Alternative Bulk Generation Proposal for inclusion in the Integrated Resource Plan

Prepared for

The Regulatory Authority of Bermuda

July 2018

NOTICE:

This document is non-binding and is intended solely as an outline of general concepts and the basis for further discussion and does not contain all matters upon which agreement must be reached for a binding transaction to be consummated. No legally binding obligation, duty, commitment, or liability (contractual or otherwise) whatsoever shall be created, implied, or inferred by this document.

Sol Petroleum Bermuda Limited
25 Ferry Road
St. George's GE 01
Bermuda
Tel: (441-297-3776
Fax: (441) 294-5243
Email: info.bermuda@solpetroleum.com

The Regulatory Authority of Bermuda
1st Floor, Graig Appin House
8 Wesley Street,
Hamilton HM11
Bermuda

July 2, 2018

Re: Alternative Bulk Generation Proposal for inclusion in the Integrated Resource Plan (IRP)

Dear Sir,

In furtherance of the energy policies of Bermuda, Sol respectfully submits this Alternative Bulk Generation (Non-Binding) Proposal for inclusion in the Integrated Resource Plan (the "IRP") being evaluated for approval by your agency. As will be explained in detail in our Proposal, Sol has invested time, capital, and resources to investigate not only the optimisation of its existing Ferry Reach Terminal (the "FR Terminal") and operations to import and store LNG; but also the utilisation of the regasified natural gas to operate BELCO's Pembroke Power Plant as well as a co-located power plant, (the "FR Power Plant"), at its facilities.

The IRP, proposed by BELCO, already includes an LNG import facility at Sol's FR Terminal. Sol contends that the inclusion of a co-located power plant at its facilities will provide additional benefits to Bermuda in the form of a more affordable, reliable and environment-friendly electricity supply, which would be consistent with the Electricity Act 2016 and Ministerial directions.

The energy future of Bermuda continues to be of utmost priority to Sol and we look forward to working with your agency to ensure this future remains positive.

Kind Regards,

Sol Petroleum Bermuda Limited

_____
Jonathan Brewin
General Manager

Sol Petroleum Bermuda Limited

Alternative Bulk Generation Proposal for inclusion in the IRP

1 Executive Summary

Sol is the premier supplier of petroleum products to the Caribbean, providing customised energy solutions to individuals, families, businesses and government organisations across 23 countries. Sol, through its affiliate Sol Petroleum Bermuda Limited, is the owner/operator of the Ferry Reach Marine Storage Terminal (the "FR Terminal"). The FR Terminal has provided long-standing, safe and reliable energy supply services to Bermuda for over 100 years.

As a company, Sol considers Bermuda's energy future to be of the utmost priority. Integral to Sol's investment strategy is the alignment of its development initiatives with the long-term objectives of Bermuda. Sol has invested time, capital, and resources to investigate, not only, the optimisation of the FR Terminal and operations to import and store LNG; but also the utilisation of the regasified natural gas to operate BELCO's Pembroke Power Plant, as well as a co-located power plant, (the "FR Power Plant"), at its facilities.

In response to the request by the Regulatory Authority (the "RA") for detailed proposals for alternative bulk generation for inclusion in the IRP, Sol respectfully submits this Proposal for consideration and inclusion into the IRP consultation process. Sol asserts that it is uniquely qualified to develop, own, and operate the facilities described in this Proposal and has endeavoured to produce a proposal that is directly aligned with the Electricity Act 2016 (the "EA") and Ministerial directions.

The Bermuda Electric Light Company Limited ("BELCO"), together with Sol, commenced technical evaluations, in 2013, of the FR Terminal for purposes of siting power generation facilities and the importation of LNG (the "FR LNG Terminal"). At that time, based on the information available regarding the capacity of the electric transmission system near the FR Terminal, BELCO indicated that the FR Power Plant should be limited to approximately 20 MW, without any upgrades to the system. However, the FR Terminal has the land available to potentially accommodate up to 55 MW.

Consistent with the IRP findings, the FR Power Plant comprises dual fuel engines operating on both HFO and natural gas. Two engines would be used to keep within the 20 MW transmission constraint. Alternatively, six of the same engines would be used for a 55 MW plant. The units, mounted on a common flexible base frame and enclosed in the engine hall, can operate on natural gas with an efficient heat rate and on HFO at basically the same heat rate. The auxiliary systems include the lubricating oil, starting air, cooling water, fuel treatment and controls.

Fuel to the FR Power Plant will be supplied by a natural gas interconnection to the proposed FR LNG Terminal and HFO from the existing storage tanks at the FR Terminal. For 20 MW, electric interconnection to BELCO's existing 22 kV transmission system would likely be along the southern edge of the site. If up to 55 MW are installed, then additional upgrades to the transmission system would likely be required. However, the benefits that a larger plant may present could offset the investment in these transmission upgrades.

In Sol's opinion the inclusion of the FR Power Plant in the IRP and having Sol invest in the FR LNG Terminal would improve on BELCO's highest ranked scenario, Scenario 3, in the IRP. The IRP indicates that Scenario 3 was the highest cost scenario due to higher capital costs,

which included both LNG infrastructure costs as well as costs to convert existing generation resources to operate on natural gas, resulting in a cost spike in 2022. However, Scenario 3 became the least cost scenario by 2031 as lower fuel costs offset the higher capital costs. With Sol investing in the FR LNG Terminal, the intention would be to recover its investment over the life of the terminal rather than over one year, as shown in BELCO's IRP. On a net present value basis, this would be economically beneficial to Bermuda. Additionally, the FR Power Plant would also lower the overall costs in the IRP due to the earlier retirement of older less efficient plants and eliminating the need to convert any of these plants, resulting in a net cost reduction to Scenario 3. Potentially, this new scenario with the FR Power Plant would become the lowest cost alternative.

The LNG Viability Study, commissioned by the Government in 2016, estimated LNG imported to Bermuda at a price between US$11.70/MMBtu and $14.30/MMBtu, between 2019 and 2035. The study estimated the cost of storage and regasification to be $2.00/MMBtu. Subject to further investigation and analysis, Sol believes that this pricing is indicative of the overall pricing required for its facility. Moreover, the cost of delivered natural gas at the FR Power Plant would be more competitive since it excludes the price assumed for transport in the proposed natural gas pipeline to the Pembroke Power Plant. Sol expects to conduct business at the FR LNG Terminal similar to its current operations, i.e. charging fees for use of its facilities but allowing the off-takers to arrange for delivery of the commodity without Sol taking title to the fuel at any point in the supply chain.

Regarding electricity supply pricing, the LNG Viability Study concluded that electricity generated by conceptually the same configuration as Sol's Proposal could be generated at 15% to 42% less than continued use of oil products.

Studies conducted suggest that the FR LNG Terminal would take approximately 30 months to construct, allowing sufficient time to install the FR Power Plant, which would take up to 24 months. The IRP contemplates 2022 as a target date for the receipt of LNG in Bermuda. Since the FR Power Plant to anchor the LNG infrastructure investment could be built within 24 months, Sol considers the timeline to be achievable provided BELCO and the Government initiate negotiations with Sol in the near term.

Overall, the co-located FR Power Plant with an installed capacity between 20 MW and 55 MW would produce numerous benefits: lower the cost of production on the generation system; lower emissions; allow earlier retirement of older, inefficient units; eliminate any need to convert older units to burn natural gas; ensure that the best generation option is added to the system; provide flexibility to the system expansion plan; improve system reliability; allow Sol to become an IPP in furtherance of policy objectives; and smooth out the infrastructure investment over the life of the assets through a negotiated fee structure.

In conclusion, Sol believes its Proposal is aligned with Bermuda's energy policies and the FR LNG Terminal and FR Power Plant are consistent with the purposes of the EA and Ministerial directions, providing electricity that is least cost, high quality, environmentally sustainable, secure, and affordable.

2 Introduction

2.1 Overview

Sol Investments Limited (through its affiliate Sol Petroleum Bermuda Limited, and including other affiliates, hereinafter "Sol") is the owner/operator of the Ferry Reach Marine Storage Terminal (the "FR Terminal") located in St. George's Parish. Through the licence granted by the Government of Bermuda and regulatory oversight of the Regulatory Authority (the "RA"), Sol is vested with the responsibility to manage critical infrastructure and provide safe and reliable energy supply service to Bermuda.

In alignment with Sol's long-term strategic objective to target capital investments which optimise or expand existing operations, Sol has conducted extensive technical due diligence on the FR Terminal to determine how the existing facilities could support additional infrastructure as Bermuda may require. This Alternative Bulk Generation Proposal (the "Proposal") is the result of Sol's efforts to determine feasible power generation and liquefied natural gas ("LNG") storage terminal solutions which would serve to extend safe, secure, affordable, and environmentally sustainable energy supply services.

The Bermuda Electric Light Company Limited ("BELCO"), together with Sol, commenced technical evaluations in 2013 of the FR Terminal for purposes of siting power generation facilities (the "FR Power Plant") and the importation of LNG (the "FR LNG Terminal"). Following an initial fatal flaw analysis and siting assessment for generation facilities and LNG storage tanks, the details concerning project design, capacity requirements, and preliminary capital cost estimates were determined. It should be noted that the scope of the technical analysis work conducted thus far towards the design of the proposed project represents a substantially greater level of detail than a fatal flaw level of analysis which is typically the technical basis of analysis for submission to a Request for Proposal/tender process. Similarly, the Government made public in 2016 a study that assessed the viability and trade-offs relating to the potential deployment of LNG into Bermuda (the "LNG Viability Study").

In submitting this Proposal for review and consideration for inclusion in the IRP consultation process, Sol affirms that it is uniquely qualified to develop, own, and operate the facilities described in this Proposal. Given the company's experience and capabilities in energy supply and infrastructure management, in addition to the company's history of providing dependable energy services with a consistent focus on environmental stewardship, Sol is well equipped to facilitate the importation of LNG into Bermuda and develop the FR Power Plant for the benefit of the citizens of Bermuda.

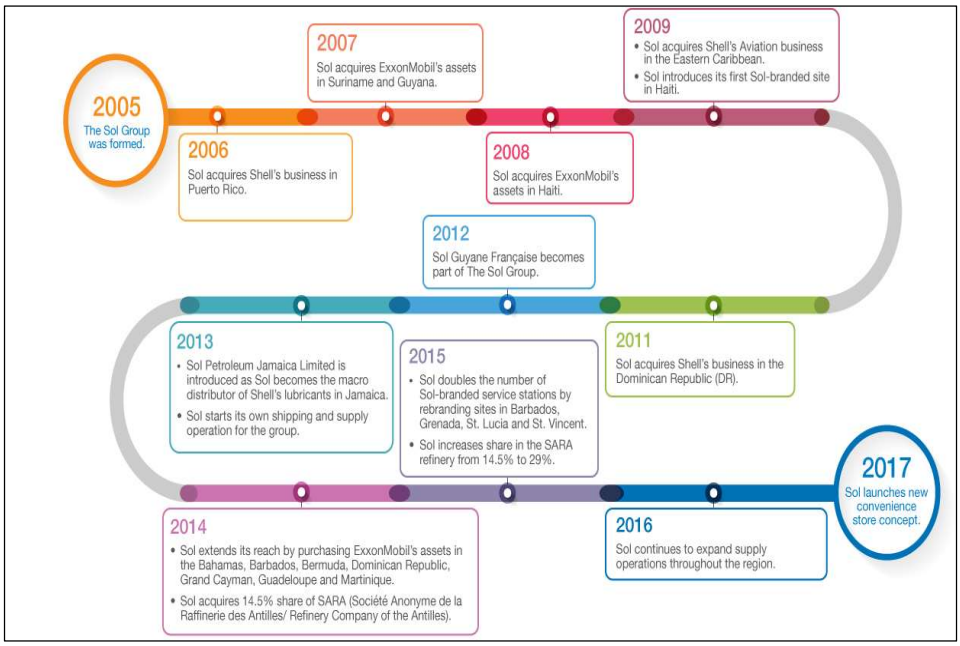
2.2 Sol

Sol is a privately-owned energy company which serves individuals, families, businesses and government organisations across the Caribbean. Our impact is felt across 23 countries, communicated across four languages and countless regional accents and dialects. Our corporate office is located in St Michael, Barbados. Sol is the premier supplier of petroleum products to the Caribbean, providing customised energy solutions to customers every day and for generations to come. We understand that energy fuels all aspects of life in the Caribbean. From the shipping of commercial cargo to powering the business community, we are committed to providing the best possible energy solutions.

Sol has leveraged its position and extensive footprint in the region to engage established, regional and international, power and renewable energy players as potential partners to advance its commitment throughout the energy value chain. Sol is capable of developing the FR Power Plant with one of its strategic partners.

Sol Markets

Sol Journey



Sol at a glance

2.3 Request for IRP Consultation

Sol respectfully submits this information for proposed energy supply facilities for consideration and inclusion into the IRP consultation process. Sol asserts that the Proposal and its consideration are directly aligned with the policies and procedures outlined in the Legislative Context of the 2015 National Electricity Sector Policy (the "Policy") and National Fuels Policy and the IRP guidelines published by the RA. Specifically, Sol requests that the Proposal be accepted for inclusion into the IRP consultation process in response to the RA's request for submission of detailed proposals for bulk generation as stated in the 2 May 2018 IRP Consultation Document.

3 Co-located Power Plant at FR Terminal

Inclusion of the FR Power Plant in the IRP should result in an electricity supply with enhanced overall benefits to those included in the IRP Proposal submitted by BELCO. The indicative economics of Section 3.5 and the benefits discussed in Section 3.8 serve to elaborate on these upsides. However, the same evaluation methodology used by BELCO to develop its IRP will need to be utilised to make a direct comparison. If shown to be enhanced, as expected, the Proposal would therefore be consistent with the purposes of the Electricity Act 2016 (the "EA") and Ministerial directions. As shown in Table 2-8 of the IRP proposed by BELCO labeled "Natural Gas (Scenario 3) Annual Expansion Plan Summary", BELCO's analysis focuses on the conversion of many of its older units at its main generating station (the "Pembroke Power Plant") to burn natural gas and then retiring them within four to nine years. Sol contends that the IRP could be better optimized by developing the FR Power Plant, which also introduces an Independent Power Producer ("IPP") to the electricity market. An IPP introduction also furthers the objectives of the EA. Including the FR Power Plant in the IRP would enable earlier retirement of the older units which are slated to be retired in any case. According to Table 2-8, the three units to be retired (GT5, E5 and E6) total 40 MW. As such, Sol has been investigating plant sizes in the range of 20 to 55 MW.

3.1 General Description

Conceptually, plans for a power plant using reciprocating internal combustion engines as well as a combined cycle plant using combustion turbines have been considered at the FR Terminal. Based on information available regarding the capacity of the electric transmission system near the FR Terminal, the power plant capacity was limited to approximately 20 MW. However, Sol's FR Terminal is large enough to potentially accommodate approximately triple this capacity. Therefore, the issue of increasing the transmission capacity on the eastern side of Bermuda should be investigated by BELCO in conjunction with installing up to approximately 55 MW at the FR Power Plant.

To be consistent with the IRP findings and pending further analysis in conjunction with BELCO and the RA, Sol has begun work on an indicative plant design operating on natural gas. Sol has been evaluating engines with the capability to dual fire on natural gas and heavy fuel oil ("HFO"). Given the proximity of HFO supply at the FR Terminal, this would allow early start up on HFO and the availability to switch back to HFO in case of interruption in LNG supply.

3.1.1 Indicative Plant Design

To keep within the 20 MW transmission constraint, two dual fuel engines are mounted on a common flexible base frame and enclosed in the engine hall. The units can operate on natural gas and HFO at basically the same efficient heat rate. The auxiliary systems include the lubricating oil system, starting air system, cooling water system, fuel treatment system and controls.

Alternatively, six of the same engines would be used for a 55 MW plant. To date, there are over 600 units of a similar type throughout the world and about 100 units in the United

States. This type of dual fuel technology has accumulated more than 12,000,000 running hours, with more than 1,300 engines installed and in operation in the field.

Additionally, a combined cycle option, using a combustion turbine with a steam turbine, was considered. It would be prudent to evaluate this option in greater detail as part of the IRP to determine any benefit to installing a combined cycle instead of an engine plant at the FR Power Plant, especially at the larger size of 55 MW.

3.1.2 Site Location and Characteristics

The proposed location for the FR Power Plant has been earmarked at the FR Terminal. Currently the area contains a storage tank, a vacated office building and other facilities. This area has various roads that cut through the terrain and certain tanks and structures will need to be demolished and removed. Limestone will need to be excavated and removed from the site to establish a reasonably flat grade for constructing the power plant.

Although the property is on the edge of the outer approach cone for aircraft landings at the Bermuda International Airport, hazards to flight patterns are not expected to be a concern. Delivery of major equipment to construct the FR Power Plant may require offloading at the St. Georges dock location since bridge capacities on the main roads south of the FR Terminal could be inadequate for the tonnage of this equipment. As such, a logistical transport study will need to be conducted to route the delivery of major equipment.

3.2 Site Layout

A generic layout for installing two engines includes the engine hall, the exhaust stacks, and the air-cooled condenser. Other supporting facilities would be required, including a potential administration building, social facility, and workshop. For the installation of six engines, the main impact to the site layout will be an increase in the size of the engine hall, but many of the other buildings are minimally impacted.

Actual locations will be arranged on the site during final design to maximize the interface with existing facilities, to minimize the demolition work required and to accommodate the required construction laydown area. Fuel storage tanks would not be required given the existence of fuel storage at Sol's FR Terminal.

3.3 Interconnections for Fuel Supply and Electric Output

Fuel to the FR Power Plant will be supplied by a natural gas interconnection to the proposed FR LNG Terminal. Similarly, by installing dual fuel engines, an interconnection to the HFO storage tanks at Sol's FR Terminal will be required. Coordination with the proposed natural gas pipeline going to the Pembroke Power Station must also be considered. Some additional HFO tankage may be necessary, especially if the HFO must be treated before injection into the engines.

Electric interconnection to BELCO's existing 22 kV transmission system would likely be along the southern edge of the site. The existing power lines would be brought into an indoor substation which would interconnect to the power plant generator step-up transformers.

Water supply to the power plant will come from the existing facilities at the FR Terminal for potable and small quantity use. Further study of the existing water facilities will be performed to engineer the best interface and ensure the supply is adequate.

If 55 MW are installed at the FR Power Plant, then additional upgrades to the transmission system would likely be required. However, the benefits that a larger plant may present could offset the investment in these transmission upgrades, therefore warranting further studies by BELCO.

3.4 Bulk Generation Proposal Input Requirements

As delineated by the Bulk Generation Proposal Guidelines published 22 June 2018, the input assumptions for alternative generation proposals should be consistent with the requirement for a quantitative modelling methodology. Input assumptions for a reciprocating internal combustion engine power plant with radiator cooling (combustion turbine assumptions to be developed in conjunction with BELCO) are discussed below for each of the categories presented in the guidelines.

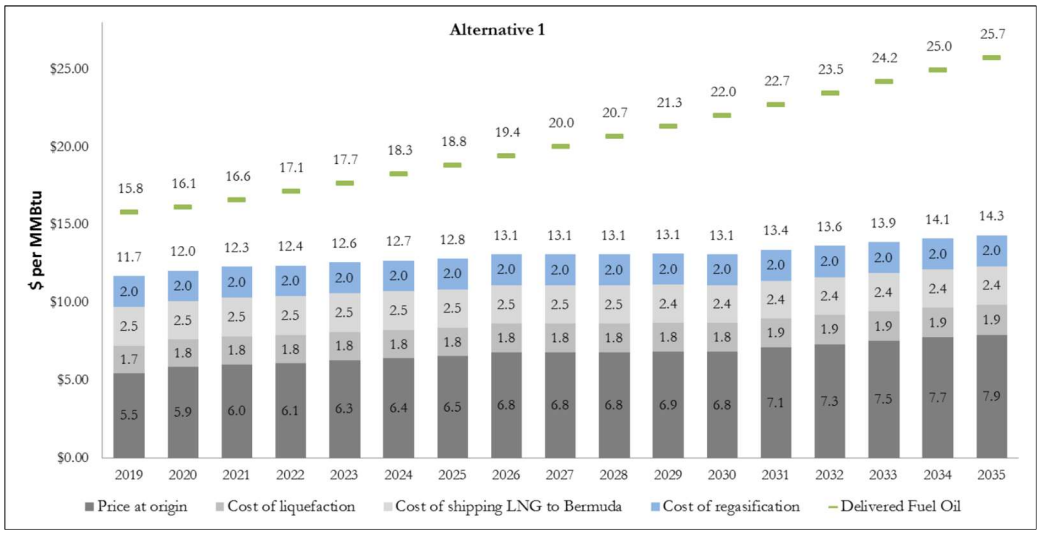
3.4.1 Data on capital, operating and fuel cost of future generation technical and other

The estimated capital costs, excluding import duties and taxes, for the type of engines to be installed for the FR Power Plant are consistent with industry standards. These preliminary estimates are subject to refinement and investigation of other engine configurations to optimise the performance and minimize the costs.

Fuel cost assumptions for HFO are assumed to be the same as in Scenario 3 of the IRP proposed by BELCO less the cost of transport by pipeline to the Pembroke Power Plant. The price of LNG should also be consistently priced, using the same assumptions for the commodity and shipping of LNG as in Scenario 3 of the IRP.

The LNG Viability Study showed a breakdown of all the costs for delivered natural gas in Figure 5.7 (reproduced below as Figure 1 for convenience). As seen below, the cost of regasification for the FR LNG Terminal (Alternative 1 in the study) was calculated to be $2/MMBtu. Considering the cost spike in 2022 (see discussion below in Section 3.5), it appears BELCO assumed a capital cost recovery adder in lieu of this throughput fee. If this is correct, then SOL would advise using the $2/MMBtu as a throughput fee and not charge the high capital cost recovery fee in 2022. However, Sol reserves the right to negotiate the commercial terms for use of the FR LNG Terminal which could include a throughput fee, a capacity reservation charge or some combination of the various fees typically charged for these facilities.

Figure 1: Cost of Delivered Natural Gas, 2019-2035



3.4.2 Operating characteristics, and expected retirement dates

Expected Performance	Units	Natural gas	HFO
Gross output	MW	Up to 10	Up to 10
Gross heat rate (HHV)	btu/kWh	8,350 to 8,450	8,350 to 8,450
NO_x setting at full power with 15% oxygen	ppmv	Less than 200	Less than 1,000
Commercial operations date		1/1/2022	1/1/2022
Retirement date		1/1/2052	1/1/2052

Note: Assumed at 100% load, 100m altitude, 30˚C, 75% relative humidity and 60 Hz.

3.4.3 Assumptions on future macroeconomic performance (e.g., growth) and government policy

Economic growth and government policy are consistent with the same assumptions in Scenario 3 of the IRP proposed by BELCO.

3.4.4 Technical and operating characteristics of future generation technologies and their availability

No future generation technologies are being proposed other than the installation of the FR Power Plant assumed in Section 3.4.1 and 3.4.2 above.

3.4.5 The price for input fuels and other related commodities, as well as the availability and price considerations of import infrastructure

Fuel cost assumptions for HFO are assumed to be the same as in Scenario 3 of the IRP proposed by BELCO less the cost of transport by pipeline to the Pembroke Power Plant. Import infrastructure for liquid fuels should also be the same as Scenario 3. However, as discussed in Section 3.4.1 above, the import infrastructure for the FR LNG Terminal should assume a throughput fee of $2 per MMBtu (representing the cost of storage and regasification, whereas actual commercial terms will need to be negotiated with Sol) is added to the commodity and shipping assumptions for the price of LNG in lieu of a capital cost recovery fee. Note also that the cost of natural gas delivered to the FR Power Plant would not include the costs associated with the proposed natural gas pipeline to the Pembroke Power Plant.

3.4.6 Costs related to network infrastructure upgrades (if required)

For the two engine option, based on BELCO's information no major network infrastructure upgrades are expected. The cost of interconnection is assumed in the capital cost above. For the six-engine option, the cost of transmission system upgrades will need to be developed in conjunction with BELCO due to the need to do a system interconnection study to determine the upgrades required.

3.4.7 Sensitivity analysis of possible "high" and "low" cases along with base case scenarios for each source of uncertainty. These scenarios would be expected to be targeted at the assumptions that have the greatest impact on overall system costs. The uncertainties can include, but not limited to:

3.4.7.1 production uncertainty – as in the IRP proposed by BELCO, the high load forecast case and low load forecast cases are assumed.

3.4.7.2 fuel price uncertainty - as in the IRP proposed by BELCO, the high fuel forecast case and low fuel forecast cases are assumed.

3.4.7.3 alternative capital and operating cost assumptions for future generation resources – reasonable high and low cases should be consistent with industry standards and the cases that were developed for the IRP proposed by BELCO (e.g. +15% and – 10%).

3.5 Indicative Economics

As discussed in Section 2.2 of BELCO's IRP, the natural gas scenario (Scenario 3) was the highest cost scenario over the course of the study period due to higher capital costs. This included both LNG infrastructure costs as well as costs to convert existing generation resources to operate on natural gas. As a result, a cost spike occurred in 2022, but Scenario 3 became the least cost scenario by 2031 as lower fuel costs offset the higher capital costs. Sol contends that inclusion of the FR Power Plant in the IRP and having Sol invest in the FR LNG Terminal would smooth out this cost spike that is shown in Figure 2.2 of the BELCO IRP. Recovery of Sol's investment would be over the life of the FR LNG Terminal and would not be recovered over one year as shown in BELCO's IRP. On a net present value basis, this would be economically beneficial.

Inclusion of the FR Power Plant should also lower the overall costs in the IRP due to the earlier retirement of older less efficient plants and eliminating the need to convert any of these plants, resulting in a net cost reduction to Scenario 3 that could potentially make this new scenario that includes the FR Power Plant the lowest cost alternative.

The LNG Viability Study estimated LNG could be imported to Bermuda at a price between US$11.70 per MMBtu and $14.30 per MMBtu during the period between 2019 and 2035 (see Figure 5 above). As part of this LNG pricing, the study estimated the cost of storage and regasification to be $2.00 per MMBtu (compared to $2.60 per MMBtu for importation at an alternate site). Subject to further investigation and analysis, Sol believes that this pricing is indicative of the overall pricing required for its facility. Alternatively, pricing terms may be considered which would include a capacity reservation charge for the storage and other fees, as mentioned in Section 3.4.1 above. Sol expects to conduct business at the FR LNG Terminal similar to its current operations with liquid fuels, i.e. charging fees for use of its facilities but allowing the off-takers to arrange for delivery of the commodity without Sol taking title to the fuel at any point in the supply chain. Nevertheless, any study including the FR Power Plant in the IRP should assume the same price for the commodity and shipping of LNG as was assumed in the BELCO IRP. Moreover, the cost of delivered natural gas at the FR Power Plant would be more competitive since it excludes the price assumed for transport in the proposed natural gas pipeline to the Pembroke Power Plant.

The LNG Viability Study concluded that "electricity could be generated for between $0.16 per kWh and $0.20 per kWh—a discount of between 15% and 42%, compared to continued use of oil products." Sol is currently updating the construction costs of the FR LNG Terminal and the FR Power Plant but expects the conclusion of the LNG Viability Study regarding a discount to oil products to remain reasonable.

3.6 Similar Technology in Other Jurisdictions

Examples of LNG to power technology that is in commercial operation in other jurisdictions include:

A. Puerto Rico – LNG imports commenced in July 2000 with the commissioning of the Penuelas LNG terminal on the southern coast. Natural gas from the terminal fuels the

540 MW EcoEléctrica power plant (receiving 93 MMSCFD and owned by the owner of the terminal) and the Costa Sur power plants (receiving 93 MMSCFD expanding to 186 MMSCFD).

B. Dominican Republic – Andres LNG Terminal began operations in 2003 and has a capacity of 1.9 MTPA. The terminal provides natural gas to two power plants owned by AES that also owns the terminal, as well as 50 industrial customers, two third-party power plants, and 15,000 vehicles. Bunkering operations begin in February 2017 with a reloading of over 60,000 m^3 of LNG.

C. Panama – Costa Norte, owned by AES, began operations earlier this month. About 25% of the terminal's 1.5 MTPA capacity will be used to supply the new 380 MW combined-cycle power plant co-located at the terminal, also owned by AES. It has also been designed for reloading LNG in bunkering operations.

3.7 Indicative Schedule

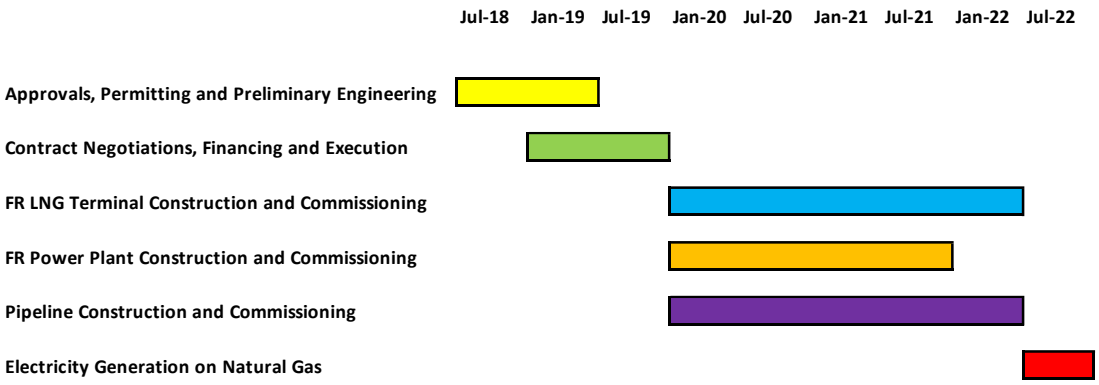
The LNG Viability Study assumed it will take approximately 30 months to construct the FR LNG Terminal. This also allows enough time to construct the FR Power Plant which should take approximately 24 months and should begin construction at approximately the same time as the LNG terminal. Including final site evaluation, regulatory approvals, permitting, procurement, financing and contracting, an additional 18 months would be added to the front end of the schedule prior to construction. If a tender process is conducted, this would add another six to twelve months prior to actual project development work beginning. As such, receipt of LNG cargoes could commence as early as 2022, as assumed in the IRP proposed by BELCO, or extend into 2023 or beyond depending on the additional time required to structure a final LNG to power deal (e.g. due to tendering the terminal, the power plant or both).

The IRP contemplates 2022 as a target date for receipt of LNG in Bermuda. This is dependent on how BELCO and the Government decide to procure an LNG import facility and power plant. Any tendering process would necessarily delay delivery of LNG to Bermuda beyond what is contemplated in the IRP or the LNG Viability Study.

Similarly, a power plant to anchor the LNG infrastructure investment could be built within 24 months depending on the size and type of technology ultimately selected. This should coincide well with the FR LNG Terminal construction. However, a point of uncertainty remains with the schedule for the natural gas pipeline due to the numerous marine, road and utility crossings on route to the Pembroke Power Plant. Even if the pipeline is constructed on time, the addition of the FR Power Plant on the east side of Bermuda adds to the reliability of the system and complement operations of the Pembroke Power Plant.

For purposes of this alternative proposal for inclusion in the IRP, the schedule in Figure 2 illustrates the timing for developing the FR LNG Terminal and the co-located FR Power Plant from an engineering perspective without any allowance for a tendering process.

Figure 2: Indicative Schedule for Generating Electricity on Natural Gas



3.8 Benefits of the Co-located FR Power Plant

Both a 20 MW option for the FR Power Plant (to stay within the existing transmission limitations) as well as a 55 MW option (to maximize the benefit from the co-located generating plant but offset by required transmission upgrades) should be analysed as part of the conclusions resulting from this IRP consultation. This would provide additional benefits to the electricity users of Bermuda, as noted below:

A. The FR Power Plant would be more efficient and reduce overall system fuel consumption, thereby lowering the variable cost of electricity production on the system.

B. As a more efficient plant, the FR Power plant will lower emissions on the island.

C. The FR Power Plant will allow earlier retirement of some of the older, less efficient units currently on the system, particularly those that are to be converted and then retired prior to full realization of the benefits from the investment in conversion.

D. The FR Power Plant will avoid the expenditures in the IRP to convert the older, existing units to burn natural gas, as well as potential delays in completing the conversions which can be technically challenging depending on the condition of the units. The LNG Viability Study noted some concerns with conversion, namely:

   1. Whereas the gas turbines would be easier to convert than the engines, it may also be relatively expensive to convert them compared to more modern gas turbines.
   2. The cost of conversion would depend on how well the units had been maintained and the actual condition of each of the machines.
   3. The degree of life extension resulting from conversion would be dependent on the expected duty cycles (baseload operation providing the longest life extension).

E. Sol intends to work with BELCO and representatives from the Government to ensure that the best generation option for the system (engine plant versus combined cycle)

is added, with phase in scenarios potentially evaluated as well (20 MW going to 55 MW by adding more engines or by closing in a simple cycle to combined cycle).

F. The FR Power Plant will add flexibility to the IRP by adding new generation co-located with the FR LNG Terminal, thus the need to convert units that are scheduled for retirement will be mitigated. And if the load forecast increases substantially over the next twenty to thirty years (as opposed to a decrease as currently shown in Figures 1.1 and 1.2 of the IRP proposed by BELCO), then retirement of the most efficient of these older units can be postposed as needed.

G. The FR Power Plant will be located away from the central Pembroke Power Plant, thereby improving system reliability, particularly on the east side of the island.

H. Allowing the FR Power Plant to be licensed as an IPP will further the objectives of the EA, thus enhancing the wholesale generation market.

I. As an investor in the FR LNG terminal and an IPP, Sol will make the necessary investments in the infrastructure required to import LNG and charge fees over the life of the asset, as opposed to immediately passing through this upfront investment to the ratepayers as was apparently assumed in the IRP proposed by BELCO (see Figure 2.2 of BELCO's IRP where costs in 2022 temporarily increase over 50% due to this effect).

These potential benefits demonstrate why the FR Power Plant should be evaluated for inclusion in the IRP. Inclusion in the IRP may also enable Sol to extract potential synergies with the FR LNG Terminal that only Sol could realize (e.g. using the waste heat form the power plant as part of the LNG regasification process). The economic benefit of these synergies would then be shared with the people of Bermuda. As described in Section 3.6 above, the typical LNG to power arrangement has the LNG terminal owner also constructing a power plant to anchor its investment in the LNG import infrastructure.

4 Associated Energy Project

4.1 Overview - Sol FR Terminal Brownfield Development

The marine trestle, storage facilities, fuel supply/distribution systems, and properties at Sol's FR Terminal have served to provide long standing, safe, and reliable energy supply services to Bermuda. Through recent efforts to assess the country's future energy infrastructure requirements, Sol and other parties have focused on the feasibility of expanding energy services at the FR Terminal, primarily due to it being the only marine receipt and storage terminal in Bermuda and the availability of land and capacity at the facilities.

4.2 LNG Storage and Regasification at FR Terminal

4.2.1 Technical due diligence

The potential for developing an LNG import terminal on the island of Bermuda to allow BELCO and IPPs to purchase LNG as the primary fuel for power generation has been assessed. The assessment was undertaken as a follow-up to a fatal flaw review of the LNG supply concept that was undertaken in 2013. Executed in parallel with BELCO's IRP development, results from the IRP's dispatch analysis of BELCO's generation fleet (e.g. the projected consumption of natural gas) were used to size the LNG facilities.

Consistent with the findings and conclusions of the fatal flaw review, Sol's FR Terminal situated in St. George's Parish was selected to evaluate the feasibility of an LNG import terminal. This terminal includes an existing marine dock and trestle structure through which Sol imports liquid fuels for use in power generation and other industries. Utilising the existing marine facilities to the maximum extent possible for LNG unloading was an overriding objective. As discussed above in Section 3.1, the FR Power Plant was also examined.

Co-locating a suitably sized natural gas pipeline in the existing right-of-way for the Sol pipeline that runs nine miles from the FR Terminal to the Pembroke Power Plant was investigated. In addition to supplying the Pembroke Power Plant with gas, consideration was also given to utilising the pipeline to extend natural gas supply to commercial/industrial customers and natural gas distribution systems in the future.

4.2.2 Technical design basis

Final design of the FR LNG Terminal has not been made, pending further analysis into the sizing requirements, LNG cargo ship details and receipt of requisite approvals from the RA and the Government. However, the FR LNG Terminal would be sized to receive the expected volumes of imported LNG and designed with a commensurate send out capacity. Pending further analysis, storage of LNG would likely be in the range of 20,000 m^3 (net) in a single storage tank and injected after regasification into a new pipeline designed for transporting natural gas to the Pembroke Power Plant nine miles south. The LNG stored at

the FR LNG Terminal would also supply the FR Power Plant. To construct the FR LNG Terminal, the following would be considered:

A. LNG vessels with a transport capacity between 7,500 m3 and 20,000 m3 could be berthed and moored without any modification;

B. Modifications would be required to the pipe racks on the existing trestle;

C. Demolition of non-essential buildings on the existing loading platform would be required to accommodate the LNG pipelines and unloading facilities;

D. Demolition of two out of service fuel oil storage tanks and excavation into an existing hillside would be required to accommodate the LNG storage tank and equipment

E. Existing marine structures could accommodate the expected volumes of LNG import

The LNG storage tank would ultimately be sized to provide adequate storage for both the Pembroke Power Plant and the FR Power Plant operating at full capacity. A full containment LNG storage tank would be designed with a reinforced concrete outer tank. Notably, thermal exclusion zones should not be an issue for the selected tank location. Pipelines would be designed to allow for projected transport requirements as well as future requirements arising from commercial or residential development of natural gas.

LNG truck loading facilities would be required to deliver LNG to remote locations on the island not immediately accessible to a gas pipeline. As such, the design would allow for adding in the future a truck loading position pumped from the LNG storage tank. Regasification design will include redundant equipment to assure continuous availability of natural gas to the power generating facilities. Regasification to natural gas should therefore have a minimal impact on the reliability of the generating units.

An oil pipeline owned by Sol currently extends from the FR Terminal to the Pembroke Power Plant. The proposed natural gas pipeline would parallel the Sol pipeline in the same right of way. The gas pipeline would require five marine crossings, two road crossings and over thirty utility crossings. Approximately 50% of the existing right of way is beneath pavement, requiring paving repair and temporary road closures for construction of the new natural gas pipeline. Due to these complications, alternate routes may need to be investigated for some of the more challenging sections.

4.3 LNG Supply

The primary factor driving LNG development activities in Bermuda is the advancement of LNG supply capacity in North America. In fact, over the period that Sol, BELCO and the Government of Bermuda have assessed the feasibility of LNG as a fuel supply solution for power generation in Bermuda, over 70 million tonnes of LNG supply capacity has been brought online or is under construction in the United States. Due to the volume of resources discovered and the relatively low cost of production for shale gas, North America is now a substantial and competitive LNG supply market driven by multiple capacity holders and liquefaction projects.

There are several methods for securing LNG fuel supply for Sol's proposed FR Power Plant which could apply as well to BELCO's potential future LNG supply requirements. Of the

possible LNG supply structuring options, it is most common for gas-to-power projects which have a single electricity off-taker for the LNG supply to be procured and secured directly by the energy end-user. The LNG terminal facility could therefore be commercially structured under a capacity tolling agreement, i.e. charging a throughput fee for its services.

For the purposes of assessing the viability of Sol's proposed energy project, it is Sol's position that the procurement and commercial structuring of the fuel supply is distinct from the development, implementation, ownership and operation of the facilities. In this regard, Sol defers to the RA as the regulator of the fuels sector (and to BELCO as the sole electricity off-taker) to determine which party should be responsible for supply procurement and how the fuel supply is managed in terms of the overall project commercial structure.

5 Alignment of Sol Development Initiatives

Sol's Proposal reflects the company's core strategic objective to optimise both existing operations and underutilised resources. Therefore, given the scope of services under management and the underlying base of infrastructure in Bermuda, the company has prioritized development options for capacity utilisation at the FR Terminal. Integral to Sol's investment strategy is the alignment of its development initiatives with the long-term objectives of Bermuda. The following points represent a broad outline of how Sol's development plans are closely correlated with Bermuda's energy market policies and objectives as defined in the Policy of Bermuda:

A. Least-cost and high quality: The utilisation of existing resources should serve to underscore both efficiency and affordability. Furthermore, a brownfield expansion of the FR Terminal should afford continued high reliability and quality of service.

B. Environmental sustainability: The siting of new energy infrastructure at the FR Terminal (i.e. brownfield expansion) presents a significantly lower level of risk of harm to Bermuda's sensitive natural environment in comparison to the likely risk of environmental impacts for a greenfield project.

C. Aspirational Mix: From an emissions standpoint, natural gas is the primary supply-side energy source targeted to replace HFO and diesel. The FR LNG Terminal represents one of the best available options to achieve this objective.

D. Desired structure of electricity sector: Sol's Proposal is directly aligned with the Government's policy objective to introduce competition in bulk electricity generation. Specifically, the Policy creates an enabling environment for IPPs to develop new energy sources and contribute to other Policy objectives. By installing the FR Power Plant, Sol would introduce generation not owned by BELCO thereby initiating the beginnings of a wholesale generation market.

E. Bulk generation and developing an Integrated Resource Plan: The Policy specifies that IPPs are entities that provide energy, capacity, and ancillary services for commercial purposes exclusively for the Electric Utility. Furthermore, the Policy affirms "importantly, bulk generation may be operated by the Electric Utility or by IPPs." Sol would be an IPP providing services in furtherance of this objective.

In defining the IRP process, the Policy confirms that the RA accepts challenges from IPPs provided that challengers are able to articulate how their inclusion in the draft IRP would result in an electricity matrix that is more consistent with Policy objectives. In addition, challengers should be able to demonstrate the following:

- The proposed technology is commercially proven elsewhere
- An investment-grade feasibility study has been secured on the resource and the most appropriate technology
- The party has experience building, developing, and operating bulk generation plant (or have a partner with this experience)

- The party has the financial resources to successfully execute the proposed project (such as through a performance bond)
- Collectively, the information contained in the proposal represents a packaging of information pertaining to strategic planning, project development, and technical due diligence that is directly aligned with the principles and policies proscribed in the Policy.

The above listed points factor towards a credible optimisation of benefits and risks, which will be ultimately assessed through the Government's conclusion of Bermuda's energy requirements and the trade-offs associated with viable solutions. In addition to the close alignment of Sol's Proposal with Bermuda's energy policies, the FR LNG Terminal and FR Power Plant would be more consistent with the purposes of the EA and Ministerial directions.

In conclusion, Sol and its Proposal meet the requirements for challenging the IRP proposed by BELCO and should be evaluated for inclusion in the final IRP approved by the RA.

Appendix: Project Documentation

- Viability of Liquefied Natural Gas (LNG) in Bermuda by Castalia Advisors (MAR 2016)

  Note: This report was to the Government of Bermuda