



# **Integrated Resource Plan (IRP) Proposal Request**

Matter: 20221117

Date: 17 November 2022

## Notice of Request for Integrated Resource Plan Proposal

In the matter of the Electricity Act 2016, as amended (**EA**), and in accordance with section 40 of the EA, NOTICE IS GIVEN that the Regulatory Authority (**RA**) requests an Integrated Resource Plan (**IRP**) proposal (**IRP Proposal**) from the Transmission, Distribution and Retail (**TD&R**) Licensee that complies with the requirements of this Notice, the EA, and any relevant administrative determinations.

The IRP Proposal must cover no less than a 5-year period from the date that the RA approves the IRP (**Period**). The IRP Proposal must contain:

- (a) a resource plan that includes the Period's projected demand and account for the existing generation resources available to the TD&R Licensee; and
- (b) a procurement plan detailing how the TD&R Licensee proposes to meet projected demand.

In preparing the IRP Proposal, the TD&R Licensee must:

- (a) consider all reasonable resources, including new generation capacity, demand side resources and generation capacity retirements;
- (b) consider various renewable energy and efficient generation options, and prudent generation portfolio diversification;
- (c) prioritise actions that most meet the EA's purposes, conform to Ministerial directions, and be reasonably likely to supply electricity at the least cost, subject to trade-offs contained in any Ministerial directions or instructions from the RA;
- (d) indicate recommendations regarding whether any resources will be procured through competitive bidding in accordance with section 48(7) of the Regulatory Authority Act 2011; and
- (e) include proposed limits, if any, for total distributed generation capacity over the planning period.

The IRP Proposal's form and content must be in accordance with Annex A of this Notice. The TD&R Licensee must submit the IRP Proposal to the RA no later than 17 November 2023.



# **ANNEX A:**

## **Integrated Resource Plan (IRP) Proposal Guidance**

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## Integrated Resource Plan Guidelines

### 1. Introduction

1.1 These guidelines establish the Regulatory Authority of Bermuda's (RA) expectations of the Transmission, Distribution and Retail (TD&R) Licensee for updating the Integrated Resource Plan (IRP) (Guidelines). The Guidelines seek to ensure that the RA and BELCO meet their statutory obligations under the Electricity Act 2016 (EA) in a manner that is consistent with the National Electricity Policy; and to implement the regulatory regime established by the electricity sector licences. The Guidelines reflect established practice and precedents for the development of IRPs and similar capacity planning exercises seen in relevant regulatory jurisdictions.

### 2. IRP Aims

2.1 The EA under section 40 requires the RA to direct the TD&R Licensee to prepare an IRP Proposal at least every five years. The IRP Proposal should contain:

- (a) "a resource plan that includes the expected demand for the period and the state of the TD&R Licensee's existing resources; and
- (b) a procurement plan to details how the licensee proposes to meet this demand."

2.2 The TD&R Licensee must consider all resources required to meet demand, including but not limited to:

- (a) New conventional generation capacity;
- (b) Expected lifetime and date of retirement of conventional generation capacity;
- (c) Various renewable energy and efficient generation options;
- (d) Prudent generation portfolio diversification; and
- (e) Demand side resources (including demand response and energy efficiency).

2.3 As under section 40(2)(b) of the EA the TD&R Licensee must "prioritise actions that most meet the purposes of this Act, conform to Ministerial directions, and be reasonably likely to supply electricity at the least cost, subject to trade-offs contained in the Ministerial directions or instructions from the Authority"; Trade-offs include, but are not limited to, meeting demand with acceptable reliability and implementation risk.

2.4 Following the TD&R Licensee's proposal, the RA will engage in "at least one public consultation, whether alone or together with a consultation in respect of other proposals".<sup>1</sup>

2.5 The IRP Proposal must be credible, comprehensive in its treatment of available resources, auditable, and robust to identifiable sources of uncertainty in order to enable the RA to:

- (a) Assess alternative capacity environmental, and social implications and determine optimal trade-offs;
- (b) Identify the lowest cost, or otherwise most suitable plan aligned with the EA and this guidance document.

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<sup>1</sup> Section 43(a) of the EA

### 3. IRP Requirements

#### 3.1 Approach and Methodology

The TD&R Licensee should undertake its IRP Proposal from an objective perspective, focusing on the country, its economic, environmental and populace's needs. Specifically:

- (a) Methodologies must remain neutral to any (current or future) specific business's commercial interest. They must be squarely focussed on the country's overall economic benefit.
- (b) Capital, operational and fuel costs modelled must be evaluated on economic rather than financial terms, meaning that:
  - The analysis must be conducted in real terms, using levelized electricity costs, rather than nominal terms;
  - Taxes, subsidies, PPA considerations, duties, import tariffs, demand side conservation program incentives, and distributed generation incentives must be excluded;
  - Social discount rates (i.e., 10% or less), irrespective of potential developers, must be used rather than business returns (Cost of Capital);
  - Wherever reasonable and practical, account for supply chain environmental impacts, rather than just local impacts (e.g., fuel commodity extraction, delivery chain and local use impacts plus, and remediation rather than just costs plus local impacts). If reasonable, associated externalities should be monetised and internalised in the calculation of levelized costs underpinning the analysis;
  - Account for estimated social costs e.g., negative community health implications, costs to the environment of carbon and other relevant emittants such as nitrogen oxides ("NOx") and sulphur oxides ("SOx") (social damage costs) – associated externalities should be monetised and internalised in the calculation of levelized costs underpinning the analysis;
  - Country & overall economy benefits must be evaluated rather than any particular business entity's financial prospects.
- (c) Under the constraints listed above, use quantitative modelling methodologies and mathematical programming approaches to project demand across the simulation period (10-20 years), including sensitivities that account for:
  - Projected local conditions affecting demand;
  - Existing and projected asset condition;
  - Historical system data;
  - Current and projected site-specific resource availability;
  - Planned asset retirements;
  - Planned capacity additions;
  - Battery storage; and
  - Specified potential fuel options.
- (d) Determine Levelized Electricity Costs, seeking lowest cost (Present Value) and

- Maximal Net Present Value within policy, social, and geographic constraints;
- (e) Use the technical & economic inputs provided in the specifying section below to constrain modelling; Inputs must be reported in the assumptions register template provided by the RA at a date the RA specifies separately;
  - (f) Use Scenario Analysis as specified below;
  - (g) Provide the RA with models underpinning their IRP Proposal in native format(s) – including from Microsoft Excel®, PLEXOS® and any other software used for the purpose of the analysis;
  - (h) The IRP Proposal must include detailed references and other supporting documentation where necessary;
  - (i) Screen evaluated technologies primarily using LCOE analysis;
  - (j) Carry out transmission power flow and dynamic stability studies to quantify additional investments (e.g., battery storage, transmission and distribution network reinforcements) needed to ensure the resilience and reliability of the power system under each scenario considered – and ensure they are monetised and included in the scenario benchmarking analysis;
  - (k) Determine the optimal timeline to commission supply and demand side resources, whilst considering practical tendering and implementation constraints;
  - (l) Ensure outputs are:
    - Diligent;
    - Peer reviewed independently;
    - Account for expert input as required;
    - Technically, financially, and economically sensible;
    - Comprehensive; and
    - Easy to read and understand by the general public.
  - (m) Propose a plan consolidating all the above, meeting projected demand while satisfying technical, economic, environmental, and policy objectives.

#### **4. Policy Objectives**

- 4.1 The EA requires that the IRP Proposal reflects the RA and/or Ministerial policy guidance. Overarching policy objectives include system reliability, affordability, and environmental sustainability.
- 4.2 The IRP must comply with established bulk generation licensing requirements including meeting applicable codes and standards.
- 4.3 The IRP Proposal must establish and target a specified Loss of Load Expectation (LOLE) suited to Bermuda.
- 4.4 Where possible, the IRP must specify and account for shadow factors and social costs (such as carbon costs).

4.5 The IRP must consider Bermuda's National Electricity Sector and National Fuels Policy.

## 5. Input Assumptions

All participating parties are to use the IRP inputs listed below. Where applicable, all parties will also use the approach and methodology specified above.

### 5.1 Input Assumptions

IRP developments must use the following input assumptions:

- (a) Simulation horizon 10-20 years;
- (b) Sales Forecast, accounting for
  - Assumptions on future macroeconomic performance (e.g., GDP growth);
  - Residential consumer activity;
  - Commercial consumer activity and future connections;
  - Distributed Generation impacts;
  - Energy efficiency programs should be considered as demand side resources.
  - Conservation programmes (e.g., Water heater and pool pump timer installations) warrant consideration; and
  - Consider potential electric vehicle adoption rates, likely demand impacts and including smart charging capabilities.
- (c) Supply Side
  - Proposed CAPEX and OPEX assumptions must be justified using (decreasing order of preference): RA-provided studies, other feasibility studies, pre-feasibility studies, recent experience in other small islands, or reputable sources (e.g., IEA, IRENA, World Bank).
  - Must consider technologies including but not necessarily limited to:
    1. Fuel oils including existing fuels and lower sulphur content fuel oils;
    2. Onshore & offshore solar PV;
    3. Offshore wind;
    4. Liquefied Natural Gas (LNG);
    5. Liquefied Propane Gas (LPG);
    6. Biomass; and
    7. Wave Power Generation.
- (d) Technical and operating characteristics of the generation technologies and their availability;
- (e) Prices for input fuels, any other related commodities, as well import infrastructure availability or developmental requirements, accounting for any diseconomies of scale;
- (f) Battery Energy Storage Systems can be considered to the extent that system stability and IRP economic analysis supports (or warrants exclusion);
- (g) IRP Resources

- The IRP shall make use of the RA's August 2021 RA desktop wind (and any future) studies, existing PV studies and any other relevant, readily available resources as IRP base materials, in addition to studies conducted by BELCO.
- (h) Scenario Analysis
- The IRP Proposal should consider a minimum of three scenarios corresponding to the various combination of supply side and demand side resources.
- (i) Sensitivity Analysis
- IRP development must include base case, plus plausible high and low sensitivity analysis. In particular the sensitivity analysis should consider:
    1. Demand uncertainty;
    2. Fuel price uncertainty;
    3. Alternative carbon price assumptions;
    4. Alternative capital and operating cost assumptions for future generation resources;
    5. Extended existing generation resources operation beyond planned retirement dates; and
    6. Retirement of existing generation resources before their planned retirement date.

## 6. Outputs

### 6.1 IRP Outputs must include:

- (a) 10 to 20-year demand projections;
- (b) 10 to 20-year generation projection including reserve capacity and connection costs, if any;
- (c) Proposed procurement plan including timelines for at least a 5-year period;
- (d) Rate impact analysis; and
- (e) Any other relevant information and supporting analysis to meet expectations this document lays out.