the month.

Thus on good summer months, daytime energy production from distributed solar can be far more consistent than BELCO and others have previously alluded.

Solar PV provides both daily coincidence with BELCO's summer peak daily load and yearly coincidence. These coincidences put solar PV in the unique position of being able to offset the use of these peak load gas turbines, thus minimizing or even eliminating the use of these inefficient, most costly and most CO_2 producing generation technology used by BELCO. Distributed solar also has the advantages of being able to be widely funded by individual home and business owners, without having to utilize undeveloped land or sea bed.

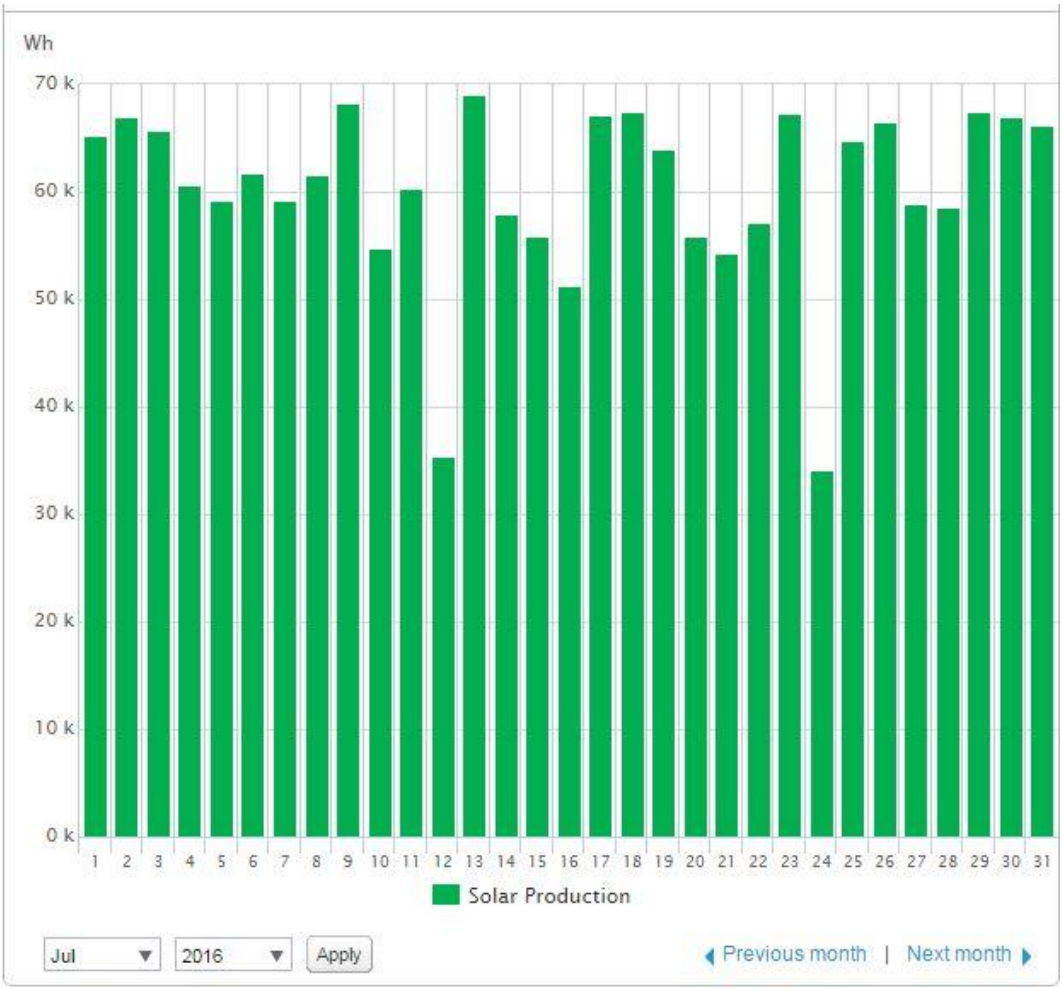

Figure 5

Amazingly, neither the NESP nor BELCO's IRP seem to even recognize the use of these gas turbines as both the most costly and most carbon intense per kWh of BELCO's three generation

types. Nor do they consider by how much these units put up the summer cost of electricity for every household, business and institution on the island. Having overlooked this unique advantage that solar PV offers for lower summer electrical costs, the Aspirational Matrices of the NESP and BELCO's IRP, both assign solar PV a relatively small portion of the future generation mix. Perhaps this small allocation of solar PV in these aspirational matrices is designed to preserve the revenue stream of the oil companies and the government, who earn more tax revenue per kWh generated by these gas turbines than from the other technologies?

We trust that the foregoing proves how well suited solar PV is to minimizing or eliminating the use of these costly and inefficient gas turbines. We also trust that this proves solar PV is so well suited to satisfy the least cost electricity vision of the NESP. So let us now compare Solar PV to the other renewable technologies contained in the aspirational matrices of the NESP and IRP to help identify the advantages solar PV has over these other technologies.

Bulk Scale Solar PV: As far as we know, the aspirational matrix was based on the construction of a solar farm on the airport finger of approximately 20 MW capacity. However BELCO apparently have advised that their grid cannot presently handle such a large solar farm, so the present plan appears to be to construct only 6 MW. This leaves a 14 MW deficiency in bulk scale solar for a time period that is not public knowledge. Wider adoption of distributed solar PV is the only practical technology to offset this shortfall. Both distributed solar and bulk scale solar are the best technologies to minimize or eliminate the use of gas turbine peaking generators by BELCO.

Solar Water Heaters (Solar Thermal): We fail to understand the logic that was used to allocate solar water heaters a bigger percentage of the share of generation by source and the share of peak demand by source than distributed solar PV in the aspirational matrix targets for 2020. There is already some 3 MW of distributed solar deployed in Bermuda and we suspect that the deployed solar water heaters are under 300 kW total, even though this latter technology has been used here since the 1970s. We understand that there are approximately 85 distributed solar systems being installed per year at present, compared to perhaps five solar water heater installations. The annual deployment of distributed solar is approximately 650 kW, compared to perhaps 22.5 kW of solar water heater capacity. The reality is that Bermudian home owners have come to the realization that for a typical existing home, solar water heating is a less attractive investment than solar PV, particularly when the house has 3 or more existing water heaters. Other alternatives for saving energy costs are to convert from electric water heaters to propane or heat pump water heaters, both of which are far less expensive than solar water heating in existing homes. In terms of solar water heating's ability to curb the use of BELCO's gas turbines, most residential hot water is consumed either in the early morning or in the evening after 5.30 pm. So solar water heating con only offset a much smaller proportion of the turbine use compared to the same capacity of solar PV.

Waste to Energy: The existing waste to energy plant at Tyne's Bay is a meaningful renewable source that is close to base load output. It does emit CO2, and has no significant room for growth, but it does deserve to be part of the aspirational matrix for future electricity sources.

Future Renewable Energy Base Load: The NESP's aspirational matrix identifies a future base load technology to be brought on line in 2025 that is earmarked to produce 26% of the Island's electricity. We could find no description of what this base load technology could be within the text of the NESP. However we did find more description in Table B.1, which lists it as being based on an ocean pilot project in Martinique. Our searches of the web for an ocean energy project in Martinique all lead to an Ocean Thermal Energy Conversion (OTEC) project under consideration in that country. As the listed inventor of US and UK patents on an ocean

thermal technology, who has worked with some of the leading firms in this industry, I believe that I have an intimate knowledge of whether Bermuda is suitable for deployment of this technology by 2025. The answer is an emphatic NO, because our winter sea surface temperatures are too low for OTEC to work in an economic manner. So while we may see this technology deployed in more equatorial locations, where the sea surface temperature remains high all year long, there is no hope of it happening here without higher annual sea surface temperatures. Thus 26% of our forecast future renewable energy is based on a technology that does not work here, leaving a gaping hole for other technologies to try to fill.

The NESP is silent on the future use of off shore wind, biomass or wave energy, although some of these at least get mentioned in the IRP. Looking briefly at offshore wind, its greatest potential is in the wintertime when average winds are highest. In the summer, when BELCO's peak demand is highest, the average winds are lowest. This means that off shore wind does not provide the daily and seasonal peak energy coincidence that solar PV provides. Therefore off shore wind is a poor candidate for lowering the use of BELCO's gas turbines and thus a poor candidate for lowering the summer fuel adjustment charges for all BELCO customers. So we should consider off shore wind as a potential complimentary technology to solar PV, but even together they will be intermittent and thus cannot fill the base load void left by the above OTEC system. We consider wave energy to have similar seasonal availability to wind and thus poorly suited to offset the use of BELCO's gas turbines in summer months. Furthermore, we do not consider wave energy to have reached commercialization, so it remains a future energy source with large potential.

Besides the huge benefit of reduced summer FAR rates for all customers, which distributed Solar PV is the only renewable to offer, other benefits over other renewables largely include the following:

1. Reduction of the most carbon intense emissions by BELCO
2. Less grid losses with the neighborhood distribution model.
3. Less expense by BELCO upgrading the grid to take multi-megawatt in-feeds such as at the airport.
4. Potentially lower FAR rates in the fall, winter and spring due to the off-setting of #2 diesel and #6 fuel oil at the OPS and EPS respectively, although this will be less than that provided in the summer.
5. Can mostly be deployed on exiting roof tops, thus avoiding further development of un-used land.
6. Will offer solar customers the option of silent back up power rather than using noisy generators during power outages.

With regard to the cost of distributed solar for residential customers, the cost was relatively easy to justify for all different sized users with net metering, or even the modified net metering proposed by BELCO for new PV customers. However, with the FIT proposed by the RAB, only the largest residential users will be able to justify the cost of solar PV, because they will self-consume most of the energy that their PV systems produce. For smaller and medium sized customers, they will be forced to use systems far smaller than they would need to become near net zero users. This will drive up the cost per watt for those systems because of all the fixed costs and economies of scale, leading to longer return on investments and thus far slower adoption of solar PV. In fact, the RAB's proposed FIT could kill distributed solar's chance to offset the use of BELCO's gas turbines in the near term and thus not provide the summer FAR savings that all BELCO customers would otherwise enjoy.

Please note that Maui achieved more than ten times our solar adoption per unit of population before net metering was ended there in late 2015, so why is the RAB looking to switch all PV customers to a FIT, when BELCO was willing to grandfather existing customers and provide newer customers net metering up to the point they become net monthly exporters?

In summary, we trust that the foregoing shows how well solar PV is uniquely suited for substantially reducing the use of BELCO's inefficient and carbon intense gas turbines. The direct side benefit for all Bermuda residents, businesses and institutions will be dramatically lower FAR rates in peak summer months and less dramatic reductions in other months. Thus solar PV, as a renewable, is uniquely positioned to achieve least cost electricity which is one of the fundamental objectives of the EA and NESP. Please note that these FAR savings can be achieved regardless of whether BELCO continues to burn oil based fuel or switches to LNG although the magnitude of FAR savings should be less with LNG. Given that the airport solar farm has been substantially downsized and the future renewable baseload identified in the NESP's aspirational matrices will not work in Bermuda, there is now a huge shortfall in renewable capacity for the foreseeable future. We therefore urge Government and the RAB to re-prioritize solar PV as the first choice on the aspirational matrices with the aim to get close to 32 MW of installed capacity by 2025. For 2035 the target should be for perhaps 50 MW with enough energy storage to eliminate all simple cycle gas turbine use.

We trust that this answer adequately demonstrates how important distributed solar is for Bermuda to obtain a more sustainable and cost effective energy future.

Please contact myself should you require any further information on our answers, comments and recommendations.

Yours Sincerely,

C. E. Nash, P. Eng.
Engineering Manager

CEN/nec

Cc Nick Duffy

Regulatory Authority of Bermuda

Response to Consultation Document 17-0316

(Transitional Measures for Bermuda Electric Light Company Limited Solar Net Metering Scheme) Emergency General Determination

QUESTIONS FOR CONSULTATION

1. What is your view of the how Solar PV has evolved in Bermuda? Please provide views on the uptake of this technology.

To properly evaluate the evolution of Solar PV in Bermuda it is necessary to look at the Bermuda case in the context of Global Solar PV evolution and in particular PV evolution in comparable or similar Island nations.

In our letter to the RAB of 6th January, 2017 we included the following information, which you should already have on file. We would be happy tp provide additional copies if required:

"We suggest that the RAB examine the economic benefits that have resulted in the widespread adoption of distributed generation in Hawaii. We further suggest that the review should be geared more specifically to the Island of Maui, because its population is approximately 2.5 times that of Bermuda and therefore its traditional generation technologies are similar as well.

For your reference, we have included the following documents from Hawaii in the Appendix Section:-

A. *Hawaii's Cumulative Installed PV Summary as of September 30, 2016*
B. *Hawaii's Cumulative Installed PV Summary as of December 31, 2015*
C. *Maui Electric's Web Pages on Tripling Distributed Solar by 2030*
D. *HECO's Sustainability Report 2015*

From these documents you can see that Maui already has 89.6 MW of distributed solar capacity and they are looking to triple this by 2030. Yet as far as we can determine, it appears that Maui Electric have not had a price increase since 2013. By contrast, BELCO has already received a huge rate increase in 2016 as well as a substantial increase in their Facilities charge in 2014. Yet according to BELCO, our adoption of distributed solar is only approximately 2.8 MW. Also as far as we can determine, Maui Electric's residential rates including fuel surcharge and their facilities charges are far below BELCO's. To us this demonstrates that an island the size of Bermuda could have much higher adoption of distributed PV without having to incur all the price increases that BELCO have been granted. Would this not be a huge economic savings for all of BELCO's customers? Furthermore, the Sustainability Report shows that Hawaii and its utilities are fully committed to 100% of electricity from renewable by 2045. Yet BELCO is advocating the huge investment in LNG, which if Bermuda were to match Hawaii in renewables adoption, would leave us with substantial stranded assets that would impose huge economic costs on the next generation of Bermudians and residents of Bermuda.

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Please note that the Public Utilities Commission in Hawaii ended residential net metering there in October 2015. Based on attachment B above, we can conclude that there was approximately 70 MW of distributed PV installed in Maui when net metering was ended, 64% residential and 36% commercial. Given that Hawaii and other states still enjoy a federal tax credit for installing solar PV, we have to ask why is Bermuda proposing to end net metering after only approximately 1.8 MW of residential solar has been installed?

Based on the latest information available to us, we estimate Bermuda currently has only 2.8 Megawatts of installed distributed solar PV, of which approximately 1.0 MW is commercial.

Residential Solar PV Evolution

We estimate there are approximately 350 installed residential systems, giving an average of 5.1 kW per system, which agrees closely with our own empirical data. With the earliest installations dating to around 2009 this gives us an average install rate of 44 per annum. Looking at it another way, there are 32,100 residential valuation units in Bermuda[1], each of which is eligible for a solar PV installation however, at this time only 1% of potential residential adopters have chosen to invest in a Solar PV system.

Commercial Solar PV Evolution

To our knowledge there are only 9 commercial solar PV installations in Bermuda (excluding BELCO's own in-house system), totaling approximately 1 installed Megawatt.

2 are smaller Fuel Stations, 1 Private School, 1 Hardware Store, 1 Liquor Company, 1 Warehouse, 1 Insurance /Real Estate Company, 1 Investment company and 1 Supermarket.

With 3700 registered commercial units[2] this represents an adoption rate of just 0.0025%.

Government Buildings Solar PV Evolution

There are no Government Buildings installed at this time.

2. Looking to the future, how important do you believe Solar PV is for Bermuda? If a respondent views Solar PV as important please provide your views on what its costs and benefits are, how these should be quantified, and how these should be reflected in the framework for electricity regulation.

Because of time constraints we have submitted our 'Response to Question 2' as an additional and separate document to be read in conjunction with this document.

3. Should there be capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within a formal licensing framework?

We assume that this question is specifically related to Residential Systems and in our experience, there are two overriding factors that typically influence solar capacity:

i) **Traditional 'Bermudian Architectural Roof Design'.**
   a. This dictates major elements of residential design and construction and is already strictly regulated by The Department of Planning. The 'Bermuda Cottage & Bermuda Roof' style of construction, comes with multiple small 'Hip' rooves and a unique water catchment system, which places angled gutters directly across the majority of useable roof faces.

[1] Land Valuation Statistics – December 2016
[2] Land Valuation Statistics – December 2016

b. Both of these elements significantly restrict PV installation from large areas of the overall roof area and typically do not allow for either large scale or efficiently located solar installations.
c. This results in complex multiple array and multiple orientation PV installations in Bermuda that are not commonly seen in other countries but are required here to overcome the physical constraints of the typical Bermuda roof design and are themselves significant constraining factors on the overall size of installations.
d. It is also a major contributing factor to the overall cost of a PV system, which in turn becomes a further limiting factor.

ii) **The almost total lack of Energy Efficiency Standards and/or Regulations in Bermuda.**

a. Historically there has been virtually no effort in Bermuda to institute standards or regulations related to energy efficiency and residential building codes are no exception. The typical Bermuda home is poorly insulated, badly oriented and filled with appliances and devices that consume unnecessarily high amounts of electricity.
b. In addition, the nature of our 'bi-seasonal' climate puts high power demands on homes and businesses to maintain a comfortable indoor environment for lengthy periods throughout the year. As a result we have peak power demands during the summer months that put a significant strain on our traditional fossil fuel based power source and result in the use of highly inefficient generation devices (Gas Turbines) to manage the peak load.

The combination of the two factors outlined above has the effect of firstly constraining the size and capacity of the vast majority of residential PV systems. And secondly, placing demands on them that result in the majority of installed systems being somewhat undersized in relation to overall demand.

We acknowledge that there are instances where owners/installers have significantly oversized PV systems in an effort to create financial gain, and we as a company do not support this approach. However, these systems are certainly not the norm and while we disagree with their objective, we feel that the additional power contribution to the overall peak demand helps to balance and compensate for the majority of residential PV systems that are limited in capacity by the constraints we have already identified.

For all of the above reasons we do not support the concept of an additional layer of bureaucracy to create a 'formal licensing agreement' for PV systems as they are already regulated by a comprehensive set of international standards, including: NEC Electrical codes; UL- Compliance Codes; and Bermuda Building Codes.

Indeed the imposition of an additional licensing framework would be a further disincentive to the adoption of solar PV as it would further increase the so called 'soft costs' of a system, which are already disproportionately high in Bermuda in relation to the overall system costs.

a. If so, who should be responsible for assessing the system sizes and their limits (BELCO, Department of Planning, RAB, etc.)

Because we do not support the concept of imposing 'artificial capacity limits' by definition, there is no requirement to devise a body with responsibility for the same.

While we have assumed that the major thrust of the question is related to residential PV we do recognize the need for larger (commercial PV systems) to be assessed in relation to their interconnection point to the grid, to ensure the localised BELCO infrastructure can accommodate the connection. This process however must not become a vehicle for BELCO to unreasonably deny access and requires a simple and rapid arbitration process to be triggered in the event of a dispute.

b. Should Solar PV system sizing for a customers' premises be limited to the prior 12-month consumption of a residence/business and/or should it be based on forecasted consumption?

This is essentially the same question as previously answered and is associated with capacity limits, of which we are not in favour. Once again, it is the addition of yet another cumbersome layer of bureaucratic oversight that would be both difficult and expensive to administer, and in all likelihood would be mainly inaccurate. Solar PV systems have a minimum lifespan of 25 years and in Bermuda household demographics are constantly changing, particularly with the high percentage of travel and overseas schooling that are commonplace, and the relocation of family members in and out of the 'homestead'. Thus, imposing a 'forecasted' or 'historical usage' model would cause sizing in many instances to be based on data that could be both inaccurate and out of date as well as constantly changing throughout the lifetime of the system.

4. The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for electricity received from Solar PV systems on the basis of the Energy Commission recommendations of October 2016 (see the Determination for detail). What are your views on this transitional measure?

The effect of the transitional measures mandated by the EGD, and originally prescribed by way of a set of recommendations by the former Energy Commission, have been both instantaneous and devastating to the survival of the renewable energy industry in Bermuda. It is particularly painful that these measures have been implemented after the industry has struggled through over 6 months of indecision since the original BELCO proposal, and bear very little relation to the original requests submitted by them as early as August, 2016.

As a direct result of the EGD, Interim Orders the Renewable Energy Industry is suffering from:

- Massive business interruption, caused by widespread confusion and mistrust;
- The inability to calculate valid Return on Investment calculations with any certainty of long term financial accuracy or security;
- Interruption of cash flow;
- Contract delays, Downsizing and Cancellation of pipeline systems;
- Inability to conduct ongoing sales activities (residential);
- Consequential loss of income;
- Unsold high value inventory;
- An unprecedented demand on resources to conduct 'communication' & 'damage control' exercises.

Our views on the Transitional Measure are as follows:

- It was reckless in the extreme to mandate a sweeping set of changes prior to conducting a comprehensive consultation process with the stakeholders. Prudence would dictate that information gathering and consultation should always precede the introduction of sweeping changes;

- Our preliminary enquiries indicate that there is very little evidence from the documentation available that the 5 recommendations made by the Energy Commission, and subsequently adopted by the RAB, were founded in quality research and evaluation. Indeed, the recommendations bear little resemblance to the original submission by BELCO and there is very little supplementary information given to indicate how the information they were able to gather led them to the set of recommendations they eventually arrived at. We have been reliably informed that both the content and quality of the minutes and other parts of the paper trail is severely lacking.

- It also of great concern that the RAB, despite being specifically recommended to do so, **as a matter of priority**, by the EC, under 'recommendation #3' has not carried out:
  " a more thorough and complete solar PV economic and market study be carried out by the Regulatory Authority as a matter of priority, with a view to establishing sustainable policies and power purchase rate determination methodology. The new policies and rate determinations should be in accordance with the Government's mandated industry policies and the Electricity Act 2016."
  We sought a meeting with the RAB in January 2017 to discuss the concerns of the Solar Industry and provided them, in advance, with significant amounts of detailed information on the state of the industry. However, despite all our efforts, we were only given approximately 30 minutes of their time and had no opportunity to exchange the bulk of the information we had prepared.

- Basic principles of Rate Setting dictate that a comprehensive set of Social, Environmental and Economic factors are an inherent part of the process and it cannot be simply regarded as a mathematical process. It is our opinion, that these basic principles have not been applied and are in direct contradiction of the Electricity Act[3] and therefore the set of Interim Orders cannot be allowed to stand.

- It is our opinion that the Interim Orders are clearly in contradiction of the following sections of the Electricity Act:
  Purposes of this Act (Page 7)
  6 The purposes of this Act include the following, namely, to seek—
  (a) to ensure the adequacy, safety, sustainability and reliability of electricity supply in Bermuda so that Bermuda continues to be well positioned to compete in the international business and global tourism markets;
  'Interim Orders' removes the financial viability of a sustainable energy source
  (b) to encourage electricity conservation and the efficient use of electricity;
  'Interim Orders' not only encourages increased usage of self-generated electricity, but also encourages that usage during periods of 'peak demand' which is detrimental to the overall price efficiency of the grid.

[3] Section 36 (a) (i) & (ii) of the Electricity Act

(c) to promote the use of cleaner energy sources and technologies, including alternative energy sources and renewable energy sources;

'Interim Orders' is a huge disincentive to the use of cleaner energy sources and technologies and has brought the entire renewable energy industry to a standstill. Any continuation of the present situation will result in the complete failure of the industry with the accompanying loss of employment and expertise. This in turn will leave those who have invested in cleaner and renewable energy sources with 'technically and financially stranded assets.

(d) to provide sectoral participants and end-users with non-discriminatory interconnection to transmission and distribution systems;

We regard the proposed interconnection terms as financially discriminatory toward those who have, in good faith, made significant financial investments in renewable energy systems.

(e) to protect the interests of end-users with respect to prices and affordability, and the adequacy, reliability and quality of electricity service;

Clearly, 'Interim Orders' does the opposite for those end users that have already invested in sustainable technology. It also removes any incentive for financially viable future investment in the same.

(f) to promote economic efficiency and sustainability in the generation, transmission, distribution and sale of electricity.

Distributed Solar PV is both efficient and sustainable and reduces not only peak generation costs but also transmission and distribution costs.

- Contractual relationships exist between the approximately 350 'legacy' net metered customers and BELCO. From the evidence available, BELCO were not seeking to disadvantage these legacy customers or invalidate their contracts by way of their application to institute a revised form of net metering for new customers, after the August 15th press release. The RAB by their actions have essentially superseded the contracts that existed and overruled the terms that were jointly agreeable to the two parties and in doing so have caused significant financial damage to the legacy participants.
- The only customers that are not financially disadvantaged by these interim orders are typically high net worth homeowners, with properties that have a higher than average electricity consumption, and where demand for electricity consistently exceeds the maximum solar output throughout the day. Because these customers will never have excess production during daylight hours they will not be subject to the massively reduced export rate.
- A likely unforeseen consequence of the RAB's orders is that it has inadvertently introduced 'time of day billing' for solar producers and will actively encourage them to maximise their electricity consumption during the daylight hours of peak solar production. By programming devices: pool pumps, water heaters, dryers etc., to operate only during daylight hours they can maximise their self-consumption. However, the downside of this type of usage is that peak solar production also coincides directly with the period of maximum demand and is when the grid could most benefit from the addition of surplus power from independent solar sources. Without this influx of additional solar energy during peak demand there will be a greater need to run the most inefficient and expensive gas turbine 'peaking engines' increasing the overall cost per kWh of the electricity produced by BELCO, which is obviously contrary to the primary goals of conserving energy and reducing demand

BELCO's original filing of September 16th 2016 sought to make 2 major changes to the existing net metering program:

i) Changes to the frequency of the calculation of NET POSITION from BI-annual to Monthly

'Net Position' in kWh, is defined as:
The total of DEL (delivered) kWh by the utility to the customer, in timeframe 'X'
MINUS
The total of REC (received) kWh by the utility from the customer, in timeframe 'X'
= NET POSITION

- Timeframe 'X' was originally a bi-annual period in which the rolling total, if ***in credit to the customer*** was settled and re-set to zero. The revised BELCO filing requested that Timeframe 'X' be revised to a rolling monthly or 'billing cycle' period and then be settled, ***if in credit to the customer,*** and re-set to zero.
- In question 3 we provided considerable detail on the sizing of PV systems and the difficulties, in typical installations, of providing adequately sized systems to offset the bulk of the owner's electricity billing.
- One of the most important characteristics of a well-designed and properly sized residential PV system is the ability to create a POSITIVE NET POSITION, or put another way, be a net exporter of kWh's, during the Spring and Fall months of the year.
- This POSITIVE NET POSITION helps to buffer the significantly higher demand during summer when air conditioning systems come into play and during the winter months when solar production is significantly lower and heating is sometimes required.
- Thus, while a customer may be NET POSITIVE at certain times of the year their annual position is normally NET NEGATIVE. We have scrutinized our installed base and do not see any examples of customers who are likely to be NET POSITIVE on an annual basis. We do not dispute that exceptions may exist, but we contend they are extremely rare.

i) Valuation of surplus electricity, after the calculation of NET POSITION at the revised 'Avoided Fuel Cost' rate of $0.1736 per kWh

- In total contrast to BELCO's filing, the RAB's interim orders completely remove any calculation of a NET POSITION from the equation. And all kWh's produced by solar that are not immediately consumed by the property, at the time of production, are valued at the Avoided Fuel Cost rate of $0.1736.
- By completely removing the cycle for calculation of a NET POSITION, from the equation, the customer who exports the majority of their solar production during the day back to the grid has been given an immediate 60% reduction in the value of each kWh they produce.
- Assuming their system is correctly sized to produce just enough electricity to match their average monthly consumption, they would now need to generate 2.5X more electricity to achieve financial parity.
- A likely unforeseen consequence of this approach is that it actively encourages customers to 'over-consume' and use additional electricity, increasing demand during those periods when they know they are likely to create a NET POSITIVE

position. Obviously, this is contrary to the primary goals of conserving energy and reducing demand.

We have provided 3 tables in the ***Appendix Section*** that show the financial impact on customer billings for 'small', 'medium', and 'larger' PV systems under the RAB Interim Orders.
Each table has 3 'Monthly Usage Profiles' on the left hand side as follows: LOW, MEDIUM & HIGH.

- These relate to how much of the solar electricity is consumed by the house *at the time of production*. So a house with a lot of constant load, air conditioning, pool & other pumps, hot water etc., which would be typical of a house with part of the family at home during the day, will have a 'HIGH' monthly usage of the kWh's produced by solar and will only export a small percentage of the solar production.
- In contrast, a house with no one at home during the day and minimal load, perhaps only a refrigerator and a few communication devices, will have a 'LOW' monthly usage of solar energy *at the time of production* and will export the majority of the solar production.
- As the tables show, in the worst case scenario, customers are looking at monthly increases in their BELCO bills of over 310%, despite having PV systems that are not sized to create a NET POSITIVE POSITION.
- We have also attached a 4th table that summarises each of the 3 systems and shows 'typical' solar production totals per month (right most column) for a system of that size.

5. What level and type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed-in tariff for electricity provided by Solar PV?

Because of the Q & A format of this consultative document there is a strong implication, based on the wording of the questions, that a Feed In Tariff (FIT) is the only appropriate solution. In our opinion, this is not the case, and we refer to the following:

In our letter to the RAB of 6th January, 2017 we included the following information, which you should have on file:

"THE INCLINED BLOCK STRUCTURE AND COST SUBSIDIES*: In our previous letter of 3rd October we outlined that residential customers here who are close to net zero consumers due to their PV production (net importing or exporting less than 250 kWhs/month) are actually subsidizing BELCO due to the trading of first block electricity, which is then often resold by BELCO to a close neighbor at third block rates. This represents a 113.5% mark up on the first block rate at the new 2017 rates, whereas it was a 104.4% mark up under the 2016 rates.*

We respectfully suggest that the RAB should ask BELCO how many of the existing 325+/- net meter customers are typically within 250 kWhs +/- of zero net consumption per month in order to quantify the magnitude of this subsidization of BELCO by these near net zero customers. It would also be helpful to know how many net metering customers never get down to the second block of net consumption and how many are net exporters in excess of 250 kWhs per month? Alternatively, the RAB could ask BELCO for details of $594,395 subsidy that they claim to have incurred over six years, broken down by residential inclined block rate, as we assume that 100% of this subsidy is for residential customers. This should give

some indication of the magnitude that solar customers are subsidizing BELCO. This should also be compared to how much free solar energy they received from commercial customers prior to the introduction of the CRSEER and from those commercial customer that are not on the CRSEER. Please note that the total amount refunded by BELCO to net metered customer in five years was only $42,870.00. How does this compare to the solar energy that they credited to PV customers at the first block rate and sold to their neighbors at the third block rate?

We reiterate that the huge difference in BELCO's inclined block residential rates makes this subsidization of BELCO by certain net metering customers unique to Bermuda. BELCO has cited and continues to cite numerous overseas jurisdictions where net metering has ended because it was genuinely being subsidized by other rate payers, but due to our inclined block rates this is not the case here for near net zero customers. Also, while BELCO has cited on page 12 of their September 16th letter that three US states have voted to end net metering, Florida and California have voted to retain net metering. The latter two states have far larger populations than the three cited by BELCO. Also BELCO has cited other examples of feed in tariff rates that have been reduced or eliminated, but they have not provided the data for the residential rates in those jurisdictions to show how much the FITs were being subsidized.

***RETAIL AND FEED IN TARIFF SETTING PRINCIPLES**: We note that there is nothing in the new Act that stipulates that net metering must be replaced by a feed in tariff. BELCO has asserted that net metering should end because one rate class should not be subsidizing another, but clearly some net metering customers are subsidizing BELCO and by extension subsidizing other rate classes. Therefore we suggest that there is nothing in the Act that stipulates that residential net metering must end, so long as we have an inclined block rate structure with such high differences in cost as presently exist."*

In particular: a. The Authority intends to mandate full accounting separation between BELCO's (i) generating, and (ii) transmission, distribution and retail activities. Please provide your views on specific aspects of BELCO's operational activities that are relevant to the cost transparency and related determination of the feed-in tariff rate?

In our letter to the RAB of 6th January, 2017 we included the following information, which you should have on file:

***"AVOIDED COST MODEL**: We are pleased to see that the RAB has sought proposals for an audit process for separating the accounts of the TD&R licensee from the BG licensee divisions of BELCO. We trust that this is your first step in arriving at an avoided cost to the TD&R licensee that is substantially higher than just the cost of avoided fuel, as we outlined in our previous letter. However in our previous letter, time did not allow us to address the second cost benefit under section 36 (b) of the Act, the economic benefits of distributed generation."*

5 - b. What levels of cost element transparency would you expect within a BELCO feed in tariff for Solar PV?

In our opinion, the FIT that the RAB is trying to mandate is totally inadequate, does not come close to the true avoided cost to the TD&R licensee and therefore does not comply with the requirements of the EA.

Firstly the FIT proposed by BELCO was calculated in July 2016 when the fuel adjustment rate was only $0.0875/kWh. Since that time, we assume there has been a gradual increase in the price of oil and know that the Customs' duty on BELCO fuel has recently been increased. The April 2017 FAR was $0.105/kWh which is both significantly higher than when BELCO proposed the $0.1735/kWh FIT rate and also significantly higher than the April 2016 FAR. So why have these fuel price increases not been included in the FIT rate? We would like to provide more detail, on this item, but as the BELCO FAR applications have no longer been published since the RAB took over from the EC, we have no recent detailed information on BELCO's fuel costs to refer to. Please note that the fuels costs per kWh contained in BELCO's Marginal Fuel Cost Table of their letter of September 15th for the East Power Station (EPS), Old Power Station (OPS) and Gas Turbines (GT) were listed at $0.0976, $0.1481 and $0.2106/kWh respectively. These rates are far lower than those listed in Table B.3 of the NESP which are $0.15, $0.21 and $0.24/kWh respectively. These represent cost differences of approximately 50 % for the EPS and OPS, but only 14.3% for the GT generators. So are BELCO artificially discounting the cost of fuel per kWh in their proposed FIT, or are the values in the NESP table too high? This important metric for the determination of the FIT should be independently audited by individuals with the qualifications and experience to verify the calculations are correct.

Secondly, the avoided cost model proposed by BELCO is their perception of the avoided cost to the Bulk Generation Licensee (BGL), therefore it does not comply with the requirements of the act.

Items missing from the proposed avoided cost to the TD&R licensee (TD&RL) include the following costs to the BGL:

- Generator amortization costs, these range from $0.02 to $0.04/kWh according to Table B.3 of the NESP.
- Generator O&M costs that are listed at $0.01/kWh in the same table.
- Overhead costs to the BG licensee including administration cost, IT costs, taxes, health insurance costs, social insurance costs, building rent or amortization cost, employment tax costs, oil pollution remediation costs, advertising costs, etc. etc.
- Profit of the BGL.

Based on the above, the true avoided cost to the TD&R licensee will obviously be much higher than the one proposed by BELCO and incorporated into the EGD FIT. Because this $0.1736 rate does not include all of the above other costs incurred by the BGL, it does not reflect the true cost to the TD&RL. Additionally it does not include for any of the economic benefit cost of renewable generation as allowed for in the EA. Therefore this rate does not comply with the requirements of the EA and should be considered illegal in our opinion. Furthermore, we estimate that it could take up to two years from now to obtain truly auditable separate accounts from the BGL and TD&RL, therefore the RAB will be trying to enforce an underpriced and therefore illegal FIT on the solar industry for up to two and a half years before a FIT that complies with the EA can be established. This will ruin the residential solar industry here in that time and it will take far longer for potential solar customers to regain faith in the RAB's ability to administer fair, equitable and long term FITs, as required by the EA, before we see new investment in the industry. Therefore we urge the RAB to reinstate the modified net metering program for new customers proposed by BELCO except with 6 month rolling credits and to restore the original net metering scheme to existing customers that are eligible for grandfathering.

6. What do you believe should be the economic basis for Solar PV in Bermuda, specifically in the context of feed-in tariffs?

- The key to financially viable residential solar PV is to ensure that the homeowner can buy back the same amount of kWh's, that they exported during the day, at the same rate as they were sold. However, once the homeowner becomes a 'net exporter of kWh's it is entirely reasonable that the 'excess energy' is sold at a lower rate. This would be in keeping with the true concept of self-sustainability and help homeowners to become energy independent without exploiting BELCO by having oversized residential PV systems.
- Existing Net Metered customers are already paying a premium for this enhanced facility in the form of a Facilities Charge of $39.95 per month that is disproportionately high given their typical overall low monthly kWh consumption.

Alongside any general comments by respondents please provided responses to the following: a. Should BELCO's Solar PV Metering Scheme reflect a cost-benefit methodology or an avoided cost methodology? b. What cost rate design for Solar PV participants is best suited to incentivizing greater utilization of cleaner energy sources and technologies in Bermuda? c. What other factors should be considered in determining the cost rate design for feed in tariffs?

In our answer to question 2, we pointed out how the aspirational matrix in the NESP is fundamentally flawed because the consultants who wrote it did not adequately research the Bermuda renewable energy resources and how to tie them into the grid. We believe the same consultants were employed in the drafting of the EA and it was they that pushed for the avoided cost methodology that is written into the act. Again, we believe that they did not adequately research the PV market in Bermuda, nor the existing BELCO rate structure. We have previously submitted to the RAB and the EC that the huge differences in the 3 residential and 3 small commercial rate blocks, along with the huge facilities charges are such that many solar customers are already subsidizing BELCO by trading large blocks of energy at the first block rate, which BELCO then sells to near neighbors at the third block rate, plus fuel adjustment. This translates to a potential profit of 180% for BELCO on a fairly simple transaction. In all other jurisdictions that have or had net metering, the difference between block rates is much smaller, as is the fuel adjustment charge, which translates to a much smaller profit for the utility. Indeed, in those jurisdictions with a single block rate, there is no profit for the utility on this type of transaction. This is why other jurisdictions have been abandoning net metering, but the reasoning does not apply here. That is why BELCO is proposing to grandfather existing net metering customers and move new customers to a net metering scheme up to the point of becoming net exporters.

Our recommendation is that the RAB should abandon the FIT that the EC recommended on the basis that the EC had neither the resources, time or expertise to analyze a fair and reasonable FIT to both PV owners and BELCO, nor did they have the legal authority to do so. The fact that the RAB has just regurgitated the EC's recommendations also clearly indicates that the RAB has not had the time and resources to analyze this FIT. We further recommend that we move back to the net metering scheme proposed by BELCO, with the exception of monthly netting of credits. The original 6 month rolling credit arrangement should be retained for existing customers at the very least.

Failing the reinstatement of net metering with minor modifications, we are totally puzzled by the RAB's question 6 a above. The EA clearly mandates that the FIT should include both an avoided cost component and an economic benefit component. Our answer to question 2 clearly identifies multiple economic benefits of distributed solar including lower BELCO bills for all customers, if we have wide scale adoption of distributed solar.

Other cost-benefit considerations should include whether smaller PV system owners should receive a higher FIT than larger system owners because of economies of scale, which is a quite common practice in other jurisdictions.

7. Should Solar PV or other renewable energy programs be incentivized within a specific regulatory framework for renewables in Bermuda?

The global trends are abundantly clear and the growth of renewable energy is increasing at an exponential rate. Bermuda has fallen significantly behind other developed nations in the charge to replace outdated fossil fuel burning generation facilities with environmentally responsible renewable technologies.

The 2011 White Paper made an excellent first attempt at defining long term targets for moving Bermuda forward but sadly, the document has since been largely ignored. A regulated framework for transition to a predominately de-carbonised generational mix would certainly be very desirable for the long term good of Bermuda. But, as we have stated in other parts of this document, the creation of such a framework requires a clearly articulated long term renewable energy policy and the associated 'political will' to enact it.

8. In your view, are there any barriers to Solar PV or other forms of renewable generation investment?

Yes.

a. If so, what are these barriers?

1. Without doubt the most significant barrier to solar PV investment is the lack of financial stability for investors, which has been created by some or all of the points below;
2. The imposition of non-negotiated, unannounced and now retroactive changes by 3rd parties including: BELCO; Government; Energy Commission; and RAB that significantly diminish the value of the investment. Examples are:
   2.1 Removal of Solar Rebate Program without consultation or notice
   2.2 Removal of Net Metering Program without notice or consultation
   2.3 Imposition of retroactive 'Interim Orders' without notice or consultation
3. Lack of political will to embrace the inevitable changes in technology that will, in the foreseeable future, render fossil fuel based power generation near to obsolete in the worlds developed nations;
4. Mistrust on the part of potential investors about Governments true level of commitment to the introduction of clean renewable technologies and the lack of clear direction on national energy policies;
5. Fragmented policies, rulings and recommendations by various government and quasi-governmental agencies including Customs, Planning, Department of Energy, Energy Commission and Regulatory Authority that clearly demonstrate the lack of a single cohesive Energy Policy;
6. Protectionist Policies and Conflicts of interest, that have in the main served to protect the status quo rather than move with the times, and have left Bermuda far behind other developed countries in the adoption of clean renewable energy.
7. Excessive layers of bureaucracy that significantly add to the so called 'soft costs' of PV systems.
8. High cost of solar PV systems in Bermuda, which are directly attributable to each of the above barriers.
9. The biggest barrier for BELCO's Commercial Demand customers is the artificially low second and third block rates for energy for these customers. The third block rate of only $0.0862/kWh is only 25.64% of the residential third block rate and only 26.5% of Small Commercial's third block. At this very low third block rate paid by bigger hotels, the hospitals and bigger supermarkets, solar PV cannot provide an attractive return on investment. The Commercial Demand second

energy block rate of $0.1629/kWh, which is the tail block rate paid by most large office buildings, is only 48.5% of the residential third block rate, or 50.1% of the small commercial tail block rate. Combined with the demand charges, this low second block rate for most office buildings again lengthens the ROI for solar PV to the point that most office buildings cannot justify investing in solar PV. Ironically, it is these same office building that are probably the biggest contributor to BELCO's costly peak summer demand identified in our answer to question 2.

b. How could they be removed to enable further investment?

Quite simply! Predictability and Trust are the very foundation of financial investment, along with an attractive rate of return over a guaranteed period. None of these elements are now present in the Bermuda renewable energy domain.

SUMMARY

CONCLUSIONS

The Emergency General Determination and the associated Interim Orders have dealt a catastrophic blow to the entire Renewable Energy Industry in Bermuda. Severe financial damage has already been caused to the Industry as a result, and under the current conditions it is simply a matter of time before these small local companies cease to exist.

The measures have totally undermined the public's trust and confidence in the regulatory process and will inevitably result in robust legal challenges.

The measures are completely at odds with all previously stated governmental positions on the desirability of embracing renewable energies for the greater good of our Island and for the protection of our children's future.

There are at least 350 families that have made very significant and well intentioned financial investments, the value of which has now been significantly diminished and it is reasonable to assume that there will be a significant political backlash as a result.

COMMUNICATION

Preparing our response to the consultation document has been an extremely challenging and unnecessarily time consuming task, due to the format and content of the information, both written and verbal, that has been provided. As late as 05th May, 2017 we were forced to make major revisions to some of the most significant elements of our response as differing interpretations of the specific meanings of critical phrases in both the original Emergency General Determination (EGD), versions 1, 2, & 3, and the 'Clarification Order' of 17th April, 2017, were acquired.

In conversation with the Director of the Department of Energy on the 4th May, 2017 it became clear that the Department of Energy had arrived at a significantly different interpretation of the meaning of the EGD document than we had. So, in an effort to seek a final clarification, the Director interceded on our behalf, to acquire directly from the RAB, what we understood at the time to be, the 'definitive and final' interpretations of the problematic sections of the text.

To ensure transparency, we have provided the complete text of the relevant part of the email from the Director of the Department of Energy below:

From: The Director – Department of Energy, May 3rd 2017, 1:32 pm.
To: Bermuda Alternate Energy

"Thanks again for your call this morning, I do understand your predicament. I've just spoken to the RA, and here's what they have confirmed that EGD- and the clarification order- intended:
The ONLY thing that changes due to the EGD is the amount paid by BELCO for energy flowing to the grid **over and above what is offset by the customer's use**. That now changes from full retail value to the 17.36 cents per kWh. In other words, if my solar PV system produces 1000 kWh in a month, and I use 800 kWh in that same month, my bill will only be my facilities charge, and what I will expect to be paid from BELCO is 200 kWh x 17.36 cents.
Let me know it that helps you, and again, I appreciate your concerns and our frank and open conversation. Please let me know if there's anything else I can help with."

Within 24 hours of receiving the above 'clarification', which we are told came directly from a member of the RAB team, we subsequently received another email from the Director indicating that:

"It appears I was misinformed",

"I'd apologize if in fact I were at fault, but I could only give you the information given me- which was appreciably quite different from this."

These interchanges illustrate quite clearly that there is not only, mass confusion in the industry, but also, significant confusion within Government and the Department of Energy, and now it seems also between the staff within the RAB itself, over the precise meaning and intent of the documentation they have produced.

In addition to the very confusing wording of the primary documents, we are also concerned that the consultation procedure has not been properly communicated to either, the major stakeholders (solar PV owners), or other interested parties. It seems that the onus, for onward communication has been left primarily up to the individual Solar Installation companies.

We have made diligent efforts to handle a communications exercise of this magnitude, and coordinate the exchange of information to our customers, in both a timely and accurate manner. However, our resources have been severely challenged and we have incurred very significant manpower costs, due to not only the volume of questions, but also the constantly changing interpretations of the content.

We are also aware that one solar installation company has not been communicating with some of their customers for quite some time, and may not be actively engaged in business. It is safe to assume therefore, that a percentage of the major stakeholders are totally unaware of the retroactive changes that could potentially cause them financial hardship.

There are a number of sources where a complete list of stakeholder contact information could have been sourced including: BELCO; Department of Planning; and possibly Department of Energy.

Feedback from our customer base has also indicated:

(i) The submission format is overly cumbersome and the requirement for all submissions to be provided electronically should be considered discriminatory to those who are not comfortable with electronic media. We are aware that some customers have preferred writing and/or lobbying their MP's, The Premier, The Minister and others directly, rather than composing an electronic submission.

(ii) There is also a common theme that the Q & A format of the consultation that has been used is undesirable as it greatly limits the scope of information being solicited through the use of 'leading questions' that 'guide' rather than 'open' the narrative.

APPENDIX SECTION

(i) **Financial Impact Table – 5 kW System**

(ii) **Financial Impact Table – 10 kW System**

(iii) **Financial Impact Table – 15 kW System**

(iv) **Summary Table**

(v) **Hawaii – Cumulative Installed PV as of Dec. 31, 2015**

(vi) **Hawaii – Cumulative Installed PV as of Sept. 30, 2016**

(i) Financial Impact Table – 5 kW System

BELCO NET METERING COMPARED TO PROPOSED FIT SYSTEM FOR A 5 KW PV SYSTEM, LOW, MEDIUM & HIGH KWH						May-17	
BAE Bermuda Alternate Energy LIMITED		METER REGISTER	MONTHLY KWHS	GROSS BILL WITH FACILITIES CHARGE	NET BILL WITH DISCOUNT	GROSS COST PER KWH INCLUDING FACILITIES	PER KWH AFTER DISCOUNT
5 KW PV WITH LOW MONTHLY KWHS USED	OLD NET METERING	DEL	650	$246.66	$237.74	$0.3795	$0.3658
		REC	545	$169.99	$164.35	$0.3119	$0.3016
		NET	105	$68.01	$65.16	$0.6477	$0.6206
	NEW FIT 2017	DEL	650	$246.66	$237.74	$0.3795	$0.3658
		REC	545	$97.20	$92.34	$0.1784	$0.1694
		FIT NET	105	$149.46	$145.40	$1.4234	$1.3848
		% INCREASE		119.76%	123.14%		
5 KW PV WITH MEDIUM MONTHLY KWHS USED	OLD NET METERING	DEL	1250	$509.42	$490.51	$0.4075	$0.3924
		REC	395	$117.53	$113.72	$0.2975	$0.2879
		NET	855	$333.27	$321.10	$0.3898	$0.3756
	NEW FIT 2017	DEL	1250	$509.42	$490.51	$0.4075	$0.3924
		REC	395	$70.45	$66.93	$0.1784	$0.1694
		FIT NET	855	$438.97	$423.59	$0.5134	$0.4954
		% INCREASE		31.72%	31.92%		
5 KW PV WITH HIGH MONTHLY KWHS USED	OLD NET METERING	DEL	2050	$866.18	$833.64	$0.4225	$0.4067
		REC	195	$52.11	$50.53	$0.2673	$0.2591
		NET	1855	$779.22	$750.00	$0.4201	$0.4043
	NEW FIT 2017	DEL	2050	$866.18	$833.64	$0.4225	$0.4067
		REC	195	$34.78	$33.04	$0.1784	$0.1694
		FIT NET	1855	$831.40	$800.60	$0.4482	$0.4316
		% INCREASE		6.70%	6.75%		
NOTE THE ABOVE RATES ARE BASED ON THE FOLLOWING:							
A SOLAR PV FACILITIES CHARGE OF $39.95 PER MONTH							
THE NEW REGULATORY AUTHORITY CHARGE OF $0.00475/KWH							
THE 2017 THREE RESIDENTIAL BLOCK RATES							
THE APRIL 2017 FUEL ADJUSTMENT OF $0.105/KWH							

(ii) Financial Impact Table – 10 kW System

BELCO NET METERING COMPARED TO PROPOSED FIT SYSTEM FOR A 10 KW PV SYSTEM, LOW, MEDIUM & HIGH KWH						May-17	
BAE Bermuda Alternate Energy LIMITED		METER REGISTER	MONTHLY KWHS	GROSS BILL WITH FACILITIES CHARGE	NET BILL WITH DISCOUNT	GROSS COST PER KWH INCLUDING FACILITIES	PER KWH AFTER DISCOUNT
10 KW PV WITH LOW MONTHLY KWHS USED	OLD NET METERING	DEL	1350	$554.02	$533.40	$0.4104	$0.3951
		REC	1140	$420.42	$405.38	$0.3688	$0.3556
		NET	210	$96.07	$92.37	$0.4575	$0.4399
	NEW FIT 2017	DEL	1350	$554.02	$533.40	$0.4104	$0.3951
		REC	1140	$203.32	$193.15	$0.1784	$0.1694
		FIT NET	210	$350.70	$340.25	$1.6700	$1.6202
		% INCREASE		265.04%	268.35%		
10 KW PV WITH MEDIUM MONTHLY KWHS USED	OLD NET METERING	DEL	2600	$1,111.46	$1,069.53	$0.4275	$0.4114
		REC	890	$308.93	$298.16	$0.3471	$0.3350
		NET	1710	$714.56	$687.81	$0.4179	$0.4022
	NEW FIT 2017	DEL	2600	$1,111.46	$1,069.53	$0.4275	$0.4114
		REC	890	$158.73	$150.79	$0.1784	$0.1694
		FIT NET	1710	$952.72	$918.74	$0.5571	$0.5373
		% INCREASE		33.33%	33.57%		
10 KW PV WITH HIGH MONTHLY KWHS USED	OLD NET METERING	DEL	3600	$1,557.41	$1,498.43	$0.4326	$0.4162
		REC	390	$115.78	$112.04	$0.2969	$0.2873
		NET	3210	$1,383.48	$1,331.16	$0.4310	$0.4147
	NEW FIT 2017	DEL	3600	$1,557.41	$1,498.43	$0.4326	$0.4162
		REC	390	$69.56	$66.08	$0.1784	$0.1694
		FIT NET	3210	$1,487.85	$1,432.36	$0.4635	$0.4462
		% INCREASE		7.54%	7.60%		
NOTE THE ABOVE RATES ARE BASED ON THE FOLLOWING:							
A SOLAR PV FACILITIES CHARGE OF $39.95 PER MONTH							
THE NEW REGULATORY AUTHORITY CHARGE OF $0.00475/KWH							
THE 2017 THREE RESIDENTIAL BLOCK RATES							
THE APRIL 2017 FUEL ADJUSTMENT OF $0.105/KWH							

(iii) **Financial Impact Table – 15 kW System**

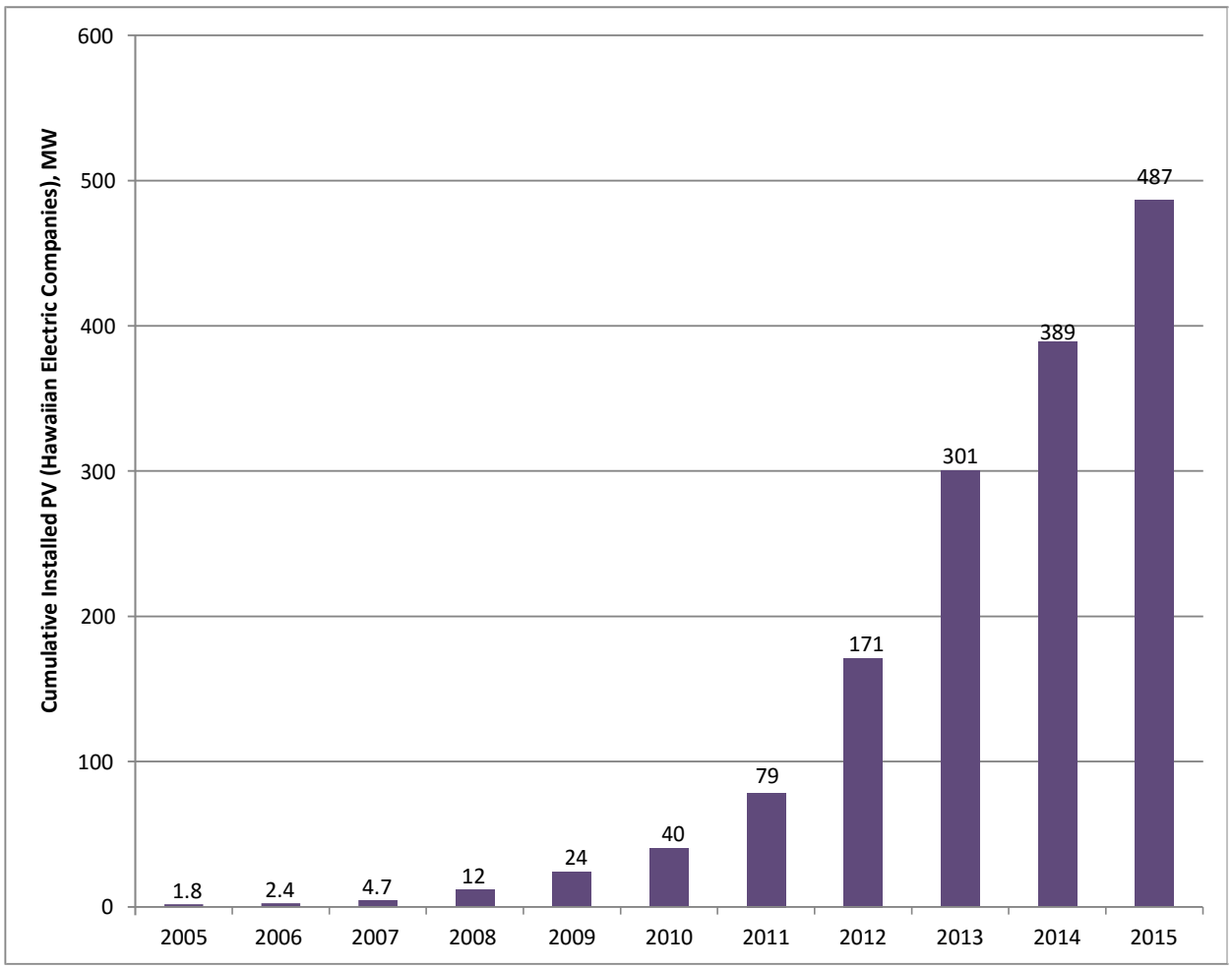
BELCO NET METERING COMPARED TO PROPOSED FIT SYSTEM FOR A 15 KW PV SYSTEM, LOW, MEDIUM & HIGH KWH						May-17	
BAE Bermuda Alternate Energy LIMITED		METER REGISTER	MONTHLY KWHS	GROSS BILL WITH FACILITIES CHARGE	NET BILL WITH DISCOUNT	GROSS COST PER KWH INCLUDING FACILITIES	PER KWH AFTER DISCOUNT
15 KW PV WITH LOW MONTHLY KWHS USED	OLD NET METERING	DEL	1950	$821.59	$790.75	$0.4213	$0.4055
		REC	1635	$641.16	$617.69	$0.3921	$0.3778
		NET	315	$129.50	$124.68	$0.4111	$0.3958
	NEW FIT 2017	DEL	1950	$821.59	$790.75	$0.4213	$0.4055
		REC	1635	$291.60	$277.02	$0.1784	$0.1694
		FIT NET	315	$529.99	$513.72	$1.6825	$1.6309
			% INCREASE	309.27%	312.05%		
15 KW PV WITH MEDIUM MONTHLY KWHS USED	OLD NET METERING	DEL	3850	$1,668.89	$1,605.66	$0.4335	$0.4171
		REC	1285	$485.08	$467.57	$0.3775	$0.3639
		NET	2565	$1,095.85	$1,054.52	$0.4272	$0.4111
	NEW FIT 2017	DEL	3850	$1,668.89	$1,605.66	$0.4335	$0.4171
		REC	1285	$229.18	$217.72	$0.1784	$0.1694
		FIT NET	2565	$1,439.71	$1,387.94	$0.5613	$0.5411
			% INCREASE	31.38%	31.62%		
15 KW PV WITH HIGH MONTHLY KWHS USED	OLD NET METERING	DEL	6500	$2,850.66	$2,742.25	$0.4386	$0.4219
		REC	435	$131.52	$127.22	$0.3023	$0.2925
		NET	6065	$2,656.67	$2,555.68	$0.4380	$0.4214
	NEW FIT 2017	DEL	6500	$2,850.66	$2,742.25	$0.4386	$0.4219
		REC	435	$77.58	$73.70	$0.1784	$0.1694
		FIT NET	6065	$2,773.08	$2,668.55	$0.4572	$0.4400
			% INCREASE	4.38%	4.42%		
NOTE THE ABOVE RATES ARE BASED ON THE FOLLOWING:							
A SOLAR PV FACILITIES CHARGE OF $39.95 PER MONTH							
THE NEW REGULATORY AUTHORITY CHARGE OF $0.00475/KWH							
THE 2017 THREE RESIDENTIAL BLOCK RATES							
THE APRIL 2017 FUEL ADJUSTMENT OF $0.105/KWH							

(iv) Summary Table

		BAE Bermuda Alternate Energy LIMITED				
5 KW SOLAR SAMPLE HOUSEHOLD'S NET METERING VS FIT METERING						
	TOTAL CONSUMPTION (KWH)	DELIVERED BY BELCO (KWH)	RECEIVED BY BELCO (KWH)	NET CONSUMPTION (KWH)	SELF CONSUMED (KWH)	TOTAL SOLAR PRODUCED (KWH)
LIGHTER USER	750	650	545	105	100	645
MODERATE USER	1500	1250	395	855	250	645
HEAVY USER	2500	2050	195	1855	450	645
10 KW SOLAR SAMPLE HOUSEHOLD'S NET METERING VS FIT METERING						
	TOTAL CONSUMPTION (KWH)	DELIVERED BY BELCO (KWH)	RECEIVED BY BELCO (KWH)	NET CONSUMPTION (KWH)	SELF CONSUMED (KWH)	TOTAL SOLAR PRODUCED (KWH)
LIGHTER USER	1500	1350	1140	210	150	1290
MODERATE USER	3000	2600	890	1710	400	1290
HEAVY USER	4500	3600	390	3210	900	1290
15 KW SOLAR SAMPLE HOUSEHOLD'S NET METERING VS FIT METERING						
	TOTAL CONSUMPTION (KWH)	DELIVERED BY BELCO (KWH)	RECEIVED BY BELCO (KWH)	NET CONSUMPTION (KWH)	SELF CONSUMED (KWH)	TOTAL SOLAR PRODUCED (KWH)
LIGHTER USER	2250	1950	1635	315	300	1935
MODERATE USER	4500	3850	1285	2565	650	1935
HEAVY USER	8000	6500	435	6065	1500	1935

Cumulative Installed PV -- As of Dec. 31, 2015

	Number of PV Systems			PV Capacity, MW		
	Number	% Residential	% Commercial	Capacity	% Residential	% Commercial
Hawaiian Electric	41,568	97%	3%	343	63%	37%
Hawai'i Electric Light	9,664	94%	6%	69.8	65%	35%
Maui Electric	9,320	93%	7%	73.6	64%	36%
Total	60,552			487		

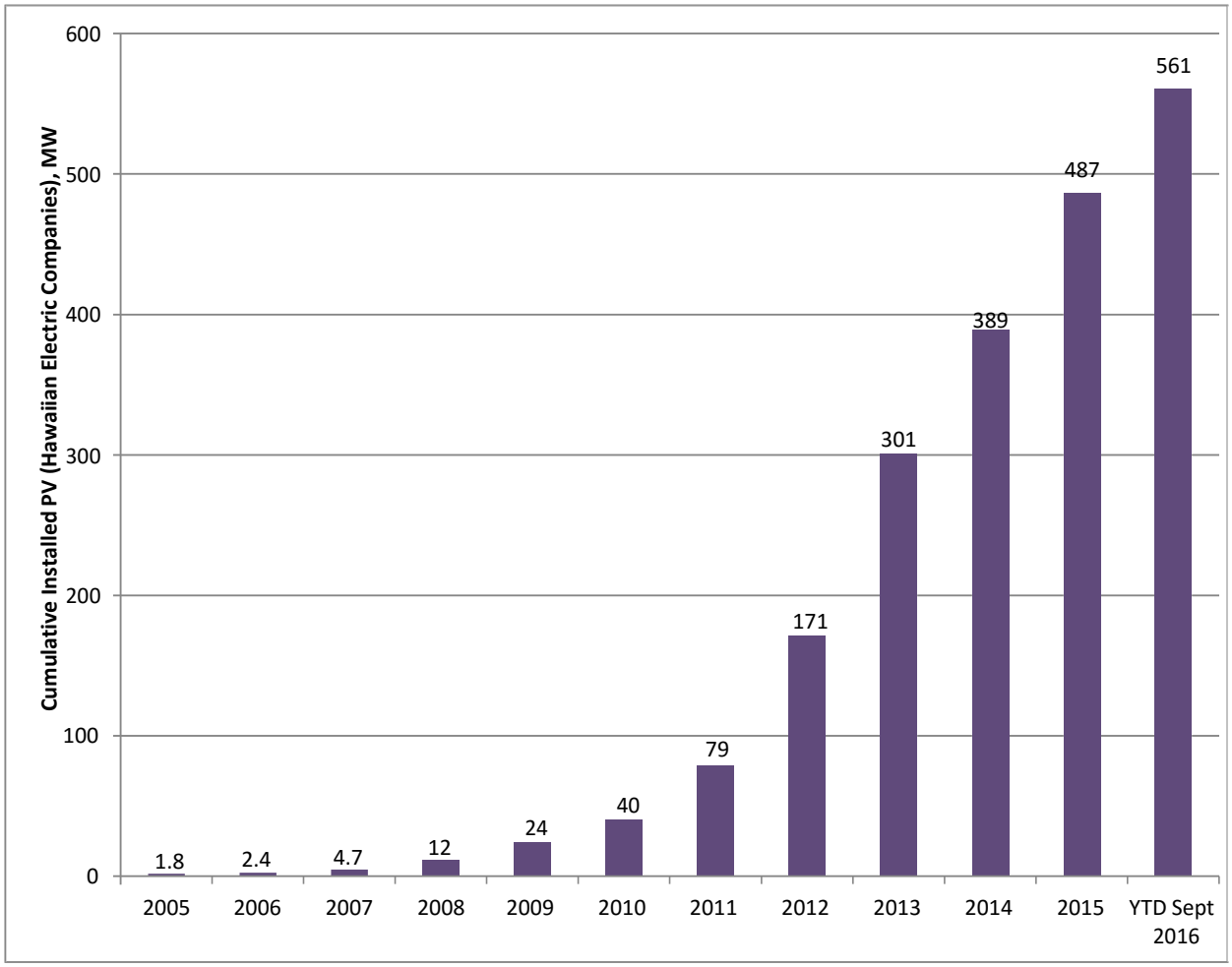


Data subject to change

Hawaiian Electric
Maui Electric
Hawai'i Electric Light

Cumulative Installed PV -- As of Sept 30, 2016

	Number of PV Systems			PV Capacity, MW		
	Number	% Residential	% Commercial	Capacity	% Residential	% Commercial
Hawaiian Electric	45,789	97%	3%	392	62%	38%
Hawai'i Electric Light	10,910	94%	6%	79.3	66%	34%
Maui Electric	10,996	93%	7%	89.6	63%	37%
Total	67,695			561		



Data subject to change

Hawaiian Electric
Maui Electric
Hawai'i Electric Light

1.441.279.5907
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48 St. John's Road, Pembroke, HM 07 - Bermuda

BE Solar Consultation Response

To the Regulatory Authority of Bermuda:

(Transitional Measures for
BELCO Limited Solar Net Metering Scheme)
Emergency General Determination

26th of April, 2017

1.441.279.5907
www.BEsolar.bm
48 St. John's Road, Pembroke, HM 07 - Bermuda

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8 Are there any barriers to PV or renewable generation investment in Bermuda?

1.0 Background

1.1 Consultation

- Consultation issued 16 March 2017
- Responses due by 17:00 on 27 April 2017
- RA has issued an emergency general determination that BELCO must pay a feed in tariff (FiT) to PV producers
- Response must comply with rules outlined in section 3 of the consultation document.

1.2 Solar Tariffs

- 15 Aug 2015: BELCO letter to the Energy Commission (EC) advised they would:
  1. close net metering scheme to new participants,
  2. adopt a monthly net-metering up to zero kWh net balance based on BELCO's definition of avoided costs for new customers
  3. continue to pay Commercial Owner's Excess Energy Rate (CSEER) to commercial participants and anyone who had begun construction as of the date of the letter.
- 26 Aug 2016: Minister directs EC to conduct inquiry into:
  1. BELCO's proposal to close net metering to new participants
  2. BELCO's proposed new rates for solar from residential and commercial customers
- 16 Sep 2016 BELCO NET Metering Filing to Energy Commission
- 11 Oct 2016: EC presents findings to Minister 'Net Metering Inquiry Response & Recommendations'
- 26 Oct 2016: Minister re-iterates EC's recommendations, but held off on implementation due to imminent transfer of authority from EC to RA.
- 28 Oct 2016: Regulatory Authority (RA) comes into force
- 14 Feb 2017: RA finds that BELCO letter ceasing all payments to solar customers is contrary to sections 6(c) and (d) of the EA and 12(a) and (c) of the RAA.

1.3 Emergency General Determination

As a result of the above, the RA issued an Emergency General Declaration (EGD) requiring BELCO to operate its solar net metering scheme as follows (based on the Energy Commission's recommendations):

1. Original scheme to run in parallel with transitional programme until 31 December 2016, at which time it will be terminated to avoid subsidising PV customers. All PV customers to be migrated to transitional scheme by 1 January 2017.
2. Commercial and residential PV (Feed in Tariff) FiT will be set at $0.1736 per kWh for new solar PV systems going forward, with no limit on number of systems as proposed by BELCO.
3. Financial cost of FiT to be absorbed by BELCO until a new power purchase regime is implemented by the RA. Costs to be placed in a (Fuel Adjustment Rate) FAR like recovery account.
4. Payments to be calculated on a monthly basis.

2.0 Response to Questions

1 What is your view of how Solar PV has evolved in Bermuda? Please provide views on the uptake of this technology.

Solar PV has developed rapidly in Bermuda since the first grid connected systems were installed around 8 years ago. The island now has at least one Megawatt of Solar PV generation capacity and a steady stream of new projects being installed day to day. The costs of Solar PV have fallen significantly during this time, with solar electricity now costing substantially less than electricity generated from oil (approximately $0.10 - $0.15 per Solar PV kWh versus $0.40 per BELCO kWh). [1]

Uptake has generally been limited to organisations and individuals with sufficient capital to purchase systems outright, or those who are able to secure financing. There is a now an increasing need to ensure that widespread access to the benefits offered by Solar PV is available to residents of Bermuda, regardless of their level of income or home ownership status.

[1] Solar PV cost per kWh based on actual contracts closed in Bermuda and BELCO costs per kWh based on actual higher residential and commercial tier rates.

2 Looking to the future, how important do you believe Solar PV is to Bermuda? If a respondent views Solar PV as important please provide your views on what its costs and benefits are, how these should be quantified, and how these should be reflected in the framework for electricity regulation.

Solar PV is critically important to Bermuda and will form a major component of the electricity generation mix in the future. Dozens of countries now obtain substantial proportions of their electricity from Solar PV and several small island states now obtain all of their electricity from Solar PV. Many countries have made ambitious targets in regards to drastically reducing and eliminating reliance on fossil fuel generated electricity as the realities of the economics of health costs and climate change due to fossil fuel use are realized and observed[2].

Global investment in renewable energy capacity was more than double that of fossil fuels in 2016. Solar and wind have clearly established themselves as the leading electricity producing technologies, with total installed solar capacity forecast to reach 300GW by the end of the year and investment of $114 billion in 2016. Costs are forecast to continue to decline and intermittency is no longer a concern with seamless integration of forecasting, demand side management and energy storage technologies into electricity grids[3].

The long-term trends are clear, to do anything but promote expansion of solar would be to take Bermuda backwards relative to the rest of the world and harm our ability to remain an attractive competitive economic jurisdiction to do business and visit.

Costs

Solar PV systems[4] in Bermuda currently cost in the range of $4,500 to $5,000 per kW of DC capacity, for a fully installed system including costs associated with interconnection and the Department of Planning. The levelised cost of electricity produced by these systems typically ranges from $0.10 - 0.15 per kWh[5].

Benefits

With most systems producing around 1600kWh per kW of solar PV each year, depending on tilt and orientation, and solar technology, over their 30 year lifetime each solar PV kW is likely to generate around 46,000 kWh of electricity.

Based on these assumptions, each kW of Solar PV installed offers the following benefits:

- Avoids the need to import 67 barrels of heavy fuel oil

[2] 77 countries sign the Paris Agreement on Climate Change targets, the UK has committed to reducing carbon emissions by 57% by 2032, BBC news reports.
[3] The UK, for example, already has over 3GW of operational energy storage.
[4] These prices reflect costs of typical system sizes from 3-8kW. Costs for smaller systems increase disproportionately due to fixed costs of planning, interconnection, site setup etc.
[5] Accounting for system degradation, maintenance and time value of money. The cost of energy produced is not an accurate indication of appropriate feed in tariff levels, as these would not provide a payback period of less than 7 years, which is typically necessary to justify investment in Solar PV.

- Reduces the trade deficit of Bermuda by avoiding the flow of around $6,000 offshore to purchase fuel[6]. Approximately 50% of the capital cost of the system remains in the local economy to pay for labour, parts, taxation, planning and other expenses.
- Avoids the emission of 35 tonnes of carbon dioxide.
- Avoids the emission of air pollutants such as SO_2, NOx, PM10, PM2.5, which are harmful to human health and have significant health care cost ramifications.
- Costs residential and commercial customers approximately 60-75% less than purchasing from BELCO.
- Supports local businesses that provide stable employment to Bermudians.
- Reduces exposure of both the system owner and Bermuda's economy to fuel price volatility.
- Provides more jobs per kWh and costs less per kWh vs. oil.

Quantification of Costs

Both system costs and the levelised cost of solar electricity could be quantified by the government or RA by compiling annual statistics on installed system costs and energy production. This is done in other jurisdictions and used to inform development of policies, regulations and tariffs.

Quantification of Benefits

I. **Financial** - The financial benefits of Solar PV can be calculated either on an individual system level or on a national level. A very significant benefit, which is often overlooked, is that real electricity prices can be *completely stable for the lifetime of the system*[7], if so desired by the RA. Considering individual versus national system costs and benefits:
    a. The financial benefits of individual systems are typically quantified through conventional financial appraisal methods, with the internal rate of return and net present value methods favoured by BE Solar. Many investors are very focused on simple payback, *which they often expect to be 7 years or less*[8].
    b. On a national level, we believe comparison of the long-term cost per kWh between solar and fossil fuels, based on a sensible range of scenarios[9], will clearly show the financial benefits.

II. **Environmental** - Both benefits and costs may be quantified by using carbon dioxide emissions as a proxy. This is a widely used metric in other jurisdictions and allows simple yet accurate comparison of the environmental benefits of Solar PV with other generation technologies, and also allows simple

[6] Assuming, conservatively, a purchase cost of $90 per barrel of fuel over a 30 year period not including local costs such as tax and pipeline charges.
[7] In jurisdictions where prices for solar electricity have been set for extended periods, *nominal* prices tend to increase predictably based on formulae that link them to common inflation indices
[8] This is something we believe the government and RAB should take into consideration as it develops tariffs for solar electricity.
[9] Attempting to compare the financial benefits of Solar PV with fossil fuels without applying a range of cost scenarios for fossil fuels inevitably produces misleading results due to the inherent volatility of fossil fuel prices.

comparison between Bermuda and other jurisdictions. As an example, electricity produced from oil typically has a carbon factor of **780g CO_2/kWh**, whereas electricity produced from Solar PV typically has a carbon factor of **40g CO_2/kWh**, as such Solar PV achieves a **95% reduction** in carbon factor vs. oil generated electricity.

III. **Societal** - Societal benefits may be determined through more complex analysis of financial and environmental impacts of the technology, and associated co-benefits. A few examples include increased employment opportunities, reductions in exposure to fuel price volatility, reduced risk of fuel spillages and reduced exposure to harmful air pollutants, increased opportunities for tourism and business from an increasingly sustainability and clean energy demanding international clientele[10].

[10] For example, international businesses, including insurance companies have sustainability charters which limit the jurisdictions where they do business, tourism demand for more sustainable destinations is ever increasing, various news articles confirm these trends, as well as The United Nations World Tourism Organization.

Reflecting costs and benefits in the Framework for Electricity Regulation

We believe the costs of Solar PV should be reflected in the framework for electricity regulation as follows:

I. **Financial** - Regulation could seek to:
   a. Reduce costs as far as possible through the use of simple, effective regulation to reduce administrative burden that increases the 'soft costs' of Solar PV systems[11].
   b. Reduce costs of financing by establishing a stable regulatory environment, with clear and stable long-term tariff structures and interconnection procedures. This should seek to ensure investors in Solar PV are able to obtain financing for similar rates to an established utility such as BELCO.
   c. Satisfy the key financial criteria required to encourage sustained investment in Solar PV[12]. Investors in Solar PV should receive the same entitlement to receive a fair return on investment as investors in BELCO have done under previous and existing legislation.
   d. Accurately project the cost of electricity from different generation technologies, including Solar PV, to inform decision making.

II. **Environmental** - Regulation could require reporting of the carbon dioxide factor per kWh of electricity produced based on a methodology provided by the RA.

The clear and numerous benefits of Solar PV need to be identified and taken into consideration as regulations are developed and implemented.

[11] Examples include straightforward, efficient interconnection procedures and avoiding unnecessary licensing systems for small systems.
[12] For example, by ensuring tariffs achieve a 7 year simple payback, a reasonable IRR and NPV for Solar PV systems owned by different customer groups, in sensible locations so far as exposure to solar irradiation is concerned.

3 Should there be any capacity limits on solar systems installed on individual customers' premises in Bermuda? Should this be included within a formal licensing framework?

a) If so, who should be responsible for assessing system sizes and their limits (BELCO, Department of Planning, RAB, etc.)

b) Should Solar PV system sizing for a customers' premises be limited to the prior 12-month consumption of a residence/business and/or should it be based on forecasted consumption?

There should not be pre-determined capacity limits on Solar PV systems, with the exception of technical constraints that are imposed directly by the property's service entrance capacity[13,14].

Our justification for adopting this position is based on consideration of how to maximise the benefits of Solar PV for the whole community, rather than for individual systems. In most neighbourhoods a proportion of the buildings either have poor solar exposure, or consume more energy than could be provided by their own Solar PV system. In these situations, surplus generation from neighbouring properties is a desirable outcome that we believe is in the national interest. To limit the system size on each property would be to unnecessarily limit the extent to which Bermuda can take advantage of Solar PV.

We do not support the introduction of a licensing framework for small Solar PV systems in Bermuda as systems are already covered by:

- Rigorous international standards for PV modules and inverters
- Bermuda's building codes and the Department of Planning's associated processes
- BELCO's interconnection process and inspections
- Bermuda's compliance with the National Electric Code (NEC) which refers directly to solar PV installations in section 690.

We are not aware of any jurisdictions where licensing for small Solar PV systems is required, however we are aware and support certification programmes for installers through organisations such as NABCEP.

a) We respect and support BELCO's role as the owner and operator of the electricity grid, and therefore believe they should be responsible for assessing system sizes and their limits, should they wish. We do however feel it is important that a straightforward appeals process is in place with the RA to ensure any disputes can be resolved fairly.

b) We do not believe that Solar PV sizing should be limited to prior or forecasted energy consumption, based on the same justification for not imposing capacity limits. This would distort the market and create perverse incentives, such as property owners intentionally increasing their energy consumption prior to installing a

[13] We would support the development of a schedule of capacity limits based on service entrance capacity either through an open consultation process, or through independent technical verification of the proposed limits.
[14] In the case that the service entrance capacity imposes a limit on the Solar PV system size, we believe there should be a clear process, approved by the RAB and solar industry, by which an applicant may request for the service entrance capacity to be increased.

system. Tariffs for imported and exported electricity have and will continue to provide clear price signals that will result in the installation of the most financially efficient system size[15].

4 The Authority has, via the Emergency General Determination, and on a transitional basis, mandated that BELCO should pay for the electricity received from Solar PV systems on the basis of the Energy Commission recommendation of October 2016 (see the Determination for detail). What are your views on this transitional measure?

The transitional Emergency General Determination (EGD) measure was ambiguous in its wording and has caused significant confusion. The EGD, clarified as a Solar PV Feed in Tariff (FiT) at $0.1736 on the 17th of April, 2017 is inadequate and shocking for the Solar PV industry in Bermuda. The current highest tier retail electricity rate in Bermuda is $0.4262 per kWh, the current EGD FiT is 41% of this rate, or rather, compared to net-metering the FiT will result in a reduction of 49% of the value of Solar PV energy production kWh. This is unreasonable and is undesirable for many reasons, including the increased potential of legal challenges, Bermudian Solar PV industry job loss risks, further confusion, anger and loss of trust in the RA from stakeholders and society and the increased potential for grid defection of existing and new Solar PV system owners[16].

It is important to note that BELCO itself suggested that existing Solar PV net-metering clients whose Solar PV systems were confirmed before August 15th, 2016, those who were early adopters in Solar PV in Bermuda, would be honoured and grandfathered on the existing Solar PV net-metering program as per BELCO's letter to the EC on the 16th of September, 2016. This was a sensible request as the original 325 Solar PV clients made significant financial investments in their Solar PV systems on the basis of BELCO's net-metering agreement parameters and resulting returns on investment in a legal agreement between BELCO and the system owner. For the EGD to not respect and honour the original early adopters of the Bermudian Solar PV industry is unreasonable and we request the RA consider this very carefully.

Furthermore, BELCO's letter on the 16th of September, 2016 also requested that new residential Solar PV system owners, whose solar PV systems were confirmed after August 15th, 2016, should be compensated on their solar PV system kWh production based on a new tariff, a monthly net-metering to 0 kWh balance, with an avoided cost FiT for excess kWh produced. This proposed scheme is sensible as it values a Solar kWh at the same value as a retail kWh while valuing an oversized Solar PV system less, which encourages the continuing and growing investment in the Bermudian Solar PV industry, creating jobs and keeping more money in our local economy. However, the current EGD rate scheme, as stated above, values solar PV at a much lower rate and effectively makes a residential Solar PV investor subject to the existing rules of a commercial Solar PV customer, which is unsatisfactory and unreasonable, usage patterns are very different for commercial versus residential customers.

Solar PV owners whose systems were confirmed after the 16th of September, 2016 reasonably expected that the RA would accept BELCO's rate scheme. Over six months have passed and all stakeholders were under the

[15] There are often significant economies of scale for Solar PV systems, therefore larger systems produce cheaper energy and should be encouraged. Our community needs clean affordable energy, therefore investment in Solar PV should be encouraged.

[16] The current EGD encourages Solar PV clients to increase their desire to install electricity storage technologies and sever their connection to the grid, which will result in fewer clients supporting the grid which will lead to higher grid electricity prices and more people defecting from the grid.

impression that monthly net-metering was the current rate scheme, including the Department of Energy and BELCO as communication with the RA implied. This meant that a significant number of Bermudian households (estimated to be over 50) invested a significant amount of limited resources (estimated to be over $1,000,000) in Solar PV systems based on BELCO's proposed scheme and their investment payback is now retroactively significantly reduced. It is very surprising that the RA did not include a clear example of how the EGD rate scheme would work. Such an example could be compared to the monthly net-metering avoided cost rate scheme proposed by BELCO and an example is provided below to show how the EGD compares to what was expected by stakeholders in the industry.

This example is based on a Solar PV system owner, Mrs. Jones, who invests $20,000 on solar PV system to prepare for retirement and invest in Bermuda's future for her and her Grandchildren knowing Climate Change will impact them greatly. Mrs. Jones leaves the house early in the morning and turns off all of her electrical loads to be as efficient as possible and returns late in the evening after working long days and helping her family after work.

Example A - Mrs. Jones' BELCO bill based on the monthly net-metering and avoided cost tariff rate proposed:

- Solar PV system produces 750kWh in a given month
- Mrs. Jones needs 1,000kWh from BELCO, which would **cost $338.24 without Solar PV**
- Net BELCO bill will **cost $61.88 with Solar PV**
- **Solar PV Systems savings** are approximately $276.36 per month, **$3,316.32 per year**.
- The simple **Solar PV payback is 6 years** for Mrs. Jones' PV system under BELCO's proposed scheme.

Example B, BELCO bill based on the Regulatory Authority's Emergency General Determination (EGD) scheme currently in place:

- Solar PV system produces 750kWh in a given month
- Mrs. Jones needs 1,000kWh from BELCO, which would **cost $338.24 without Solar PV**
- Net BELCO bill will be **$208.35 with Solar PV under EGD**
- **Solar PV Systems savings** are approximately $130.20 per month, **$1,562.40 per year**.
- The simple **Solar PV payback is now 13 years** for Mrs. Jones' PV system under current EGD scheme.

The above example illustrates how financially catastrophic the new EGD rate scheme is on existing Solar PV system owners and what a shock the EGD system is to the Bermudian Solar PV industry and the what the knock on effect on business and Bermudian jobs in the industry would be.

We request that the RA accepts the monthly net-metering to 0 kWh then avoided cost rate scheme as proposed by BELCO on the 16th of September, 2016. That this rate scheme should be eligible for both residential and commercial Solar PV system owners up to a maximum of 1,000 applicants or 10MW of installed solar PV capacity, whichever comes first. The monthly net-metering to 0 kWh then avoided cost rate scheme should be locked in for at least a 20 year period for these system owners, with 30 years preferable, in order to ensure investment stability for PV system owners and investors in Bermuda.

5 What level and type of cost transparency should be mandated on BELCO to facilitate the determination of an appropriate feed in tariff for electricity produced by Solar PV? In particular:

a) The Authority intends to mandate full accounting separation between BELCO's (i) generating, and (ii) transmission, distribution and retail activities. Please provide your views on the specific aspects of BELCO's operational activities that are relevant to the cost transparency and related determination of the feed-in-tariff rate?

b) What levels of cost element transparency would you expect within a BELCO feed-in-tariff for Solar PV?

We believe a high level of cost transparency is necessary to enable efficient regulation. From a regulatory standpoint, high resolution cost information is most likely to enable the development of competitive prices for electricity as it will allow better informed decisions.

A specific concern is that costs should be transparent enough to differentiate between the cost of generating and delivering solar energy. Owners of Solar PV systems should receive a fair price for *generating* energy, while BELCO should receive a fair price for *delivering* this energy[17].

a) We support the proposed approach, and would additionally recommend the following:

- Determine the cost of standby capacity[18]
- Determine the cost of generation based on time of production[19]
- Allocation of fixed vs variable charges[20]

b) We believe a Solar PV FiT should:

- Clearly show the price at which energy from Solar PV has been purchased
- Clearly show the price at which energy purchased from Solar PV has been sold
- Be set for at least 20 years to provide long-term cost transparency
- Have built-in inflation adjustment mechanisms based on government derived indicators such as the CPI or RPI to provide long-term cost transparency
- Be based on system size, to acknowledge the very different economies of scale

[17] As a hypothetical example, assuming the cost of generating solar energy is $0.18 per kWh and BELCO's cost of delivering this energy is $0.02 per kWh, BELCO could be permitted an 8% net profit on the delivery cost of $0.02, while the solar investor would be permitted an 8% net profit on the $0.18 cost of producing the energy.

[18] Intermittency of Solar PV and the requirement for backup power has been used to justify higher monthly facilities charges for some customers. The cost of generation capacity necessary to provide standby power should be determined to enable accurate pricing to be developed. This policy discriminates unfairly against customers with Solar PV as there is no technical reason why customers should be charged for variations in demand caused by Solar PV but not charged for variations in demand caused by loads within their buildings.

[19] BELCO's cost of generation varies based on time of production, and may often peak when Solar PV output is high. Time of use tariffs could therefore offer an efficient rate mechanism that improves the financial case for Solar PV.

[20] BELCO has some of the highest fixed facilities charges we are aware of in any country. The use of higher fixed charges enables kWh charges to be reduced, which reduces incentives for energy efficiency and Solar PV.

6 What do you believe should the economic basis for PV be in Bermuda, specifically in the context of feed-in-tariffs? Alongside any general comments by respondents please provide responses to the following:

- **a) Should BELCO's Solar PV Metering Scheme reflect a cost-benefit methodology or an avoided-cost methodology?**
- **b) What cost rate design for Solar PV participants is best suited to incentivising greater utilisation of cleaner energy sources and technologies in Bermuda?**
- **c) What other factors should be considered in determining the cost rate design for feed in tariffs?**

The economic basis for PV in Bermuda should be the provision of a healthy level of competition in the electricity sector and stable, predictable electricity prices for individual households, organisations and the whole community. Feed in tariffs offer the practical means through which this may be achieved.

a) The cost-benefit approach should be the primary method through which rates are developed to ensure rates are practical. Using a balance of both methods should account for the requirements of both investors in Solar PV and BELCO by producing a range, within which the most appropriate tariff(s) can be set.

The avoided cost methodology tends to be BELCO-centric as it is based around their cost structures, therefore it may suggest rates that would work for BELCO but may not be appropriate for investors in Solar PV. A key weakness of this method is that fossil fuel prices are volatile and difficult to predict, so avoided costs can change suddenly. Establishing a feed in tariff based on BELCO's avoided costs would therefore tend to undervalue the price stability that is offered by Solar PV and unnecessarily expose the solar industry to fossil fuel price volatility. The cost-benefit methodology is more Solar-PV centric and may suggest rates that work well for Solar PV systems but are not appropriate for BELCO or its customers.

b) Our modelling of different electricity rate structures clearly indicates that a *degression*[21] *based feed in tariff* based on system size would be the most economically efficient and sustainable tariff structure for Solar PV. Many other jurisdictions with more mature PV markets have tried other tariffs and settled on feed in tariffs[22], often with degression mechanisms[23]. Key findings of the modelling that support this conclusion were:

- **Net metering**: Achieves a 5-7 year simple payback, but not financially sustainable as internal rate of return (IRR) is excessive therefore benefits investors in Solar PV but these benefits are not shared with other electricity users.
- **Avoided fuel cost**: Simple payback is over 10 years therefore would not encourage investment in Solar PV despite the levelised cost of energy over the system's lifetime being very competitive.

[21] Degression could be either fixed or responsive, and set by the RAB.
[22] As of early 2014, 74 countries use some form of feed-in-tariff.
[23] Examples include Germany, UK, Denmark & Phillipines.

- **Degression based FiT**: Can be tailored to provide a 6-7 year simple payback and sufficient IRR to encourage investment in Solar PV, while providing the most competitive levelised cost of energy over the system lifetime, which ensures financial benefits are shared among all electricity users.

We believe that the feed in tariff should be designed to ensure that Solar PV systems can achieve a 6-7 year simple payback, with an IRR of at least 15% and positive net present value (NPV). It is relevant to note that the government and/or RA may be able to take steps outside of setting feed in tariffs to improve the financial performance of Solar PV systems. Examples include reducing the facilities charge for solar PV system owners and changing planning fees and planning requirements for Solar PV system approvals to make them less cumbersome.

c) We believe the following factors should also be considered in determining the feed in tariffs:

1 The period over which the import and export of energy between a customer's property and the electricity grid is summed up, as this has a significant effect on the financial performance of the system and also affects the system design.
2 The facilities charge for customers with Solar PV systems.
3 The need for long-term stability to encourage investment.
4 The value of decarbonisation of the grid.
5 The value of the offset health costs of burning fossil fuels.
6 The value of increased attractiveness of tourism and international business from Solar PV for Bermuda.

7 Should Solar PV or other renewable energy programmes be incentivised within a specific regulatory framework for renewables in Bermuda?

Yes, a quantitative, long-term, national target should be set to decarbonise the electricity grid, based on the adoption of carbon factors as suggested in our response to Question 2. This would provide stability and clear direction for all members of the industry, and inform generation mix planning.

8 In your view, are there any barriers to Solar PV or other forms of renewable generation investment?

a) **If so, what are these barriers?**

b) **How could they be removed to enable further investment?**

We believe there are a range of barriers to Solar PV and other forms of renewable generation investment, which are identified and discussed below:

- **Lack of long-term national targets for renewable energy generation and/or GHG emissions**: This could be addressed by either the RAB or the government adopting quantitative targets.
- **Major changes to the economics of Solar PV without industry consultation or warning:** Examples include removal of the government rebate programmes and ending of the net metering programme. We hope to work constructively with BELCO and the RAB to ensure that future changes are introduced via consultation and planning to allow our business and customers to prepare.
- **Retroactive changes to existing rate structures for Solar PV:** The size, layout and orientation of each Solar PV system is specifically designed to suit each client based on the rate structures in place at the time of installation. Retroactive changes to these structures can jeopardise the financial performance of Solar PV systems and discourage potential future investors in Solar PV.
- **Lack of legislative, regulatory and policy stability for the energy sector**: This creates a very difficult environment in which to operate a business, encourage investment or to secure competitive rates of financing. Stability is the key to obtaining the lowest cost energy from renewables.
- **Lack of a stable long-term tariff structure for Solar PV**: This has limited investment and increased the cost of financing. A legislated long-term feed in tariff could be used as leverage to reduce the cost of financing for Solar PV, making it accessible to those who cannot afford to buy systems outright.
- **Planning setback policies**: Costly DAP1 planning applications are sometimes required as a result of a small part of a system being installed on an existing structure within a setback area. The application of discretion or use of an approval letter from a neighbour could offer a more common sense approach.
- **Residential facilities charge**: This is a good example of a retroactive change to an existing rate structure, which substantially affected the financial performance of some Solar PV systems. We believe the present charge is counterproductive as it prevents small energy efficient homes from investing in Solar PV and is also creating a strong incentive for people to go 'off-grid'.
- **Lack of support for smaller systems**: Smaller Solar PV systems are not economically viable due to the large facilities charge and relatively high fixed costs associated with obtaining planning approval and interconnection. This is preventing many people on lower incomes, small roofs or those who use energy efficiently from investing in Solar PV. To ensure the benefits of Solar PV are shared among all socioeconomic groups, the government and/or RAB could work with the solar industry to reduce these fixed costs, or could set a higher feed in tariff for smaller systems.
- **Electricity grid capacity**: The electricity grid was designed based on a central rather than distributed generation model. At some point technical limits will be reached in terms of how much distributed energy the grid can cope with. Beyond that point it will be necessary to upgrade the grid to enable greater penetration of renewable energy. There is currently no incentive for BELCO to do this, even though it may be the most cost-effective option from a national standpoint.

- **Offshore Wind**: Bermuda has an excellent wind resource and offshore wind costs are increasingly competitive. The government and/or RAB could issue a request for proposals for a large offshore wind project with a view to getting a project online if costs are competitive and there are no technical or environmental barriers.
- **Deep Ocean Thermal**: Bermuda has excellent potential to utilize proven Ocean Thermal Energy Conversion technology, primarily for air- conditioning purposes

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Thank you for your time and consideration on this critical topic and we hope and trust you, the Regulatory Authority of Bermuda, will come to a sensible conclusion as soon as possible for the betterment of Bermuda and beyond.

Sincerely,

The BE Solar Team
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Response to Consultation Document 16-0819: Comments on Regulatory Authority and Government Fees Process

Questions.
7.1

1. It has taken far too long to get PV solar energy established in Bermuda. We have failed make a meaningful contribution from PV Solar as a percentage of total energy consumed. A much larger potential is possible.
On the positive side, the technology has advanced and costs have come down substantially - now is a good time to move forward. The uptake of this technology, has been limited to those who can afford it as upfront costs have been high, even though the payback period is reasonable considering our higher cost per kW electricity.

2. Solar PV is vitally important for the future of Bermuda.
While it is not a panacea for supplying energy overall, it can make a substantial contribution from small to the commercial installations.
This will have obvious economic and environmental benefits.
Quality installations offer good long-term investments as they have a certain economic savings for those installing them. There is a quantifiable payback for investing in PV compared to, for example, buying a car which depreciates more quickly and is a cost burden.
It will encourage local employment.

The world is at war with the environment and Bermuda must do what it can. Our coral reefs are lucky to be alive (consider Australia!)The reduction of carbon emissions from fossil fuels that we burn make a difference.
Bermuda must play its part in actively engaging in clean energy. It will add to our clean image as well which plays to our tourist image as a desirable destination.

It should be reflected in the framework for electricity regulation in a fair way as to enable the suppliers of PV to be paid for their contribution to the "grid" based on the either the **true** cost using the avoided cost methodology or an agreed tariff rate on a cost/benefit structure.
The proposed avoided cost rate of $0.1763 is too low as it reflects only the fuel costs as an expense in its determination;it fails to include the costs of fuel transfer on island to Belco's generation facility, the cost of generation and the administration of these functions.
An agreed tariff rate for solar production would be more appropriate in that the costs of solar kW energy to the public (grid)would be based on market rate of energy set at present less the costs of distribution and management/administration. In this way the solar can compete with fossil fuel.
Above all, the framework selected to encourage the further rollout of solar PV should be both transparent and long-term in scope-Ten year contract with a 10 year option.(review periods can be scheduled within these periods). I have had direct experience for over 10 years in the solar and wood energy markets in Ireland where renewable energy programs were effectively implemented for only 3 years. As a result, the industry did not develop enough inertia and collapsed. Germany, on the

other hand, was careful to give **10 year plans** in the mid 1990s which established a strong and lasting solar market.

3. a) Planning should have a role in limiting the size of domestic pv solar arrays only if the size of a particular installation is likely be too large out of proportion for an area and the likely kW demand of the property would be greatly eclipsed by the system.

It should be MANDATORY THAT ALL NEW BUILD HAVE PV INSTALLED. The use of all appropriate roof space should be possible if required. It is less expensive to the community as a whole to take this approach, as retrofitting is more expensive. I have direct expereience in solar thermal installations in Ireland. The Dept of Planning are incorrect in their assessment that builders and architects would raise their prices if it were mandatory- that should not be a consideration in the scheme of a house toatl cost. The savings will be there if the investment is made.

Outside of the domestic arena, Planning needs to identify all areas for which solar can be usefully, and practically installed. For example, parking lots and commercial areas with large roofs and open spaces that lend themselves to this technology.

Outside of planning, market forces should operate as freely as possible but rate arrangements must have a buy in from the public. Belco can engage directly with customers after the agreed tariff arrangements are in place with RA- without the need for government licensing, which ads unnecessary and cost and red tape.

b)As answered above the approximate historical kW demand can serve as a guide for domestic operators. With commercial application, this may not serve well as an operating guide as there may be some sites that work well for larger arrays where there is presently little or no kW energy consumed on site.

4. This may be the best practical short term solution in the absence of a new purchasing agreement from the RA. I do not endorse the provisional rate for the longer term.

5 **The price paid by Belco (as distibutor) to solar providers should largely be the price they charge end users less the transmission costs, and administrative charges borne by Belco.** Why should solar generation subsidize the generation of power from fossil fuels? The "avoided cost" methodology as outlined at present could be a disaster for those investing in solar is the future costs of fuel come down substantially(gas) and the determined rate falls commensurately.

Belco thinks that because they provide the power when the sun isn't available, that this on demand service should be accounted for in the rate of solar buyback. Hogwash!
The electrical demand on Belco by the Island as a whole is substantial and the costs associated with this as a percentage of the rate charged per kW of power will be little affected by % of solar contribution.
It is in the public interest, not to allow Belco to "tax" the solar buyback rate for its general costs of generation for fear it will act as a disincentive for solar installations.

Solar makes its greatest contribution is in the sunniest period of sunny days when there is also demand for AC (higher kW loads) which in turn requires Belco to fire the more expensive (fuel) units to meet demand. LFO is used at 21c/kWh.at this stage. This is not part of Belco's spinning reserve. Solar will reduce this demand. The knock on effect is that Belco's fuel costs reduce also. This, in turn would reduce retail rates and solar tariff rates would reduce as the rate paid works on the free market. The tariff rates paid by Belco to solar providers would therfore fluctuate according to the world market prices of fossil fuel.
In summary

a. I support the RA mandating full acccounting separation for transmission/generation, storage, distribution and retail activities, and all costs related to those directly responsible for purchasing and selling solar, as these are relevant formulate a tariff rate that is chosen.
b. The level of transparency should be such that it can be reasonably determined that on a 5 year average, for example with costs ascribed to generation of power , this can be calculated as a fixed dollar rate. The variable costs will be the fuel costs.

6. a.A cost benefit would be best, with free market principles applied, once the cost transparency is complete.
b. Investors of solar systems should be paid for the power they produce that is consumed on site at par market price per kW- less local distribution costs(if any). Excess power would be paid at the tariff rate as mentioned above.
c.Keep it simple. Belco will fight for the fact that they still supply power to premises with fitted solar systems when required-on cloudy days and at night; while this is so, those costs to Belco are paid in any event as they are now.

7. By and large, market forces should prevail, with little government interference in the sector.
That being said however- as Belco is a virtual monopoly that has long been given the rights by a public body to charge what they wish (for a private company)- future RA decisions that endorse the rates they wish to charge the public must come with a caveat that forces them to be adoptive of the potential solar microgrid potential*. This can occur without subsidizing solar (as was the case when Belco paid full retail kW rates for solar).
The Bermuda Government should continue to offer duty relief on all renewable products- whether PV, or solar thermal and others that operate without the need for fossil fuel use.

The RA must determine what the costs of transmission are. This rate can be then added to a cost of administration for Belco handling the purchasing and that can be the rate chosen to be deducted from the retail rate.
It will fluctuate over time as the market prices of fuel change and be self regulating. Solar can then compete properly with fossil fuels in an **open market** way.
The rates paid for solar should be stepped down as size grows - this can be discussed with the suppliers of solar systems to reflect the fixed upfront investment costs which will likely be higher per installed kW from small (domestic) installations.

8. The largest barrier is that **there is no long- term strategy in place** to promote solar PV.
There are **no Solar PV targets in place**. These can articulated as a goal by the RA(if that is possible) in consultation with the wider public as to be in the best interests of Bermuda.
Long-term buyback arrangements do not exist for solar investors-big or small.

Once there is a plan in place, technological changes (battery storage for example) can be accommodated in the mix. The best options for Bermuda must be kept in the forefront to minimise the use of imported fossil and maximise the sun's energy on lsland.

The regulatory framework that supports solar needs to be put in place as soon as possible. The Public, Belco and the solar companies are all stakeholders.
The transparency of the long-term arrangements made will aid decision makers-Banks to lend and new companies to emerge/others to grow in this sector.

Respectfully submitted,

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April 19th, 2017