



Consultation on the Integration of Battery Energy Storage Systems in the Energy Sector

Statement of Results

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1 Introduction

The Utilities Regulation and Competition Authority ('URCA') is the independent regulator and competition authority for the Electricity Sector ('ES') in The Bahamas. Its role, powers and functions are set out in the Electricity Act, 2015 ('EA')¹. Among other things, URCA is responsible for the licensing of all generation, transmission, distribution, and supply of electricity within, into, from or through The Bahamas. The electricity sector policy mandates that URCA promotes the use of environmentally sustainable electricity; as such, URCA remains cognizant of developments in renewable energy technology and their application to the ES.

Battery storage systems have the capacity to advance the electricity sector policy and objectives. They help address grid instability concerns and enable energy derived from renewable sources like solar and wind to be stored and then released when needed. Advances in battery storage technology have made grid stability and energy coordination an important part of the management of the electrical system on a utility scale. There has been increased interest from stakeholders in the establishment of regulations to facilitate the use of battery storage technology in The Bahamas.

In May 2023, URCA published its "Invitation for Comments and Contributions on Battery Storage Integration" (ES 03/2023) with a view to receiving input and comments from interested stakeholders on the matter of Battery Energy Storage Systems (BESS)².

In this document, URCA provides the findings from its investigations to gain a fuller appreciation of public awareness of Battery Energy Storage Systems, the role that they play in renewable energy penetration and the available technologies.

URCA thanks all those stakeholders that provided input. Their contributions are considered vital in understanding the market and identifying the next steps to advance the sector.

¹ EA s37 and 38

² <https://www.urbahamas.bs/wp-content/uploads/2023/05/Invitation-for-Comments-and-Considerations-ES-03-2023-1.pdf>

2 Regulatory Framework

The National Energy Policy speaks about the storage of energy in the electricity system including the development of a framework to provide energy storage for small users.³ Section 37(1) of the EA provides that “the primary role of URCA is the regulation of the electricity sector in accordance with the goals objectives and principles underpinning the national energy and electricity sector policies.” Broadly speaking, these goals are a safe, reliable, affordable, and environmentally sustainable provision of energy.

Section 25 of the EA mandates public electricity suppliers produce a renewable energy plan that “gives preference to renewable energy resources in all procurement actions in the absence of compelling reliability or cost considerations.” And “to ensure the reliability of intermittent resources, taking into account the availability of cost-effective storage technologies.”

The cumulative effect of the foregoing provisions is that they provide URCA justification to act, including the development of a regulatory framework, in promoting the use of battery energy storage technology, particularly as it relates to renewable energy.

3 Approach adopted by URCA

Given the importance of this matter, URCA desired to engage with a wide range of stakeholders and therefore has, in this particular instance, adopted a more extensive approach than the standard process for its public consultations. In particular, URCA chose to obtain input from members of the general public and representatives of various sectors/industries within the Bahamian economy. In addition to posting the consultation document (ES 03/2023) on its website and inviting comments, URCA took the following actions;

- Conducted an end user survey and,
- Held a general meeting with stakeholders from various related industries.

Each of these processes is discussed in more detailed below.

³ The Bahamas National Energy Policy 2013 - 2033 page 24

3.1 End User Survey

Using in-house resources, URCA conducted an end-user survey and performed an analysis of the results. The end user survey covered the following key topics:

1. Familiarity with Energy Storage:
 - a. Familiarity with BESS;
 - b. Knowledge of the types of batteries;
 - c. Preference regarding types of batteries;
 - d. Knowledge about battery safety; and
 - e. Intent to install battery storage in the future.
2. Familiarization with URCA and Renewable Energy (R/E) in general:
 - a. Intent to install any renewable energy system; and
 - b. Knowledge of URCA and its functions.
3. Demographic questions
 - a. Location
 - b. Age.

A list of the survey questions is presented in Annex A.

During the month of August 2023, approximately 400 end users were surveyed across New Providence, by means of telephone interviews and internet surveys.⁴ A composition of 300 residential customers and 100 commercial customers was considered to be ideal given the overall population size and desired +/- 5% confidence interval.

3.2 Stakeholder Meeting

On 26 May 2023 URCA held a meeting with various stakeholders in the energy sector in the Bahamas. The group consisted mainly of end-users and service providers, and industry experts. The following sectors were represented:

⁴ The number of users was the amount considered to be statistically significant given a customer base of approximately 80,000 customers.

1. Energy Service Providers
2. Education Providers
3. Retail Operators
4. Regulators

The meeting consisted of a short presentation by URCA followed by a round-table discussion that touched on the following topics:

1. Need for battery energy storage
2. Types of storage with applicability to The Bahamas
3. End of Life Considerations
4. Safety Factors
5. Level of need for regulations governing BESS

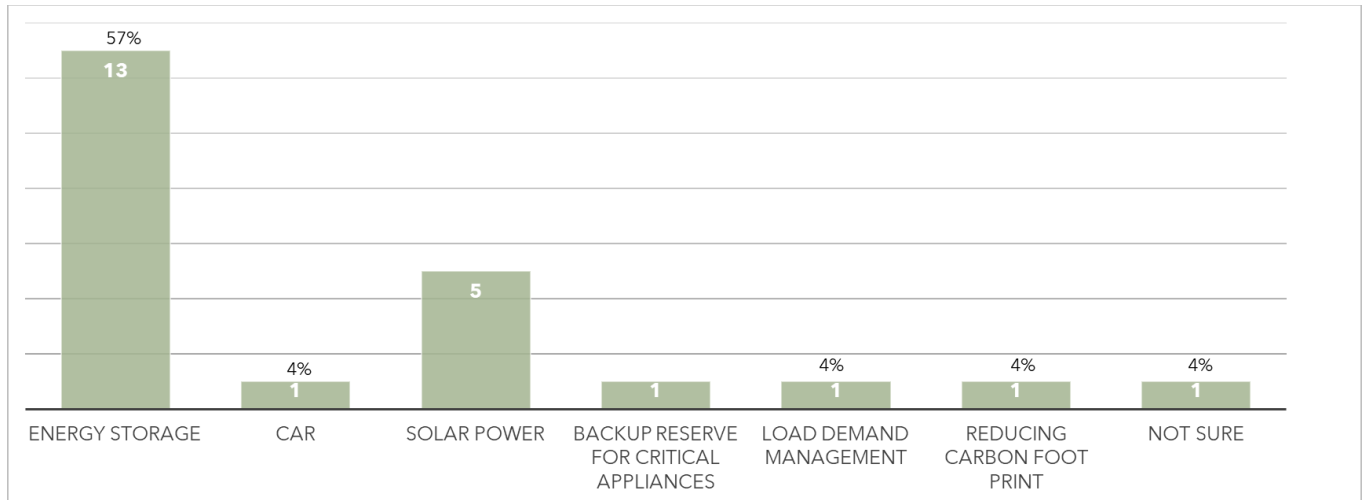
Participants were asked to share their general thoughts about Battery Energy Storage and specifically respond to the agenda items listed above.

4 Findings from End User Survey and Stakeholder Meeting

4.1 Residential Consumers Responses to Survey Questions

Knowledge of the concept of energy storage and use of batteries is widespread in residential consumers. This may be due to familiarization with consumer electronics and the batteries contained therein. However, the chart below shows that of the 250 respondents, less than 10 percent were able to name a specific use for battery energy storage systems, the majority of whom (57%) may have been prompted by the name of the technology (Energy Storage).

Survey Question: What are BESS used for?

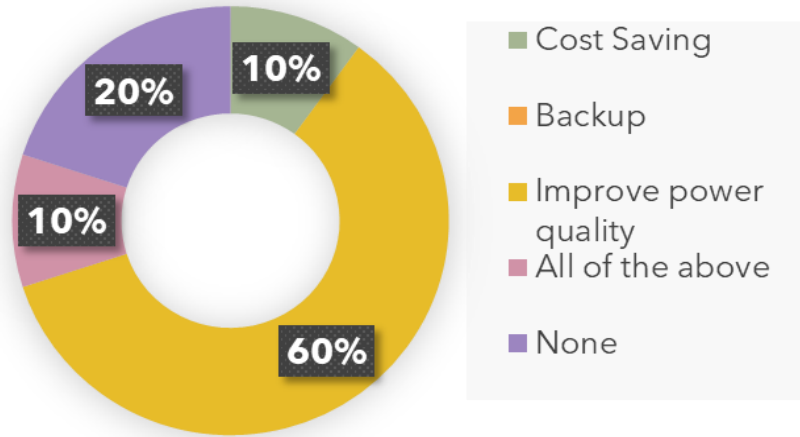


It was acknowledged in an IEEE article on smart grids, that bi-directional power flow is a major concern for power grids and is an issue that is being faced by the entire electrical industry.⁵ It is this proliferation of battery powered devices that feeds concerns on the utility of the ever-increasing ability for bi-directional energy transfer by these devices.

In terms of meeting renewable energy goals and identifying the obstacles to those goals, the main concern of residential consumers with respect to battery energy storage installation was cost. For those persons who had installed battery energy systems, the main reason for such installations was to improve power quality, which is insightful from the consumer perspective of the perceived quality and power consumption experience for those residents.

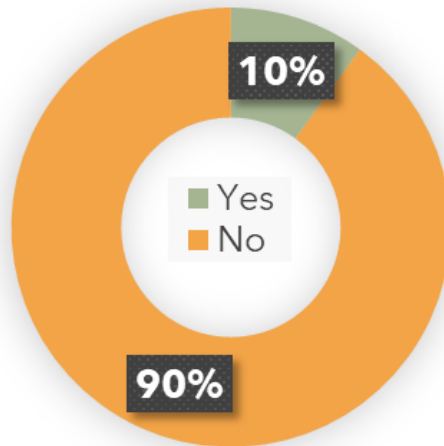
⁵ Miller, Troy Bi-Directional Power Flow: The New World Order - IEEE Smart Grid, Nov 2017

Survey Question: Why did you install a Battery Energy Storage System?



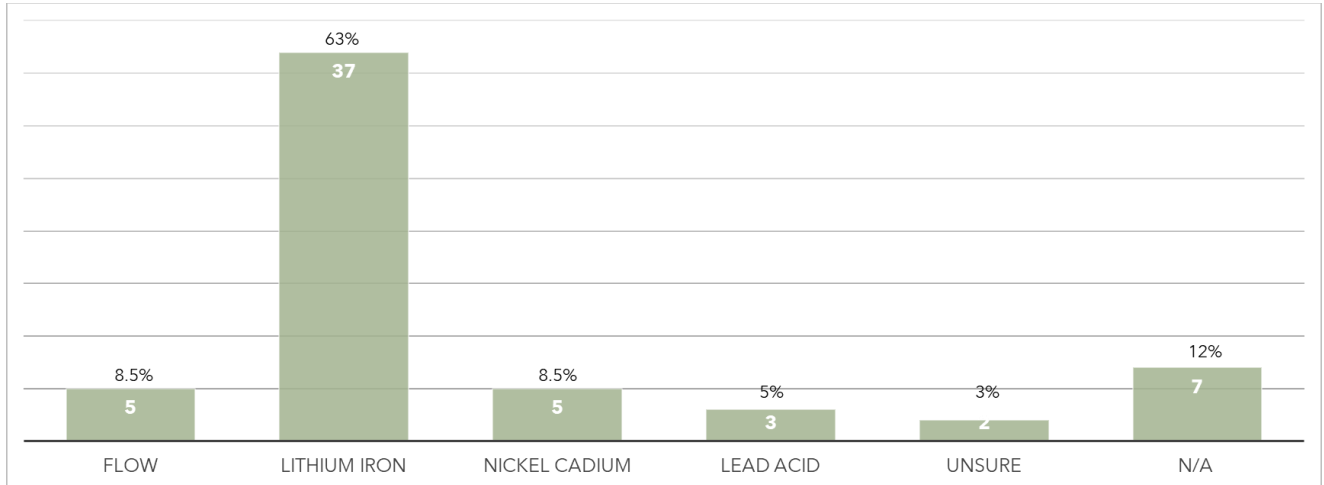
Most respondents do not presently have battery energy storage installed:

Survey Question: Do you have BESS Installed?



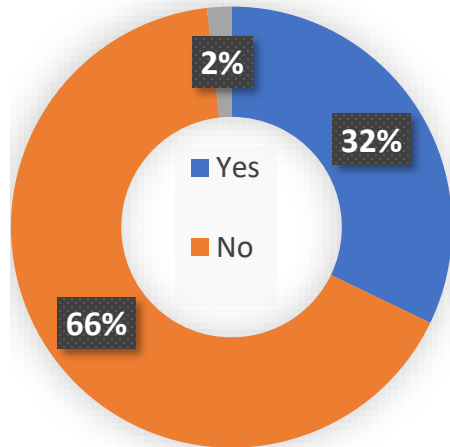
And of those who do, by a wide margin, the preferred battery storage technology is lithium-ion. However, this might be due to name recognition rather than any considered opinion on which technology was more suited to the needs of the respondent.

Survey Question: If you installed BESS what type of technology would you use?



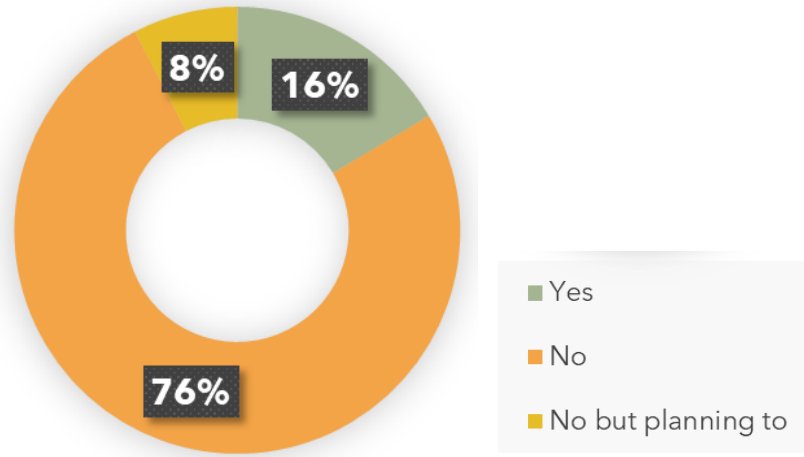
With respect to electric vehicles (EV), most of the respondents have no immediate plans to purchase an EV. Of those who do, their plans to purchase are within the near term (i.e. within 4 years).

Survey Question: Are you Planning on Purchasing an Electric Vehicle



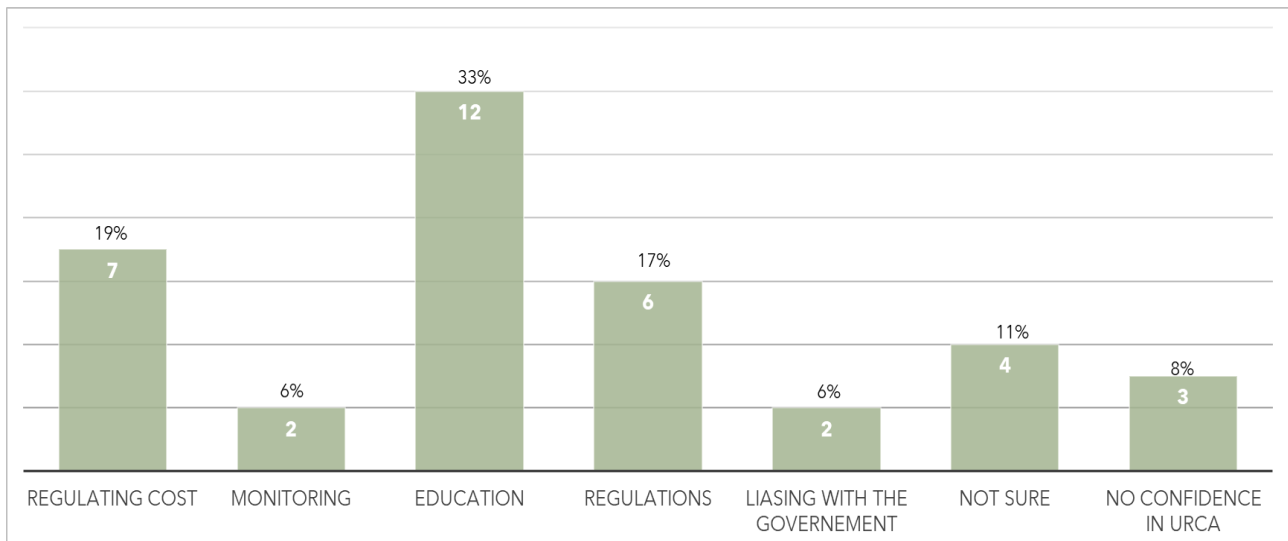
Over three-quarters of respondents indicated they have no plans to install a renewable energy system. This response is supported by the low levels of the penetration of renewable energy systems in The Bahamas.

Survey Question: Do you have a renewable energy system installed?



Regarding URCA’s role in the electricity sector in general and BESS in particular, a sizeable number of residential respondents felt URCA’s most important role was to educate the public. It is disturbing however that a fair proportion of the respondents were either not sure what role URCA should play or had no confidence in URCA (19% combined).

Survey Question: How can URCA assist in BESS?



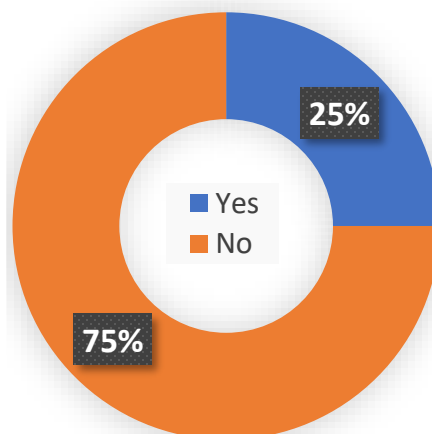
4.2 Preliminary Conclusions – Residential

- There is widespread use of batteries at the consumer level, with varying degrees of understanding of the technology, its safe use, benefits, and limitations.
- It is important to increase awareness of the benefits of BESS.
- There are barriers to the adoption of the technology mainly relating to lack of awareness and cost. Strategies to eliminate or mitigate these barriers will assist in improving the penetration of this technology.
- As the regulator for the ES, URCA needs to improve its profile among residential consumers.

4.3 Commercial Consumers Responses to Survey Questions

For various reasons, the survey was less successful in eliciting responses from commercial customers than residential ones. Many of the questions posed were not answered by respondents and many respondents were reluctant to provide information to the surveyors. Notwithstanding, sufficient responses were received to draw broad conclusions about the state of energy storage at the commercial level. From the survey results and stakeholder meetings, it is clear battery energy storage is not a priority for commercial consumers currently. While there is widespread knowledge, there is scant adoption and seemingly little interest.

Survey Question: Have you ever heard of Battery Energy Storage Systems?



4.4 Preliminary Conclusions – Commercial

- There is little use/adoption of BESS at the Commercial level, even though these establishments are likely to benefit from such installations with their ability to peak shave and reduce demand charges.
- An opportunity exists to increase awareness of the benefits of BESS at the commercial level.
- There are barriers to the adoption of the technology mainly relating to lack of awareness and cost. Strategies to eliminate or mitigate these barriers will assist in improving the penetration of this technology.

4.5 Discussion of Stakeholder Meeting

On 26 May 2023 URCA held a meeting with various stakeholders in the energy sector. The meeting was attended by Bahamas Power and Light (the monopoly vertically integrated utility) but consisted mainly of end-users, service providers, and industry experts. During the meeting, participants were asked to share their general thoughts about Battery Energy Storage (see section 2.2 above).

The stakeholder meeting confirmed that BPL recognizes the need for BESS and has at least two such systems in operation on its grids. BPL also seemed inclined to install additional systems because of the success of the existing ones. The installations have reduced the need for conventional (gas turbine) generation and associated fuel costs.

URCA notes that the installation of these systems was done ex ante regulation by URCA and the effect of such systems on the operation of the utility grid remains too early to be fully assessed. The installations form part of BPL's generation assets. No BESS has been installed on its transmission or distribution grid to date.

4.6 Preliminary Conclusions – Stakeholders

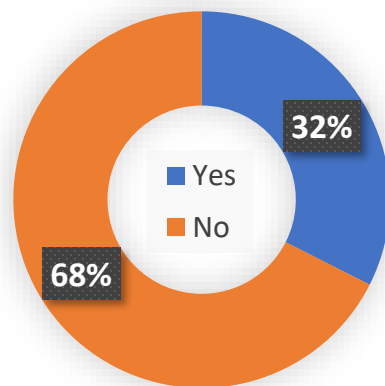
- Widespread use of BESS at the consumer level is of concern to utility providers, especially in the absence of accompanying regulations and or standards for importation and use.

- There will be continued adoption of BESS at the consumer level.
- The impact of BESS on power quality and reliability appears favourable (at this time). The use of this technology should be fully explored through an Integrated Resource and Resilience Plan (IRRP).
- The potential impact of BESS on the tariff should be fully considered as part of a tariff review.
- Additional thought needs to be given to end of life considerations for batteries used in BESS.
- There may exist at the residential level the need for safety consideration relating to the use and ongoing operation of BESS such as the need for proper venting of lead-acid batteries and battery management systems for Lithium-Ion batteries.
- Utility stakeholders are concerned that proliferation of BESS will only get more intractable in the coming years and that some kind of regulation needs to be enacted now, before the “cat is out of the box”.

5 General Conclusions

Generally, URCA observed common themes across both the survey and stakeholder meeting.

Question: Have you heard of Battery energy Storage Systems?



Stakeholder and consumer level knowledge of Battery Energy Systems was somewhat limited. There was found to be widespread knowledge of the use of batteries in consumer electronics, such as power tools used in home improvement. However, most survey participants had no specific knowledge of BESS.

URCA's preliminary conclusions cover three main areas:

1. The need for Battery Energy Storage Regulation, and,
2. The Concerns by Stakeholders
3. Areas for Regulatory Oversight

5.1 Need for Battery Energy Storage

There is little doubt that a need exists for battery energy systems of every capacity from the consumer level to the utility level. Further, the advantages of having a robust battery energy system to complement renewable energy penetration is well documented in industry standards.

Power markets worldwide are experiencing a shift in the way that energy is produced, marketed and consumed. This change is driving innovation in the design, financing and legal structuring of power systems, and the Bahamas will be caught up in this shift as it embraces the green economy and the adoption of renewables.

Energy Storage is one of the key enabling technologies in the shift towards a green economy and has a key role to play in decarbonizing grids.

Energy storage systems are increasingly able to deliver and, in some cases, improve energy services for utility grids at increasingly competitive prices.

5.2 Stakeholders' Concerns

The concerns raised by residential stakeholders in the preliminary consultation document are insightful, more in terms of what was not said rather than what was actually said.

In the residential survey stakeholders have revealed that they:

- Are not aware of any BESS companies operating in The Bahamas.
- Are not aware of the safety of BESS.
- Do not have BESS installed at their residence and do not intend to do so.

These results paint the picture of a community that is utilizing the technology without understanding where or when or how it is impacting their lives in many positive ways and the additional ways that successful integration can continue to improve the quality of life.

The concerns raised by utility / energy service provider stakeholders are more directed in their approach:

- The technology is widespread and growing.
- The need for end-of-life consideration needs to be addressed.
- There is a need for the adoption of standards to govern the use.

5.3 Areas for immediate regulatory oversight

Energy Storage Systems have a role to play in increasing and improving access to energy, economic development, reducing carbon emissions attracting foreign investment advancing job creation, expanding industrialization, ensuring system security, and stabilizing the grid.

URCA believes that the successful adoption and penetration of Battery Energy Storage Technologies that considers all of these factors will require a multi-agency approach to regulation.

URCA's approach to regulations will be centered around the following key principles:

- Consistency: Regulations will be consistent with overarching policy.
- Predictability: Regulations will be consistent with URCA's mandate and aligned with established sector regulations.
- Capacity: Clear regulations will be established that do not outstrip the ability of the licensee to comply or URCA's ability to monitor and enforce.

URCA signals its intent to develop regulation that will advance system security, increase the penetration of renewable technologies, and assist in grid stabilization, specifically:

- Definition of the Types of Energy Storage Systems (ESS) that are subject to regulation.
- Special licensing for storage (considering storage's dual role as both a consumer and source of electricity).
- The licensing of ESS will be based on the existing licensing framework. The approach will be taken of issuing an existing generation facility that is integrating ESS with a modified licence that reflects the changes to the technology type and any capacity changes. For standalone electricity storage systems, two types of licences are envisioned:
 - I. A transmission licence might include the possibility of the development and operation of an ESS.
 - II. A single separate and distinct ESS license could be issued to an Energy Service provider who has signed a PPA with a PESL or APESL.
- Inclusion of Storage in future transmission codes and technical regulations for ESS. An ESS will be required to withstand frequency and voltage deviations under normal and abnormal conditions. Disconnection and connection to the network will be at the discretion of the system operator. The codes will specify the number of tests to be performed by the project owner to demonstrate compliance with the code requirements before being allowed connection by the system operator.
- Development of and/or participation in subsidiary regulations related to safety and environment.

6 Next Steps

URCA considers that the information gathered from the stakeholder meetings and end-users' surveys has provided a better understanding of the market as it currently exists. Consequently, the following next steps are being considered.

Residential and Commercial (BESS behind the meter)

- A customer education campaign to explain the technology, its potential, and economics.
- Consultation with other entities (e.g. Ministry of Works and the Department of Environmental Planning and Protection) to determine how BESS is reflected in the codes/standards (covering such matters as installation and disposal).
- Modification of existing regulatory frameworks (SSRG and RESG) to better capture and process BESS details.
- Modification or adjustment of feed in tariff and capacity payments, where appropriate.
- Regulation on the interaction (coupling) of BESS with the electricity grid (such as registration and the potential for control by the utility e.g., charging times).

Utility (Public and Authorized Public Electricity Suppliers and Independent Power Producers)

- Establishment of frameworks for grid services – licensing, technical standards, and power purchase agreements.
- Consideration of the role of BESS in integrated resource and resilience planning.

ANNEX A: Battery Energy Storage System Questionnaire

1. What type of a customer are you?

- Residential
- Small Commercial
- Large Commercial
- Government

2. Have you heard of Battery Energy Storage Systems?

- Yes (go to question 3)
- No (go to question 5)

3. What are BESS used for?

[Ask the respondent for their thoughts.]

4. Do you have a BESS installed?

- Yes – Size and cost
- Planning to – Size and cost
- No

5. Do you have a RE system installed?

- Yes – Size and cost
- Planning to – Size and cost
- No

6. Why would you install a BESS?

[Ask the respondent for their thoughts first and record those ideas before prompting them with the following].

- Cost savings
- Improve power quality
- Back up power

7. Why wouldn't you install a BESS?

[Ask the respondent for their thoughts first and record those ideas before prompting them with the following].

- Too costly
- Technology not dependable / unsafe
- Lack of qualified contractors

8. If you installed a BESS what type of battery would you use?

[Ask the respondent for their thoughts first and record those ideas before prompting them with the following].

- Lead acid
- Lithium Iron
- Nickel Cadmium
- Flow

9. Are you aware of any local companies qualified to advise and or install a BESS

- Yes – which ones?
- No

10. Do you think BESS is safe?

- Yes
- No – why not?

11. Are you planning on purchasing an electric vehicle?

- No.
- Yes – when?

12. Have you heard of URCA?

- Yes – what does URCA do?
- No (End)

13. How can URCA assist in BESS?

[Ask the respondent for their thoughts first and record those ideas before prompting them with the following].

- Require electricity company to offer incentives
- Establish standards for installation
- Provide education on the technology