Cost Effectiveness Tariff Policy for Renewable Energy Self-Generation Projects Proposed Policy Options

RESG and SSRG

STATEMENT OF RESULTS AND FINAL DECISION

ES: 01/2022

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1 INTRODUCTION

The Utilities Regulation and Competition Authority ("URCA") issues this Statement of Results and Final Decision (SoR) further to its **Consultation on Proposed Policy Options on Cost-Effectiveness Tariff for Renewable Energy Self-Generation Projects (ES 11/2021) ("the Consultation Document")[1], published on the 20 October 2021.**

URCA is the independent regulator and competition authority for the Electricity Sector (ES) in The Bahamas. URCA is responsible for the regulation of the Electricity Sector in accordance with the Electricity Act, 2015 (EA) while also having appropriate consideration to the goals, objectives and principles underpinning the National Energy and Electricity Sector policies.[2]

Section 27(5) of the EA gives URCA the authority to decide the value and amount that an owner or operator of a renewable energy generating resource may receive when selling power to a public electricity supplier which is not required for that owner's use by regulatory measure. In taking this regulatory measure, URCA has an obligation under the EA to allow persons with a sufficient interest an opportunity to comment on proposed regulatory and other measures which, in the opinion of URCA are of public significance and further to consider those comments prior to introducing those measures. Moreover, in implementing those measures, URCA has regard to the requirements of the EA and specifically, the electricity sector policy which at section 6(2) of the EA stipulates that in making regulatory or other measures, URCA is to encourage competition in the generation of renewable electricity and to promote the use of renewable energy.

Having regard to the foregoing, it is important that URCA complete a cost-based pricing study to ascertain the economic cost of the RESG framework with the view to determine the fair economic price for the exchange of Renewable Energy (RE) from RESG installations and by extension other programs designed or determined by URCA, namely the Small-Scale Renewable Generation (SSRG) program. URCA's goal is to establish the price points at which the RESG and SSRG program design will facilitate the goals of the ESP and the NEP by establishing policy options to facilitate:

- The determination of RE tariff rate-setting references to RESG and SSRG programs
- Establishing the methodology for calculating cost-based rates, the data collection approach
- Determine the cost-effectiveness analysis of the appropriate tariff rates

In this Statement of Result and Final Decision, URCA:

1. summarizes the written submissions received to the Consultation Document.
2. provides URCA's analysis of the submissions made by key stakeholders.
3. sets forth URCA's final decision

1.0 BACKGROUND TO THE CONSULTATION PROCESS

Having regard to URCA's statutory mandate to regulate compensation payable to RE owners, URCA considers the Cost-Effectiveness Tariff Policy for Renewable Energy Self-Generation Projects and Small-Scale Renewable Projects to be of public significance, with potentially far-reaching impact on the ES.

[1] https://www.urcabahamas.bs/consultations/es-11-2021-cost-effectiveness-tariff-policy-for-renewable-energy-self-generation-projects-resg-and-ssrg/

[2] Electricity Act 2015, section 37(1)

Accordingly, URCA initiated the public consultation process and published the Consultation Document on 20 October 2021. URCA invited Stakeholders to provide written responses on the Consultation Document on or before 18 November 2021.

The Consultation Document sought respondents' views on several questions relating to the methodological framework, tariff principles, guidelines and procedures. In preparing the consultation document, URCA had the benefit, through support from the Inter-American Development Bank (IDB), in collaboration with The Cadmus Group LLC and Energynautics, of technical assistance to examinine economic costs and policy design alternatives to the Renewable Energy Self-Generation programs which encompass the RESG.

This technical assistance has provided the foundation for URCA to take the next steps in revising and implementing the RESG program in a way that balances URCA's obligations with the goals of The Bahamas' National Energy Policy and to fulfil its obligation of establishing a cost-effectiveness pricing policy for the existing RESG and SSRG programs.

Through this document, URCA now sets out its decision on the policy options as it relates to the RE tariff rate-setting references to RESG and SSRG programs, establishes the methodology for calculating cost-based rates, the data collection approach and determines the cost-effectiveness analysis of the appropriate tariff rates.

1.1 RESPONSES TO THE CONSULTATION

The consultation document was published on 20th October 2021 seeking comments from interested parties and the public. The period for submission of written responses and comments to the consultation document was initially 18th November 2021. URCA, however, received and acceded to a request from BPL and afforded them extra time to respond to the Consultation Document. In this regard, the submission period was extended to 2nd December 2021. URCA received comments from key industry stakeholders.

URCA recognizes the importance of an open and robust consultation process and is satisfied that it has discharged its statutory duty under the EA 2015 by permitting all stakeholders with interest in the subject matter of the Consultation Document a reasonable opportunity to make submissions.

During the consultation period, URCA received written responses from:

- The Bahamas Power and Light Company Limited (BPL)
- Bahamas Utilities Company Ltd. (BUCL)

URCA extends thanks to the respondents for their participation in this public consultation process and the submissions proffered.

URCA has summarised the comments submitted by the Respondents in this Statement of Results and issued its decision. Interested parties can obtain the full text of the Respondents' comments from URCA's website at www.urcabahamas.bs .

In this document, URCA has sought to provide a summary of the responses considered and a discussion of URCA's position on those responses. However, it is noted that URCA may not have reproduced all matters considered. The lack of a direct response to a comment or any issue raised by a Respondent does not signify URCA's agreement in whole or in part with the comment, nor should it be taken to mean that URCA has not considered the comment or that the comment was considered and dismissed.

1.2 STRUCTURE OF THE REMAINDER OF THIS DOCUMENT

Section 2: Outlines URCA's authority to conduct Cost-Effectiveness Tariff for Renewable Energy Self-Generation Projects.

Section 3: Summarises the general comments and comments received to the consultation questions received and outlines URCA's responses.

Section 4: Summarises URCA's view on the responses received to the consultation questions and provides URCA's analysis on the Cost-Effectiveness Tariff for Renewable Energy Self-Generation Project.

Section 5: Outlines URCA's Final Decisions and next steps.

2 REGULATORY FRAMEWORK

This section outlines the regulatory and legal framework under which URCA has exercised its power under the EA.

The EA empowers URCA, as the regulator for the ES in The Bahamas, with implementing the ES policy, enforcing provisions of the EA and enforcing licensees' license conditions.

Section 6 of the EA sets out the ESP objectives, as follows:

(1) The main goal and objective of the electricity sector policy shall be the creation of a regime for the supply of safe, least cost, reliable and environmentally sustainable electricity throughout The Bahamas.

(2) The principles and objectives governing the sector policy and electricity supply regime, in accordance with the aims and goals of the National Energy Policy, shall be the –

(a) provision of safe, least cost electricity supplies to all consumers.
(b) enhancement of the energy security of The Bahamas.
(c) introduction of a structure for the sector that is overseen by an independent regulator.
(d) employment of practices and technology that are designed to protect the natural environment of The Bahamas.
(e) promotion of energy efficiency in the generation, distribution, and consumption of electricity throughout the economy.
(f) promotion of the use of renewable energy.
(g) promotion of private investment and innovation in the electricity sector.
(h) creation of incentives for the private sector participants in the electricity sector to continuously improve performance in operations and customer service.
(i) provision of investment and job opportunities for citizens of The Bahamas; and
(j) provision of a regulatory structure that balances the interests of and affords opportunities for input from all stakeholders, honours contractual commitments and encourages investment.

Section 7 provides for URCA to issue regulatory processes that are fair, objective, non-discriminatory, transparent, and that seek to implement the NEP and ESP.

Pursuant to section 9, BPL may enter contracts with consumers in the Island of New Providence and designated Family Islands for the supply and purchase of electricity on terms and conditions approved by URCA. It allows for BPL to support the Government's NEP, including promoting and facilitating the development and use of renewable electricity generation resources and technology.

Section 27 of the EA describes the legal framework for renewable energy projects advanced by residential owners of property.

Additionally, section 28 describes the legal framework for renewable energy projects advanced by the Government and small-scale businesses or commercial enterprises, as follows:

(i) URCA shall approve in writing the installation or operation of generating stations using prescribed renewable energy resources where—

(a) renewable energy self-generation projects are advanced by—

i. the Government, in any place in The Bahamas, in relation to the supply of energy to premises occupied by a ministry, department, statutory body, agency, local government council, or other entity of Government.
ii. a small-scale business or commercial enterprise within The Bahamas.

(b) such stations meet the requirements of, and are operated in accordance with regulatory or other measures issued by URCA; and

(c) such stations have no adverse impact on the reliability of the electricity supply system.

(ii) URCA shall maintain and publish, in accordance with section 43, a list of the names of the entities granted approval under this section together with the corresponding sizes and aggregate kilowatts of the installed generation stations.

Under section 41 of the EA, URCA has a duty to consult with the public on matters which, in the determination of URCA, are of public significance.

Section 42 of the EA outlines that a regulatory or other measure is likely to be of public significance if it relates to electricity supply systems or services, energy efficiency programmes, or renewable energy resources and can lead to one or more of the following --

1. involve a major change in the activities carried on by URCA under the EA;
2. a significant impact on persons carrying on activities in those areas where URCA has functions under the EA; and
3. a significant impact on the public in The Bahamas.

Section 64 of the EA gives URCA the remit to make determinations where URCA deems it necessary relating to the terms and conditions of a licence, including obligations in licence conditions, regulatory and other measures, standards or technical rules.

3 URCA'S SUMMARY OF RESPONSES TO COMMENTS RECEIVED ON THE CONSULTATION

In this section, URCA summarizes and responds to the General comments received on the consultation. However, URCA has not included every consideration in this Statement of Result and Final Decision. The absence of a response by URCA to any comment raised by a Respondent does not indicate URCA's agreement in whole or in part with the comment, nor does it suggest URCA's lack of consideration or finding that the comment was without merit.

URCA thanks BPL and BUCL for the responses to the consultation document.

3.0 GENERAL COMMENTS ON THE CONSULTATION

BUCL In this section, URCA summarizes and responds to the General comments received on the consultation.

3.0.0 BPL GENERAL COMMENTS

In positing its general comments, BPL put forward the position that a feed-in tariff (FIT) that exceeds the avoided cost of fuel (AFC) is one that includes a subsidy component. BPL argued that this has been done in many jurisdictions and typically it would seem that such subsidies are funded through government funded programs or mechanisms and not by the utilities that administer the programs.

Additionally, BPL posited that it was expected that the Consultation Document should have outlined more on the funding of any proposed subsidy components of the FIT as BPL does not agree that such a subsidy should solely affect its bottom line. BPL argued such an approach would mean that BPL would have to pass the associated rate increase on to the entire customer base and compliance with any directions not to do so would place undue financial pressure on BPL.

BPL further requested to see more detail on the background calculations that resulted in the benefit-cost ratios reflected in this Consultation Document and added that it would be helpful for URCA to provide access to the models developed to facilitate testing of their outputs with various inputs and scenario assumptions.

3.0.1 URCA'S RESPONSE TO BPL'S GENERAL COMMENTS

URCA takes note of BPL's comments and submits that URCA will make the tariff model and cost effectiveness model along with the background calculations ("The tool") available to all stakeholders.

As it relates to BPL's concerns about subsidies and undue financial pressure on BPL, URCA considered the following key questions when assessing policy options: how attractive does the policy have to be for participants to spur development? What level of rate impacts is acceptable and sustainable? And, what is the right balance to strike fairness for all stakeholders without negatively impacting ratepayers.

The tool developed by Cadmus, on behalf of URCA, presents cost-effectiveness outputs from the perspectives of the regulator, society, and the utility. Additionally, the policy-cost tool presents cost-effectiveness from the perspective of the participants, showing the impact of policy designs on customer cash flows, and calculates what, if any, customer rate increase is needed to recover fixed utility costs. Table 1 below shows what each of these tests considers as a cost or benefit.

Test	Perspective	Costs	Benefits
Jurisdiction-Specific Cost Test	Regulators or decision-makers	Administrative costs, tariff rate payments, applicable policy goal impacts	Energy-related and capacity/transmission and distribution (T&D)-related costs avoided by the utility, applicable policy goal impacts
Utility Cost Test	The utility[a]	Administrative costs	Energy-related and capacity/T&D-related costs avoided by the utility
Societal Cost Test	Society	Administrative costs, installation costs, incremental measure costs (O&M, replacement, etc.)	Energy-related and capacity/T&D-related costs avoided by the utility, non-monetized benefits (such as cost of carbon)
Participant Cost Test	Participants	Installation costs, incremental measure costs (O&M, replacement, etc.)	Tariff rate payments, avoided retail payments
Ratepayer Impact Test	Non-participating ratepayers	Administrative costs, tariff rate payments, lost revenue to utility due to reduced consumption	Energy-related and capacity/T&D-related costs avoided by the utility

[a] The Utility Cost Test does not include utility revenue impacts such as tariff rate payments or avoided fuel charges, since these revenue impacts are passed through to utility customers through increased rates. Rather, the test focuses on direct costs and benefits experienced immediately by the utility.

3.0 RESPONSES RECEIVED TO SPECIFIC CONSULTATION QUESTIONS AND URCA'S COMMENTS

In this section, URCA provides its comments to the responses submitted by the stakeholders.

#	Stakeholders responses	URCA Comments
1	*Consultation Question 1* *Do you agree with the two proposed approaches to setting RE tariff rates? Which approach do you think is most appropriate for estimating RE pricing for exchanging energy to the grid? Please give reason(s) for your answer(s)*	
	Bahamas Power & Light Limited (BPL)	
	BPL acknowledged that both methods are valid approaches and further posited that the value-based approach pegged to the avoided cost of fuel is BPL's preferred approach. BPL also put forward the view that investors in the Renewable energy projects should be required to compete against the prevailing cost of energy to the PES. BPL premised this view on URCA's position that by setting payment rates equal to the LCOE, policymakers can ensure that payments to project investors throughout the contract will allow them to recover their costs including the return on their investment. BPL argues that rates charge based on LCOE will necessitate subsidies from ratepayers. Additionally, BPL questions whether the quality and source of the data be expanded on and explained further.	URCA notes BPL's preference for the value-based approach pegged to the avoided cost of fuel. However, URCA reiterates that while the administrative, value-based approach is an accepted methodology for setting the compensation rate for renewable energy generators, it pegs the value of the kWh produced by the renewable energy generator to the utility's cost of fuel. There are a few drawbacks associated with this approach ,including that it does not provide long-term investment certainty because the compensation rate is variable and fluctuates based on the cost of fuel, it only incentivizes investment in renewable energy when the cost of fuel is high and not when the cost of fuel is low, it does not reflect the actual costs of investing and operating a renewable energy system, and it does not reflect the full value a kWh of renewable energy may deliver to the grid. Notwithstanding, URCA believes that un-hedged avoided fuel costs over the past five years are sufficiently cost effective to incentivize RE investment. Further URCA is of the view that by setting payment rates equal to the LCOE, policymakers can ensure that payments to project investors throughout the contract will allow them to recover their costs and generate a reasonable return on their investment.

#	Stakeholders responses	URCA Comments
		If rates are designed correctly, this method provides an incentive for renewable energy development to realize the RE policy target without providing windfall profits. However, URCA believes that the payment rates should reflect cost effectiveness to all stakeholders.
	Bahamas Utilities Company Limited (BUCL)	
	BUCL, in its response, posited that the **cost approach** with a reasonable rate of return is an acceptable one. BUCL posited the following reason;. • There must be a material-based cost consideration to ensure developers and/or installers of renewables don't inflate soft cost (labor/admin). The client must know what developers/installers are paying for material to determine if they are being over charged for labor and admin.	URCA notes BUCL's position on the approaches to setting RE tariff rates. However, URCA reiterates that compared to a value-based approach, a cost-based approach ensures the compensation amount allows developers to recover all costs and earn a reasonable return on their investment creating an incentive for renewable energy project development by providing investment certainty. However, there are potential drawbacks to the cost-based approach such as providing an excessive compensation rate for renewable energy generators and, in turn, having a higher electricity rate increase than anticipated for non-participating utility customers. It is possible to mitigate these drawbacks through thoughtful program design including a highly consultative process in determining rate inputs, a cost-effectiveness analysis to understand the potential impacts of the tariff rate on different stakeholders, and regular periods of review to adjust the compensation rate to reflect the changes of an evolving market.
2	*Consultation Question 2* *Stakeholders are asked to provide comments on data collection approach and sources. Do you believe that the data collection approach is adequate? If not, explain why not? Provide alternative and/or additional data where possible*	
	Bahamas Power & Light Limited (BPL)	
	BPL posited the view that more support for the Base Capital Cost estimates and assumptions used in URCA's proposed data collection approach are needed.	A critical step prior to modelling the cost-based rates was data collection. The objectives of this step were to gather data on key parameters needed to calculate the cost-based rates for solar PV, wind and solar PV + battery storage installations and to

#	Stakeholders responses	URCA Comments
		consult with renewable energy stakeholders active in The Bahamas to understand the costs of renewable energy installations in The Bahamas.
	Additionally, BPL has also raised question concerning Barbados being used as a comparative jurisdiction for the cost of O&M for a 500kW ground-mount solar PV system. BPL has also posited the questioning of the O&M cost of $16/kW/year.	Additionally, regional data was utilized both as a cross-reference and benchmark for the primary data sources, as well as a first-choice supplement where primary data from The Bahamas was not available. The most frequently cited regional source of data on solar PV and wind installations was the CREF-Castalia Renewable Islands Index and Marketplace from 2019. The O&M cost of $16/kW/year was based on available data.
	Bahamas Utilities Company Limited (BUCL)	
	Bahamas Utilities Company responded as follows; - - Data sources are good but needs to be widened especially when considering material cost. - Data collected from a local developer/installer may include margins which will vary from business to business and not give an accurate understanding of what renewable energy material cost are. - Data should be collected from reputable suppliers that provide products to developers/installers of renewable energy technologies. o Primary data from suppliers will enable a better cost measure of solar PV, Wind and other renewable energy technologies. - URCA will be able to assess other associated cost better and determine and even mitigate what is fair pricing.	URCA notes BUCL's response and thanks BUCL for the valuable suggestions. URCA, however, is remiss not to add that a survey was developed to collect relevant data on solar PV, wind, and solar PV + storage installations. URCA shared this survey directly with a range of stakeholders involved in the renewable energy sector in The Bahamas – including renewable energy installers, developers, owners, as well as utilities and relevant ministries. Furthermore, The Bahamas Chamber of Commerce & Employer's Confederation shared this survey more broadly with an additional 40+ stakeholders. Follow-on interviews and data collection calls were conducted with survey recipients who were responsive to outreach. Relevant raw data was collected from primary written sources specific to The Bahamas.

#	Stakeholders responses	URCA Comments
	- Data on Carbon Emissions should be included in any rate setting tool used to determine carbon reduction impact on a project. o the goal of clean energy implementation is to reduce carbon emissions, there must be a value placed on carbon reduction. - This gives a comparative measure and allows for all possible clean energy technologies to be quantified, and appropriately valued.	
3	*Consultation Question 3* *Stakeholders are asked to provide comments on the Operation & Maintenance (O&M) Costs assumptions. Do you agree with the assumptions, if no explain why not and provide alternative and or additional data?*	
Bahamas Power & Light Limited (BPL)		
	BPL is of the view that additional data may have been obtained, from other sources, for example, information on the cost of insurance, by reaching out to local insurance companies. Additionally, BPL posited further questioning of the veracity of the proposed financing assumptions outlined in the consultation document.	URCA maintains that very little data was identified on available insurance products for renewable energy systems in The Bahamas. One renewable energy developer quoted $15/kW/year for the cost of insurance for a 500kW solar PV system, which correlates to ~1% of total CAPEX. No corresponding data on insurance coverage at this cost was identified. URCA notes that BPL did not propose alternative data and sources nor did the company cite sources and data to the contrary. Further, URCA had outlined the data sources and assumptions in the annexes of the consultation document.
Bahamas Utilities Company Limited (BUCL)		
	In response to the O&M Costs Data and assumptions BUCL posited the following: The O&M cost is industry standard, but it is important that URCA captures the actual cost as best as possible to ensure prices are not inflated. This can be done by completing an operation cost	URCA welcomed BUCL's valuable and thoughtful suggestions. URCA reiterates that the estimates on solar PV capital costs for various project size tiers are based primarily on Bahamas-specific data. Average

#	Stakeholders responses	URCA Comments
	breakdown with multiple renewable energy companies. The approach is agreeable, but BUCL posited that the areas being considered need to be broken down further. • As an example, Bases Capital Cost needs to be broken down into sections • Materials section (information provided by manufacturers and wholesale distributors) • Electrical design cost • Construction cost • Labor Cost • Additional Hardening cost should be covered in the base cost • It is important for URCA to get this number right to ensure renewable energy implementation prices are not unnecessarily inflated.	installed cost data was provided by one renewable energy developer in The Bahamas for projects in the respective project tiers, alongside detailed data inputs for one 500kW solar PV system. Additional storm hardening measure costs were extrapolated from averages for continuity purposes. Estimated additional costs of structural elements (e.g., carport structural costs) were subtracted and not considered as part of the average capital cost for this analysis. The resulting base capital costs used for this analysis (Table 3. Installed Cost Input Assumptions)[3] are slightly lower than the average capital costs reported for all distributed solar PV projects listed in the CREF-Castalia database published in 2019 (average: $2,698 for solar PV projects since 2013),8 and are higher than the average installed cost for commercial-scale solar PV systems in the U.S. within the 10kW to 2MW size range as reported by NREL in Q1 of 2018[4].
4	*Consultation Question 4* *Stakeholders are asked to provide comments on the Technical System input assumptions. Do you agree with the assumptions, if no explain why not?*	
	Bahamas Power & Light Limited (BPL)	
	In response to the consultation question BPL requested that URCA clarify whether the capacities in the technical assumptions the DC capacities of the system or the AC output capacities .	URCA submits that from the inception of the SSRG and RESG programs, the capacities in the technical assumptions are the AC output capacities.

[3] See consultation Document: https://www.urcabahamas.bs/consultations/es-11-2021-cost-effectiveness-tariff-policy-for-renewable-energy-self-generation-projects-resg-and-ssrg

[4] R. Fu, D. Feldman, R. Marglos. NREL. November 2018. U.S. Solar Photovoltaic System Cost Benchmark: Q1 2018. Available at: https://www.nrel.gov/docs/fy19osti/72399.pdf

#	Stakeholders responses	URCA Comments
	As it relates to the discount rate proposed to be used in the cost of providing renewable energy, BPL also question the veracity of the 10% - 15% Furthermore, in its response, BPL has suggested that it should have been possible to obtain information from the Bahamas Development Bank with respect to their likely level of loan support and rates for these types of projects.	A target rate of return of 12% was quoted by a renewable energy developer in The Bahamas as the expected rate of return on a 500kW solar PV project. The interviews and conversations Cadmus had with renewable energy developers in the Caribbean region (in the context of previous projects in the region) have indicated that a rate of return of 10% to 15% would typically be needed to attract private-sector investment. As a regional benchmark, the rate of return (cost of equity) used for the Feed-in-Tariff analysis in Barbados in 2019 was 14%. Additionally, very little Bahamas-specific data was received on typical loan products available for renewable energy projects. As such, Cadmus relied on research from previous projects on renewable energy loan products available in the Caribbean region.
Bahamas Utilities Company Limited (BUCL)		
	In its response, BUCL posited that the technical inputs seem to be fair (industry standards) and further added: • Carbon Emission Reduction should be considered in the technical and performance as this will allow for a carbon emissions impact to be measured across all technologies and this will enable URCA to expand technologies accepted under the programs ▪ Waste to energy ▪ Combined Heat and Power (CHP) ▪ Wave and tidal energy	URCA welcomed BUCL's response and noted the comments Nevertheless, it is the view of URCA that collecting data on the cost and performance of renewable energy systems and other inputs required for rate setting is often an inexact process. Particularly in markets where there is limited experience with renewables or limited available data, there is often a range of likely cost and performance data.
5	*Consultation Question 5* *Stakeholders are asked to provide comments on the targeted rate of return for RE investors. Do you agree with the assumptions, if no explain why not?*	

#	Stakeholders responses	URCA Comments
	Bahamas Power & Light Limited (BPL)	
	BPL posited that the proposed target rates of return and interest cost could ultimately mean the impact on the cost of RE will have to be passed on to the customer. Rates would have to be raised to account for these elements. BPL suggested that more local research ought to be done to determine what should be required in the local market. BPL has posited the view that the cost of Land can be significant and there should be included in the RE model analysis	URCA reiterates that local research was done to ascertain the appropriate target rate of return. A target rate of return of 12% was quoted by a renewable energy developer in The Bahamas as the expected rate of return on a 500kW solar PV project. The interviews and conversations Cadmus had with renewable energy developers in the Caribbean region (in the context of previous projects in the region) have indicated that a rate of return of 10% to 15% would typically be needed to attract private-sector investment. As a regional benchmark, the rate of return (cost of equity) used for the Feed-in-Tariff analysis in Barbados in 2019 was 14%. URCA agrees that the cost of land can be significant. Some of the costs, not included separately, are costs related to site leasing, land taxes, project management, or decommissioning, as there are varied approaches to incorporating these costs with an LCOE methodology to rate- setting, and the tool did not include separate fields for these inputs.
	Bahamas Utilities Company Limited (BUCL)	
	BUCL posited that it is their view that the targeted rate of return proposed in the consultation document is fair for private investment.	URCA welcomed BUCL's viewpoint.
6	*Consultation Question 6* *Stakeholders are asked to provide comments on the URCA proposed other Input assumptions. Do you agree with the assumptions, if no explain why not?*	
	Bahamas Power & Light Limited (BPL)	

#	Stakeholders responses	URCA Comments
	BPL is of the view that it seems that more effort could have been made to obtain information that would have meant the assumptions would have more local context. BPL further posited that the investment cost for RE is significant, and URCA should indicate whether there is consideration of government subsidies or tax concessions where applicable. BPL is of the view that this will surely impact the appetite for implementation and the rate of return of investment. • • **<u>Calculated Cost-Based Rates for Solar PV and Wind under a Buy-All/Sell-All RESG Program</u>** BPL put forward the view that the assumptions should be based on the local experience and whether or not government subsidies or tax concessions are feasible BPL posited that a Calculated Cost-Based Rates for Solar PV and Wind under a Buy-All/Sell-All RESG Program would have to be heavily subsidized in the current environment where the avoided utility cost (fuel cost) is approx. $0.105 per kWh. • **<u>Benchmarking Rates Against Buy-All/Sell-All Rates in The Caribbean</u>** BPL again posited that more data and assumptions should be gathered from The Bahamas rather than going the route of benchmarking	URCA submits that collecting data on the cost and performance of renewable energy systems and other inputs required for rate setting is often an inexact process. Particularly in markets where there is limited experience with renewables or limited available data, there is often a range of likely cost and performance data. Selecting within the range of reasonable inputs thus becomes a policy choice. For example, selecting higher costs and lower performance assumptions will lead to higher rates, which will increase participation and accelerate market growth, but it may overcompensate some generators, leading to higher policy costs. The granularity of data is also an important policy choice. More granular data can improve accuracy in the rate-setting process; however, there are diminishing returns with increased granularity and trade-offs in terms of the data collection process and transparency to the public. URCA also takes note of BPL concerns about the potential cross-subsidization effect that the <u>Calculated Cost-Based Rates for Solar PV and Wind under a Buy-All/Sell-All RESG Program could have.</u>
Bahamas Utilities Company Limited (BUCL)		
	BUCL posited that it's the view of BUCL that the assumptions are fair.	URCA welcomed BUCL 's viewpoint.
7	*<u>Consultation Question 7</u>* *<u>Do you agree with</u>*	

#	Stakeholders responses	URCA Comments
	(i) the proposed modelling of the RESG compensation rate under the proposed Net-Billing arrangement? *(ii) the proposed modelling of the SSRG compensation rate under the proposed Net-Billing arrangement?* *If no, why not? Please explain and provide the reasons and alternative proposal*	
	Bahamas Power & Light Limited (BPL)	
	BPL's position is that the current approach of compensation for energy sent to the grid under the net billing approach is the most appropriate. A subsidized rate above the avoided fuel charge would mean passing the cost onto customers and in so doing increasing electricity costs**.** • **Results: Modelling Compensation Rates Under Net-Billing** In response to the consultation BPL had submitted the following: - Can source files be shared for further/comparative analysis? - How were these figures for customer annual electricity demand determined? - What is the basis for the variation in calculated self-consumption? - It is not clear what the Rate Setting Tool Result is indicating.	URCA notes BPL's position but will also add that the compensation rates for RE will have to be adequate to incentivise the necessary RE penetration to meet the Government's policy target. Additionally, URCA considered the following key questions when assessing policy options: how attractive does the policy have to be for participants to spur development? What level of rate impacts is acceptable and sustainable? And what is the right balance to strike fairness for all stakeholders without negatively impacting ratepayers? URCA will make all models and documentation developed by the IDB consultants, The Cadmus Group LLC and Energynautics available to stakeholders. The IDB provided technical assistance to URCA to support the examination of economic costs and policy design alternatives pertaining to the various RE programs.
	Bahamas Utilities Company Limited (BUCL)	
	BUCL posited the following; • The proposed modelling for the RESG is acceptable. • The SSRG program should be modelled the same way as the RESG for significant penetration to take place.	URCA notes BUCL response.

#	Stakeholders responses	URCA Comments
8	*Consultation Question 8* *Stakeholders are asked to provide comments on the URCA proposed assumptions in regard to Solar PV + Battery Storage. Do you agree with the assumptions outlined in Annexes 4, if no explain why not?*	
	Bahamas Power & Light Limited (BPL)	
	BPL posited that the assumptions do not seem to be based on a survey of actual or potential system owners. Accordingly, BPL believes that the assumptions may not be representative of the opinion of actual end-users and have suggested that a survey of actual end-users be done in an attempt to gather a true representation to be used in the models. **Administrative Costs:** BPL posited that the assumption that the only utility cost is administrative does not account for capital investments the utility would have to make and expenses that would be incurred to maintain grid stability and optimal grid performance in support of distributed RE. BPL submitted that this should be reevaluated. **Avoided Utility Capacity Investments:** As the nature of the BPL grid is that of a night-time peak, the likelihood of these DE projects providing dispatchable power is very low. The avoidance of capacity investments is equally low. **Avoided Utility Transmission and Distribution Investments:** BPL posited that the introduction of RE on the distribution system may result in additional investments having to be made in smart grid technology at that level to monitor and manage the very different power flows that can occur. As such, BPL 18submitted that this should not be reflected as only a benefit	URCA takes note of the fact that BPL has not provided any alternative data to contradict the stated assumptions. Neither has BPL provided any evidence that the assumptions are not representative of the opinion of the actual end-users. The assumptions were developed from the survey conducted by the Cadmus Group LLC and Energynautics working as consultants on the RE Cost Effectiveness Study. In the absence of BPL providing alternative data to support the assertions, URCA maintains the view that the assumptions and data used in the model represent the best available data at the time of the study.

#	Stakeholders responses	URCA Comments
	Bahamas Utilities Company Limited (BUCL)	
	BUCL posited the view that URCA should assess energy storage needs is a case-by-case matter that should be a behind the meter benefit for its owners in most instances. BUCL has suggested that URCA must introduce separate and clear energy storage solutions incentives that can be beneficial for participants and the utility. Benefits include. o Frequency Response o Voltage Regulating o Energy storage aggregation	URCA notes BUCL 's response and comments and is of the view that these suggestions add value to the ongoing conversations to find solutions for cost effective integration of RE with storage.
9	***Consultation Question 9*** *Stakeholders are invited to provide comments on the proposed Benefit-Cost Effectiveness Tests outlined above. Comment on its appropriateness and adequacy*	
	Bahamas Power & Light Limited (BPL)	
	URCA proposed Policy Scenario BPL considers that URCA needs to provide more content on the funding mechanism for any proposed feed in tariffs above and beyond the avoided cost of fuel. It is submitted that such funding should be a subsidy from national funds allocated for this purpose and designed to stimulate efforts to meet renewable energy goals. Such subsidies could then be implemented without being a burden to the PES as failure to provide the stimulus funding would mean the subsidy would go away. **URCA's summary from Cost Effectiveness Scenarios**	URCA notes BPL's concerns about subsidies and the mechanism to fund those subsidies; however, URCA is of the view that BPL has not addressed the core question and issue pertaining to the consultation question. In the absence of BPL not providing specific comments to the information presented, in particular, to the consultation question, URCA takes the view that BPL has no fundamental disagreement with the proposed Benefit-Cost Effectiveness Test outlined in the Consultation document.

#	Stakeholders responses	URCA Comments
	In response to URCA's summary on the cost effectiveness scenarios BPL posited that in addition to the numbers, it is important to also present non-financial benefits so that the true cost and who should carry the burden of the same (government vs licensees / program participants) should be assessed in a framing policy.	On the question of non-financial benefits that BPL posited should be presented, URCA takes the view that to the extent that these financial benefits can be identified BPL should have, at least, outlined these benefits in its response.
	Bahamas Utilities Company Limited (BUCL)	
	BUCL posited that Carbon Emission can also be added as a cost-benefit measure as follows; • There may be instances where alternative solutions are not completely renewable, but still significantly reduce carbon emissions. CHP ▪ Waste to Energy	URCA agrees with BUCL that Carbon Emission Credit can also be added as a cost-benefit measure, but should be confined to RE projects such as Solar, Wind as it relates to the RE policy option discussed in the Consultation document.
10	***Consultation Question 10*** *Do you agree with URCA proposed Renewable Energy Self-Generation Policy Design Elements? And do you agree with the proposed policy trade-offs? Provide comments with reasons and explanations*	
	Bahamas Power & Light Limited (BPL)	
	BPL posited the view that the consultation process would prove more beneficial to Stakeholders with the inclusion of more localized data to support the assumptions. Additionally, access to the models and other information would have greatly assisted in the Stakeholder's review and testing of the various outputs and scenarios. BPL submitted that more information is required on proposals for funding of the subsidy elements of the FIT, BPL further reiterates its disagreement with the proposal that subsidies solely affect the PES' bottom line or that the customers bear the burden due to the increases in costs being passed on to them.	URCA will make all models and documentation developed by the IDB consultants The Cadmus Group LLC and Energynautics available to stakeholders. The IDB provided technical assistance to URCA to support the examination of economic costs and policy design alternatives pertaining to the various RE programs Furthermore, URCA notes BPL's concerns about subsidies and the mechanism to fund those subsidies; however, URCA is of the view that BPL has not addressed the core question and issue pertaining to the consultation question.

#	Stakeholders responses	URCA Comments
		In the absence of BPL not providing specific comments to the information presented and to the consultation question URCA takes the view that BPL has no fundamental disagreement with the proposed Benefit-Cost Effectiveness Test outlined in the Consultation document
	Bahamas Utilities Company Limited (BUCL)	
	URCA's proposed policy design elements are acceptable in many areas but can be improved on in some areas as we have noted. The Self-Generation program technologies should be expanded to include more technologies than solar, wind and batteries; to achieve a significant renewable energy penetration and encourage innovation and a variety of technological approaches. See a scenario that illustrates the importance of carbon emissions and other technologies. - The RESG tariff changes should be beneficial to all stakeholders and improve investment - Carbon Emissions must become part of the metric - Allows for a wider range of technology participation - Creates an impact measure for carbon reduction that can be applied to multiple technologies.	URCA welcome BUCL's response and takesnote of the comments. URCA believes there are merits in the comments but will hasten to add that for the RESG policy options and cost effectiveness tariff only RE projects such as wind and Solar are being considered at this time.

4 URCA'S ANALYSIS

The document represents URCA's assessment and Final Decision of the comments and responses received on the Proposed Cost Effectiveness Tariff Policy for Renewable Energy Self-Generation Projects – ES11-2021

URCA thanks the Respondents for their involvement in the Proposed RESG Policy Options and Cost Effectiveness Tariff. The responses received were valuable to this Statement of Results and Final Decision.

Based on stakeholder comments and feedback, URCA is of the view that whilst the comments are valuable and provided a deeper understanding of stakeholders' positions, no new information was discernable that would materially change the input data and assumptions used in the cost-effectiveness model. Therefore, a re-run of the rate-setting model is not warranted at this time. An update will become necessary when additional and new data becomes available. The input assumptions will be revisited and a re-run of the rate-setting model, as well as the cost-effectiveness model, will commence.

4.0 URCA POLICY SCENARIO

The policy-cost tool allowed URCA to test the cost-effectiveness of various policy design options by varying both the customer compensation type and compensation rates. To design policy options, URCA can vary how each project is compensated, either through a Net-Billing or a Buy-All/Sell-All arrangement. Additionally, URCA can define if projects are compensated at prevailing fuel rates or through cost-based rates. To aid URCA in its decision to determine a cost-effective tariff for the RE programs designs, Cadmus modelled six policy scenarios:

1. The current RESG policy design[5]: hybrid compensation arrangement at prevailing fuel rates
2. An adjusted RESG policy design: hybrid compensation arrangement at prevailing fuel rates and a cost-based rate
3. Alternate Policy Design Scenario 1: Buy-All/Sell-All arrangement with a cost-based rate and no storage systems
4. Alternate Policy Design Scenario 2: Net-Billing arrangement with compensation at prevailing fuel rates and no storage systems
5. Alternate Policy Design Scenario 3: Net-Billing arrangement with compensation at prevailing fuel rates with storage systems
6. Alternate Policy Design Scenario 4: Buy-All/Sell-All arrangement with a cost-based rate with storage systems

Cadmus modelled the cost effectiveness of the policy options using project-specific cost and performance data, as well as utility-area specific inputs, including fuel rates and electric rates. Other model inputs included the utility system load shape (used to calculate peak impacts), cost of carbon assumptions, utility system outage and avoided generator use costs, inflation rates, utility assumptions about rate increases, fuel cost projections, and others. Information about key data inputs can be found in the Annex I - IV.

While all model inputs are important, some of the most critical model inputs are the utility rates, utility fuel costs, and participation assumptions. Some of these key assumptions are described here, as they are major drivers of the cost-effectiveness results.

4.1 URCA POLICY SCENARIOS COST EFFECTIVENESS RESULTS

URCA assessed the cost effectiveness for six policy scenarios from the perspective of the regulator, the utility (Utility Cost Test), the project developer (Participant Cost Test), and the ratepayer (Ratepayer Impact Test) for the

[5] The RESG policy is currently designed to compensate projects between 100kW and 500kW through a Net-Billing arrangement, and projects over 500kW up to 1,000kW through a Buy-All/Sell-All arrangement. Compensation rates for customer-generated electricity is set at the prevailing fuel rate.

Bahamas Power and Light Company (BPL) and the Authorised Public Electricity Suppliers (APESL). URCA also assessed the calculated average rate increase and average bill increases under each policy scenario.

Every scenario is cost-effective from the regulatory perspective, which considers high-level policy goals and a comprehensive list of costs and benefits (as shown in Table 13). The figure does not show the results of the Utility Cost Tests because the results of this test were extremely cost effective (the benefit-cost ratio exceeded 78) because of limited costs that were assessed and favourable benefits regarding avoided operations and maintenance costs of existing generators.

Subsequent tests explore the key drivers impacting cost effectiveness for each test in detail. In summary, key drivers of cost effectiveness include the following:

- If a rate is a cost-based rate, which is higher than the cost of fuel, the policy is more expensive from a ratepayer perspective because the cost of developing distributed renewable energy is more expensive than operating and supplying fuel for existing generators.
- In a Buy-All/Sell- All policy with cost-based rates, the participant's cost effectiveness benefit-cost ratio will equal one, because the rates are set to ensure that developers earn exactly a twelve percent return on their investment. This expected return is factored into the cost effectiveness analysis.
- Due to the high level of self-consumption of project-generated energy by participants under Net-Billing policies, projects are cost effective for participants, even when the utility purchases project-generated energy at fuel rates. This occurs because customers can avoid significant utility energy costs under Net-Billing arrangements. However, when projects include energy storage in a Net-Billing arrangement, projects are not cost effective due to the high costs of energy storage.
- From a regulatory perspective, all policies are cost effective, given the multitude of benefits, including avoided fuel costs and avoided costs of carbon.
- From a utility perspective, all scenarios are very cost effective. This is because only costs associated with program administration are assigned to the test, whereas the benefits of non-fuel avoided generation variable costs are significant.

4.1.0 URCA'S SUMMARY FROM COST EFFECTIVENESS SCENARIOS

The current RESG policy design is likely not attractive for larger projects that are compensated at fuel rates under a Buy-All/Sell-All arrangement.

While the current RESG policy design is cost effective for smaller projects that can offset significant electric purchases with self-generated energy, the current design is likely insufficient to attract participation for larger projects that are not able to offset electric purchases and are compensated at a fuel rate, which is insufficient to cover project development expenses and provide system owners with the required rate of return.

A Buy-All / Sell-All arrangement with cost-based rates (Scenario 1) trades participant certainty for rate impacts.

A Buy-All / Sell-All arrangement with cost-based rates may offer certainty to project investors that they will cover project expenses and earn a return on investment, but ratepayers will purchase solar PV electricity that is more expensive than the existing generation, which will increase electric rates.

A Net-Billing arrangement with rates based on prevailing fuel rates (Scenario 2) is cost effective for all stakeholders except GBPC ratepayers. However, the cost effectiveness for participants (project investors) is primarily based on considerable offset electric purchases resulting from high self-consumption.

While a Net-billing arrangement at a fuel rate may be attractive for some utilities based on their avoided costs, the cost effectiveness for project participants is heavily dependent on offset electric purchases (high self-consumption). If self-consumption is lower than modelled, cost effectiveness for participants will decrease.

Furthermore, project investors may require additional investment security and certainty from a fixed rate to spur investment.

Battery storage costs are likely prohibitively expensive for participants and ratepayers.

The very high capital costs of battery storage systems make their deployment not cost effective for participants under a Net-Billing arrangement with fuel rates. While the cost effectiveness test for battery storage systems includes the benefit of avoided generator usage and cost during outages, this additional benefit is not sufficient to make storage systems cost effective.

If a utility were to cover project development costs through a cost-based rate that guarantees a financial return on battery storage projects, the impact on ratepayers would, however, be significant.

The economics of solar systems with battery storage are highly site and project specific. This analysis includes the additional resiliency benefit of offset generator costs. Other resiliency benefits are likely for investors, the utility system, and society. However, there are no industry accepted methodologies for valuing these additional resiliency benefits within a program cost effectiveness modelling exercise. Valuing these additional resiliency benefits would require a site-specific analysis.

A Buy-All/Sell-All arrangement with a cost-based rate will have some degree of ratepayer impact. However, the magnitude of the impact is dependent on the cost-based rate and level of program participation. To model and compare the cost effectiveness of the different scenarios, Cadmus assumed the RESG program was fully subscribed with all participants receiving the cost-based rate based on the rate-setting results. In more realistic circumstances, it would take time for the RESG program to be fully subscribed and it is possible that the rate may be adjusted in a future review cycle before the program reaches its capacity cap, meaning that the ratepayer impact may be less than the result of the current modelling exercise. URCA can monitor and manage ratepayer impact by tracking program participation and adjusting the rate as market conditions evolve.

5 FINAL DECISION AND NEXT STEP

In moving forward with determining a revised policy design for the RESG, it is critical to consider which trade-offs are acceptable in order to move forward with the overall policy goals of the RESG. URCA considered the following key questions when assessing policy options: how attractive does the policy have to be for participants to spur development? What level of rate impacts is acceptable and sustainable? And what is the right balance to strike fairness for all stakeholders without negatively impacting ratepayers?

The following table 2 below outlines URCA's cost-effectiveness matrix that informs the decision herein. The matrix represents the optimum benefit-cost trade-off that balances all stakeholder interests.

Table 2: Benefit-Cost Ratios for Net-Billing with non-hedged Fuel Rate

Fuel Rate Scenario	Jurisdiction-Specific Test	Utility Cost Test	Participant Cost Test	Ratepayer Impact Test
Low Fuel Rate	1.51	78.10	1.08	1.34
Base Fuel Rate	1.56	78.10	1.11	1.39
High Fuel Rate	1.60	78.10	1.20	1.48

This being the case, URCA has determined the following RE policy design outlined in Table 3

Table 3 Renewable Energy Self-Generation Policy Design Elements

Policy Design Element	SSRG Policy	RESG Policy
Eligible Technologies	Solar PV & Wind	Solar PV & Wind
Eligible Size Range	0kW - 100kW	101kW – 1MW
Eligible Customers	Residential	Commercial and Government
Treatment of Electricity Generated	• 0kW – 100kW: net-billing	• 101kW – 500kW: net-billing • 501kW – 1MW: net-billing
Payment / Compensation Rate	Compensation at a rate per kWh equivalent to the non-Hedged avoided fuel cost[6] of Public Electricity Supplier (PES)	Compensation at a rate per kWh equivalent to non-hedged avoided fuel cost of Public Electricity Supplier (PES)
Payment Structure	Variable. Will vary with the PES' non-Hedged cost of fuel.	Variable. Will vary with the PES' non-hedged cost of fuel.
Program Cap	Total installed capacity no more than 10% of generation capacity of respective Public Electricity Supplier	Total installed capacity no more than 10% of generation capacity of respective Public Electricity Supplier
Interconnection and System Upgrade Costs	Renewable energy generator assumes responsibility for interconnection and system upgrade costs	Renewable energy generator assumes responsibility for interconnection and system upgrade costs
Contract Duration	15 years	15 years
Periodic Review of Rates and Program Cap	when additional updated data to enhance the veracity of the cost-based model tools become available	Every two years or when Participants' cost test is less than 1, that is when Benefit-Cost is less than 1 or when additional updated data to enhance the veracity of the cost-based model tools become available

Going forward URCA will mitigate uneconomic pricing through thoughtful program design including a highly consultative process in determining rate inputs, a cost-effectiveness analysis to understand the potential impacts

[6] The fuel rate that would otherwise pertains if there was no hedging arrangements by PES

of the tariff rate on different stakeholders, and regular periods of review to adjust the compensation rate to reflect the changes of an evolving market.

ANNEX I: DATA COLLECTION FROM STAKEHOLDERS

Cadmus developed a survey to collect data on costs of generation for solar PV, wind and battery energy storage systems. Cadmus also developed a utility data request memo to collect data needed to conduct the benefit-cost assessment.

URCA shared the survey and/or the utility data request memo was shared with the following institutions:

- Compass Power
- Alternative Power Supplies Limited
- Sustainable Energy Limited
- RBC Royal Bank Limited
- Ministry of Agriculture & Marine Resources
- Bahamas Energy Solar Supplies Limited
- Bahamas Society of Engineers & Flameless Electrical Contracting
- Rocky Mountain Institute
- CARILEC
- Bahamas Chamber of Commerce
- Bahamas Power & Light Company
- Gekabi Chub Cay Utilities Limited
- Grand Bahama Power Company Limited
- Bahamas Utilities Company Limited
- St. George's Cay Power Company Limited

Furthermore, The Bahamas Chamber of Commerce shared the survey with an additional list of institutions (not named).

Cadmus received information directly (via interviews, e-mails, and/or data files) from the following institutions:

- Rocky Mountain Institute
- Bahamas Society of Engineers & Flameless Electrical Contracting
- Bahamas Power & Light Company
- Grand Bahama Power Company Limited

All other data sources were supplemented and/or benchmarked against regional and international data sources, as detailed in Section 1.3.

ANNEX II: COST-EFFECTIVENESS INPUT ASSUMPTIONS

This annex provides information about the various model input assumptions used to estimate the cost effectiveness of various policy scenarios. This annex does not include assumptions for project costs, which are described in Section 1, above.

Table 44. Data for BPL and GBPC Electric Rates

Utility	Rates Class	Participation Assumption	Tier	$/kWh
GBPC	Commercial Service	Small and Medium Projects	Tier 1	$0.196
	Commercial Service	Small and Medium Projects	Tier 2	$0.182
	Commercial Service	Small and Medium Projects	Tier 3	$0.168
	General Service	Large Projects	Tier 4	$0.112
	General Service	Large Projects	Tier 1	$0.168
	General Service	Large Projects	Tier 3	$0.140
	General Service	Large Projects	Tier 2	$0.154
BPL	General Service	All Projects	Tier 1	$0.087
	General Service	All Projects	Tier 2	$0.062

Table 45. Data for BPL and GBPC Demand Charges

Utility	Rates Class	Participation Assumption	$/kVA
GBPC	Commercial Service	Small and Medium Projects	$9.11 (if demand more than 5 kVa)
	General Service	Large Projects	$9.11 (if demand more than 1,000 kVa)

BPL	General Service	All Projects	$6.20

Table 46. Data for BPL and GBPC Minimum Charges

Utility	Rates Class	Participation Assumption	$
GBPC	Commercial Service	Small and Medium Projects	$45.55
	General Service	Large Projects	$9,110
BPL	General Service	All Projects	$568

Data for Utility Avoided Capacity and Transmission and Distribution Investments

Cadmus used the GBPC utility load shape (BPL did not provide a load shape so Cadmus normalized the GBPC load shape for BPL using BPL total electric sales) to assess the benefits of avoided capacity and avoided transmission and distribution system investments.

To assess the benefits, Cadmus calculated the overall system peak reduction resulting from solar production. Because the GBPC system load experiences its annual peak at 8 pm in September, there is no solar PV production that is coincident with this peak, even when including timing offsets from storage projects. Therefore, the overall peak reduction benefits are minimal. If a different load shape provides more significant peak reduction estimates, Cadmus has provided a per MW peak energy-reduced benchmark. This benchmark is sourced from Hawaii, which, as an island grid, has similar generation and transmission and distribution characteristics. These benchmarks are a peak reduction benefit of $85,000 per MW of peak reduced for deferred capacity investments, and $20,000 per MW for deferred transmission and distribution investments. Source: Hawaii Energy Policy Forum. University of Hawaii. Best Practices to Value Benefits of Renewable Energy Development in Hawai'i. June 2015. P. 32.

Data for Other Avoided Utility Generation Costs

To estimate the avoided cost of operating generation plants (non-fuel costs), Cadmus used data from the Jamaica Integrated Resource Plan (IRP). The Jamaica IRP estimated fossil fuel generation operations and maintenance costs at $0.0117/kWh. (Source: Ministry of Science, Energy, and Technology.

Integrated Resource Plan: A 20 Year Roadmap to Sustain and Enable Jamaica’s Electricity Future. January 2020. P. 147).

Data for RESG Policy Administrative Costs

To calculate the cost of administering the RESG program, Cadmus used information provided by BPL (GBPC did not provide this information, so Cadmus used BPL data for GBPC). BPL estimated that policy administrative costs were $875 per participant in the first year.

Data for Avoided Cost of Carbon

Cadmus calculated the avoided cost of carbon based on data from BPL and the United States Environmental Protection Agency (EPA). BPL provided an estimate of barrels of fuel per kWh, which Cadmus used to translate avoided kWh generation into avoided barrels of fuel. This estimate was 0.0019 barrels per kWh. To estimate avoided carbon, per barrel of fuel Cadmus used the EPA's estimate of 0.43 metric tons per barrel of fuel oil. (Source: EPA Greenhouse Gases Equivalency Calculator – Calculations and References: www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references).

To calculate the cost of avoided metric tons of carbon, Cadmus used the EPA's "Carbon Fact Sheet". According to data from this fact sheet, the 2021 cost of carbon was $60.58 per metric ton. (Source: www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf)

Data for Avoided Customer Generator Use

Cadmus used several data inputs to estimate avoided generator costs. These included system outage data, the percentage of customers with backup generators, the generator size, and usual operation of the generator, and the cost of diesel fuel. Additionally, several generator performance metrics were used.

System outage data were provided by BPL and GBPC (confidential for GBPC). BPL estimates that the total average customer duration of an outage was 2.5 hours per year. Cadmus assumed that 60% of commercial customers had backup generators (Source: World Bank Enterprise Survey for the Bahamas: www.enterprisesurveys.org/en/data). Cadmus used a per gallon of diesel fuel cost of $1.39 (Source: BPL). Cadmus assumed that generators would be sized to cover an entire customer's load in the event of an outage. To estimate fuel consumption of generators by size, Cadmus relied on industry data (Source: www.generatorsource.com/temp/Fuel_Consumption_Chart.pdf)

ANNEX III: CUSTOMER ELECTRICITY CONSUMPTION INPUT ASSUMPTIONS

To make estimates on customer electricity consumption, Cadmus used data from a study conducted in 2010 by a consultancy company called Fichtner. The analysis was conducted in collaboration with BPL using the electrical demand data of The Bahamas. As a proxy for the commercial sector, the study gathered data on hotel electricity consumption. The data is cited in a secondary feasibility study;[7] the original report from Fichtner was not found.

Table 48. Source Data on Customer Electricity Consumption for Hotels in The Bahamas

Hotel Size Classification	# of Rooms	Average Annual Electricity Demand per Hotel (MWh)
Large	350+	~19MWh
Mid-Sized	50 - 350	~2.5MWh
Small	<50	~0.5MWh

Representative project sizes were then matched to hotel electricity consumption profiles based on possible, realistic matches between the annual electricity yield of a representative renewable energy project and annual electricity demand from the representative hotel profile.

Table 50. Assumptions on Customer Electricity Consumptions for Representative Project Sizes

Representative Renewable Energy Project Size (kW)	Calculated Annual Project Electricity Yield (MWh)	Hotel Profile Used for Input Assumptions
750kW	**~1.2**	**Mid-Sized Hotel**
300kW	**~0.5**	**Small Hotel**
150kW	**~0.25**	**Small Hotel**

[7] http://www.esru.strath.ac.uk/Documents/MSc_2015/Cassar.pdf

ANNEX IV: BATTERY ENERGY STORAGE SYSTEM INPUT ASSUMPTIONS

Table 51. Battery Energy Storage System Assumptions

Representative Project	150kW solar PV + storage	300kW solar PV + storage	750kW solar PV + storage
RE Project Installed Capacity (kW)	150	300	750
Battery Size (kWh/kW)	318 / 72	318 / 72	1,505/ 227
Round-Trip Efficiency	90%	90%	90%
Battery Cost per Energy Size ($/kWh)	$834	$834	$834
Battery Cost per Power Size/ Inverter ($/kW)	$1,587	$1,587	$1,587
Battery O&M ($/kW/year)	$8	$8	$8
Rate-Setting Tool Result	**~$0.47**	**~$0.32**	**~$0.46**

ANNEX V: RENEWABLE ENERGY POLICY DESIGN ELEMENTS

Design Issue	Description
Policy Targets	Does the policy specifically link to existing renewable energy targets?
Eligibility	Technologies, project sizes, ownership models (e.g. community owned)
Treatment of RE Electricity	Consume on-site, export excess. Buy-all/Sell-all. Hybrid
Tariff Differentiation	Technology, size, location (e.g. ground-mounted, car port, brownfield, floating etc.)
Payment Rate	Administratively or competitively. Value based or Cost based?
Payment Structure	Fixed, tiered, or variable
Payment Duration	Time period of payment. Usually in years.
Cap & Review	Is there a cap on the amount of capacity that can connect to the grid? How often will the policy and tariff rate be reviewed and revised?
Interconnection Standards and Guarantees	What interconnection standards are required?
Interconnection and Metering costs	Who is responsible for the interconnection and metering costs? Upgrades?
Purchase and dispatch	Is the generated power purchased and dispatched by the utility?
Commodities Purchased	Who owns the environmental attributes of the project? Are they purchased? What is the value?
Amount Purchased	How much of the generation is purchased?
Contract Issues	Is there a standard contract?
Payment Currency	What currency is the payment in?
Purchasing Entity	Who is responsible for purchasing the power?

Cost Recovery	How will any costs incurred from implementing the policy be recovered?
Transition	What happens to generators that are already a part of the existing program? Grandfathered or Voluntarily opt-in or both?