

**CONSULTATIVE DOCUMENT
NOTICE OF PROPOSED RULE
MAKING**

Document Reference: 2015/002/NPRM-02

**DOMLEC'S INTEGRATED RESOURCE PLAN
AND RELATED FIVE YEAR INVESTMENT
PLAN**

March 2015

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

CONSULTATION PROCESS

Persons who wish to participate in this consultation and to express opinions on this Document are invited to submit comments in writing to the IRC. Responses/Comments should be sent to:

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Independent Regulatory Commission
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Responses, clearly showing the Document Reference identification, may be sent by mail or fax to the address or fax number above or by e mail to: ircdominica@gmail.com.

Confidential information provided with responses should be submitted as a separate document and clearly identified as such.

In order to stimulate debate, the IRC will place any responses received on its website at www.ircdominica.org immediately following the last date for receipt of responses. Comments on the responses will also be entertained by the IRC which should, likewise, be submitted by the date indicated.

The references and proposed time table for this consultation are:

Document Ref No: 2015/002/NPRM-02

Document Title: DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

Event	Proposed Date
Publication of Document	March 6, 2015
Responses close	March 23, 2015
Decision by Commission	March 26,2015

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Introduction and Background

The Commission issued two new Licences, a Generation Licence and a Transmission Distribution and Supply Licence, to Dominica Electricity Services Ltd (DOMLEC) both which became effective on January 1 2014. These two Licences which completed the process for aligning the regulatory framework for DOMLEC with the principles and intent of Electricity Supply Act 10 of 2006 (ESA) established a regime of separate licensing for each of the business sectors of public electricity supply undertakings – generation, transmission distribution and supply.

The Transmission, Distribution and Supply Licence (the Licence) sets out the provisions for conducting tariff reviews and, at Condition 33, specifically addresses the procedure for the initial tariff review as follows:

DOMLEC shall, within 7 days of the Commencement Date, submit a timetable for the filing of an application to the Commission for a tariff review, and that the date for such a filing shall not be later than 9 months after the Commencement Date without the approval of the Commission. The application for a tariff review shall be in the format set out in the Commission's Decision Tariff Regime for Dominica Electricity Services Limited - Document Ref 2009/004/D and the tariff review shall be conducted in accordance with the process set out in that Decision.

The Commission is of the view that in order to ensure timely completion of its review of any application for a tariff review submitted by DOMLEC it would be minded to consider certain critical issues in separate proceedings leading up to the tariff review itself. These issues, which are critical inputs to the tariff determination, are:

- Depreciation Policy
- Determination of Weighted Average Cost of Capital (WACC)
- Determination of Asset Base
- Approval of Investment Programme

The Commission will, if requested by DOMLEC conduct its review of and make determinations on these issues prior to the formal submission of the tariff review request on the presumption and condition that the Commission's Decisions on these issues will be used by DOMLEC as the input in the tariff request.

The Depreciation Policy was addressed and completed with the Commission's Decision Document Ref: 2014/001/D, June 2014 - "Depreciation Policy for Dominica Electricity Services Ltd". The Determination of WACC is the subject of an ongoing proceeding Document Ref No: 2015/001/NPRM-01: Weighted Average Cost of Capital for DOMLEC issued February 28, 2015.

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DOMLEC has now submitted its proposals for the Integrated Resource Plan (IRP) and related Five Year Investment Programme for the Commission's consideration.

This Notice of Proposed Rule Making (NPRM) sets out the Commission's thinking in response to DOMLEC's proposals.

The Commission's objective in this proceeding is to consider and decide on:

- a. The proposed Integrated Resource Plan(s); and
- b. The proposed investment(s) related to the same.

The Commission would be interested in receiving stakeholders' views in this regard.

Policy and Legal and Policy Framework

Government Draft Policy¹

The Government has an Energy Policy under consideration. The Commission is of the view that the principles in that draft should guide its thinking with regard to the development of and approval of the IRP. The salient features of the policy (at Section 4) are highlighted below:

On **Electricity Supply**, the Government's policy objectives are as follows:-

It is the Government's policy to foster a safe, efficient, affordable, and low-carbon national electricity supply that meets international quality standards by promoting the efficient use of imported fossil fuels, and the development of Dominica's domestic renewable energy resources. To achieve these policy goals it will be necessary for Government to:

- *Ensure that the energy resources available to the island are fully assessed in terms of their potential to economically contribute to the island's electricity supplies*
- *Evaluate the effect of their exploitation for electricity production on the local environment and on the island's carbon footprint*
- *Maintain an inventory of the available resources with potential to contribute to the country's electricity demand and update this inventory at regular intervals in line with changing economic conditions*
- *Ensure the implementation of demand-side-management (DSM) programmes to reduce the long-term demand for increased generating capacity*
- *Ensure that electricity supplies are generated and used as efficiently as possible and that losses are reduced to an economic minimum.*

Section 4.2 of the Policy which addresses "**Efficiency in Generation**" proffers:

Government through the IRC will establish an overall heat rate target for diesel engine generation efficiency. This target will set overall efficiency targets for the portion of electricity that is generated by diesel fuel. It will also ensure that generating plants are dispatched in the most economical way to meet the system loads. This means using the available mix of hydropower, conventional generation, and new

¹ Draft Sustainable Energy Plan of the Commonwealth of Dominica, 15 April 2014

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renewable energy sources to provide reliable power at least cost. Government will ensure that generation planning is such that it will use the principles of integrated resource planning to deliver the required generating capacity at least cost. The planning will take account of all the available energy resources – including geothermal, hydro, diesel, and other utility-scale renewable resources such as wind – as well as the most cost effective way to exploit those resources. If system generation expansion is not properly planned, fuel costs will not be optimized, and feasible fuel saving options (such as use of renewables, cogeneration, and efficiency improvement measures) may be overlooked. Effective capacity planning requires a good load forecast combined with appropriate use of computer-based capacity planning model programme such as the Wien Automated System Planning (WASP) computer model or the Super OLADE Power System Generation and Inter-Connection Planning Model which are used for multi-year electricity system planning studies, making it possible to simulate, and optimize hydro and thermal power system expansion plans. These models are used by several developing country utilities, including some in the Caribbean region, to determine the least costly expansion path that will adequately meet the demand for electric power, subject to user-defined constraints. Minimizing the total system costs of electricity also requires timely and efficient implementation of the selected capacity expansion path. Undue delays in planned implementation may result in the need to implement emergency additions which are more costly over the long-term and the excessive use of peaking units which are less efficient.

The Policy further mandates the following of the Commission:

- 1. The IRC will establish (and review on a regular basis) an overall heat rate target for diesel engines generation efficiency and ensure that generating plants are dispatched in the most economical way to meet the system loads. This means using the available mix of hydropower, conventional generation, and new renewable energy sources to provide reliable power at least cost. The system will be designed to ensure that any fuel usage which results from poor efficiency cannot be passed on to consumers in the fuel surcharge. However, it will remain a cost to DOMLEC. The heat rate target should be reasonable given system operating conditions, and may need to be updated as those conditions change.*
- 2. Require DOMLEC to demonstrate that its expansion planning is least cost and based on best practices in expansion planning, as required by the DOMLEC Transmission, Distribution and Supply Licence 2014.*

Legal Framework

The Commission's duties and functions with regard to tariff making are provided for pursuant to provisions in three principal instruments - the Act, the Licence and Commission's Determination "Tariff Regime For Dominica Electricity Services Ltd Document Ref: 2009/004/D 9."

The Act provides at Section 18

The Commission shall be independent in the performance of its functions and duties under this Act and shall not be subject to the direction and control of the Government or of any person, corporation or authority, except that the Commission shall have due regard to the public interest and overall Government policy, as embodied in legislation.

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At Section 19

The Commission shall have sole and exclusive authority to regulate all electricity entities that are subject to this Act and shall have full powers to regulate all licensee with regard to all economic and technical aspects of regulation in accordance with this Act especially with regard to the determination of tariff or electricity charges.

At Section 20

- (1) *The Commission shall, without limiting the generality of this section, have a duty to perform and exercise its functions and powers under this Act in the manner which it considers best calculated to:*
- (a) *encourage the expansion of electricity supply in Dominica where this is economic and cost effective and in the public interest;*
 - (b) *encourage the operation and development of a safe, efficient and economic electricity sector in Dominica;*
 - (d) *facilitate the promotion of sustainable and fair competition in the electricity sector where it is efficient to do so;*
 - (e) *protect the interests of all classes of consumers of electricity as to the terms and conditions and price of supply;*
 - (g) *ensure that the financial viability of efficient regulated electricity undertakings is not undermined;*

The Act gives the Commission full authority to act independently in the performance of its duties under the Act – specifically having regard to public interest considerations and government policy, as embodied in legislation. In providing for its functions the ESA (S20) mandates the Commission to act in a manner which it considers best calculated to achieve a number of policy objectives and in this regard clauses (a), (b), (d), (e) and (g) of S 20, reproduced above, are instructive.

Furthermore, Section 20. (1) (c) of the Act provides a duty for the Commission to “*ensure the security and efficiency of the supply of electricity in Dominica, through the conduct of an efficient long term planning process with due regard for future potential generation sources such as geothermal and wind energy*”.

DOMLEC's Licence and authorization

The Transmission Distribution and Supply Licence issued to DOMLEC and which became effective on January 1, 2014 sets out the parameters under which DOMLEC operates and its responsibilities regarding the system development. “Condition 2: Scope of the Licence” provides:

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1. *This Licence authorizes and gives the Licensee the exclusive right and privilege to transmit, distribute and supply electricity for sale to the public in the Service Territory and to operate, construct, reconstruct, modify or replace the transmission, distribution and supply facilities for these purposes subject to the ESA and the following:*
 - a) *Developers of generating facilities that will interconnect with the System by virtue of a Power Purchase Agreement with the Licensee will, as a general rule, be required to provide interconnection to the System at the high voltage (HV) side of the generator step up transformer. Under specific circumstances, subject to the approval of and grant of a transmission licence by the Commission, the developer may build, own and operate the transmission interconnector to the System.*
 - b) *Developers of energy resources that are primarily intended for cross border sale of electricity may, with the approval of and grant of a transmission licence by the Commission build, own and operate the associated transmission system infrastructure to enable such cross border arrangements. If circumstances require and it is prudent to do so, the developer may be eligible for a transmission licence to build and operate the transmission lines to interconnect with the System.*
2. *The Licensee has the exclusive right to supply for sale electricity to third parties for public and private purposes in the Service Territory for which the Licensee is entitled to bill consumers and customers for the electricity supplied at the rates and charges approved by the Commission.*
3. *Notwithstanding the provisions of Clause 2 of this Condition 2, the Commission may allow and issue licences for third party supply to any Development Areas, where there is to be no interconnection with the DOMLEC System and where it is demonstrated that for technical, commercial or other reasons the Licensee is unable or unwilling to extend the electricity supply system to those areas.*
4. *This Licence authorizes and gives the Licensee the right to purchase electricity in bulk from Independent Power Producers for transmission, distribution, supply and sale in the Service Territory.*
5. *For the purposes of satisfying the various references in the ESA, the Licensee is designated as the 'transmission system operator', the "distribution system operator" and the "system operator".*

DOMLEC's duties and responsibilities as "System Operator" are provided at Conditions 19 and 20 of the Licence.

Condition 19: Duties as System Operator

1. *The Licensee shall be responsible for dispatching sufficient generating capacity to meet System requirements in a prudent manner taking into consideration various*

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operating considerations, including but not limited to least-cost, planned and forced generator maintenance schedules and operating reserves (both on-peak and off-peak) and subject to the terms and conditions of any PPAs.

2. *The Licensee shall, as far as is practicable and safe, dispatch available generation in such a manner that the energy produced and dispatched is at the least cost to consumers.*
3. *The Licensee may purchase some or all of its energy and/or capacity requirements from Independent Power Producers pursuant to relevant PPAs.*
4. *The Licensee may purchase the electricity output from renewable or alternate energy sources on an energy only or capacity and energy basis as appropriate in accordance with the procedures agreed with or established by the Commission and subject to relevant PPAs.*
5. *The Licensee is responsible for the procurement of adequate generation supply, in terms of required energy, capacity and ancillary services to fully meet the needs of its consumers, subject to the procedure for addition of capacity established by the Commission in accordance with its policy document, “Regulatory Policy and Procedure - Adding Capacity to the Public Electricity Supply System 2008/002/D”, as amended from time to time. (Emphasis added)*
6. *The Licensee must ensure that adequate reserve generating capacity, both spinning and cold standby, is available at all times to meet the guidelines promulgated by the Commission. The Licensee may provide such reserve capacity itself or may contract some or all of it to any base-load Independent Power Producer with whom a PPA has been signed.(Emphasis added)*
7.

Condition 20: Duty to secure long term system security and reliability

1. *The Licensee shall periodically prepare and update, in accordance with internationally accepted best industry practice, an Integrated Resource Plan and Least Cost Expansion Plan. (Emphasis added)*
2. *The Commission, when satisfied, after due consultation, that the plans represent the least economic cost for system expansion consistent with internationally accepted best industry practice, will approve the plans following which the Licensee shall implement the approved plan. (Emphasis added)*

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3.

The Planning process

There are basically two elements to the planning process - first the preparation of an Integrated Resource Plan (IRP) followed by a Least Cost Expansion Plan (LCEP). The first step in this process, however, is to agree on system planning parameters. These are critical as the decisions taken will influence system reliability and investment dollars which ultimately translates into the tariff. In its Decision Document Ref: 2008/002/NPRM-01: “Regulatory Policy and Procedure - Adding Capacity to the Public Electricity Supply System” the Commission describes its expectations and processes for the development of the IRP and consequential LCEP.

(1) Integrated Resource Plan

The Integrated Resource Planning process will:

- *provide energy forecast and demand forecast;*
- *identify the gap in base, intermediate and peaking capacity;*
- *identify the time in which new capacity is required;*
- *identify the schedule for retiring assets; and*
- *identify the performance and constraints of the transmission and distribution network.*

The IRP will identify the specific projects required to fill any gap between forecasted demand and supply. It will not initially specify technology types, unit size, or similar details. If a competition is held inputs received from that process will establish, ex-post, the least cost options. If a competition is not held the Least Cost Expansion Plan will inform the decision making.

The IRC will review the IRP prepared by the utility to ensure the veracity of the techniques and associated data used to identify investment opportunities, as well as ensuring that the results faithfully reflect the outcomes of the utility’s modeling.

(2) Least Cost Planning

While the IRP will identify the long run development needs for the system and investment opportunities for power producers the Least Cost Expansion Plan produces more granular results and selects the technology of the plant to be added in by modeling various scenarios and selecting the least cost options for the assumptions made. This process is important particularly if generation is to be added without the benefit of competition. It also serves as a useful barometer for analyzing the options that result from a competition.

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SECTION 1 - Integrated Resource Plan (IRP)

DOMLEC'S Proposals²

The IRP prepared by DOMLEC and which is the subject of this consultation is attached (in full) as Attachment1. The following is a summary of DOMLEC's proposals

IRP Objective Criteria

Various scenarios have been submitted by DOMLEC in the development of its IRP proposals. The IRP considers the 20 year period 2014 – 2033.

The IRP seeks to satisfy five basic criteria. These are:

1. Project the electricity demand in Dominica from 2014 to 2033 based on historical load data and anticipated events for low, base and high growth rates.
2. Review of the age and reliability of the present fleet of generators and their expected retirement dates.
3. Consider potentially viable candidate plant options for generation expansion for period 2015 to 2018.
4. Determine when new capacity is required for maintaining reliability requirements for Dominica.
5. Determine the performance constraints on the existing distribution system which may occur within the period based on anticipated growth in demand and the consequential generator expansion.

Additionally, all considerations given to the parameters above; any expansion should be done at least cost to the customers.

DOMLEC's Energy and Demand Forecasts

The core system parameters which for the starting point for DOMLEC's as well as the economic assumptions are summarized below.

²Source: All data and references "DOMLEC GENERATION EXPANSION ASSESSMENT 2014 – 2033" dated June 13, 2014

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Table 1
DOMLEC - System parameters (2009-2013)

	2013	2012	2011	2010	2009
Number of Customers	35518	34870	34391	33986	30549
Peak Load (MW)	16.71	17.23	17.17	16.58	15.62
Gross diesel production (MWh)	63987	74807	64571	76033	69565
Gross hydro production (MWh)	36705	26748	35836	23132	23156
Gross purchased RE production (MWh)	60	117	76	16	0
Total gross energy production (MWh)	100752	101672	100483	99181	92721

Table 2
DOMLEC - Economic Assumptions

Parameter	Assumption	Comment
Discount Rate	12%	Real WACC 9.08%, expected inflation 2%
Cost Estimates	Based on real 2014 Eastern Caribbean Dollars (EC\$)	
Capital Costs Estimates	Overnight capital cost - cost of construction provided that no interest was incurred during construction (i.e. cost if the project was completed "overnight").	
Taxes and duties	Not included in model	
Currency & Exchange Rates	US\$1 to EC\$2.70	The United States dollar was the main currency for which cost estimates were denominated

Demand Forecast

Key forecast assumptions are provided at Table 3.

Table 3
Key Forecast Assumptions

Scenarios	Average Annual Values 2014-2033
Low Case Scenarios	
Temperature	27.4°C
Economic Growth	0.1%
Residential Electricity Prices	1.5%
Base Case Scenarios	
Temperature	27.8°C
Economic Growth	1.6%
Residential Electricity Prices	-2.0%
High Case Scenarios	
Temperature	28.1°C
Economic Growth	3.1%
Residential Electricity Prices	-2.2%

DOMLEC employed Real Gross Domestic Product as the Growth variable opining that the growth in electricity is influenced to a large extent by the growth in output within the economy. It also noted that the growth in the economy was flat during 2013 following as 0.2% decline during 2012. Using data published by the Eastern Caribbean central Bank (ECCB) and the International Monetary Fund (IMF) the company notes that the Dominican economy could grow by 1.6% in 2014.

Forecast summary

In the base case scenario, DOMLEC projects that net generation will increase from 97,248MWh in the year 2014 to a load of 125,914MWh in 2033 (Figure 2). In the base case, net generation growth is projected to average 1.3% per year over the 20 years of the planning period (2014–2033). In the low case load scenario, net generation is forecasted to reach 83,657MWh at the end of the planning period, while in the high case scenario, net generation is projected to reach 172,144MWh at the end of 2033. These scenarios are reproduced at Figure 1 and Tables 4..

Figure 1
Historical & Projected Net Generation: 2000-2033

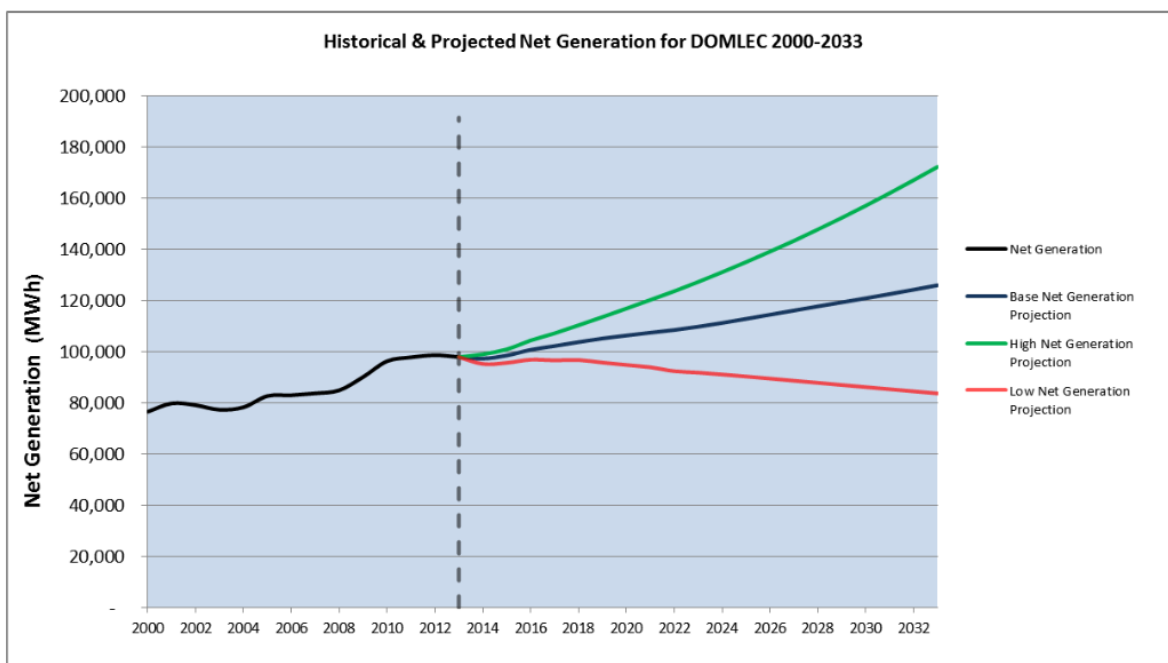


Table 4
Net Generation Growth Projections

Year	Scenarios (MWh)		
	High Case	Base Case	Low Case
2014	98,956	97,248	95,174
2020	116,823	106,294	94,769
2026	139,061	114,415	89,461
2033	172,144	125,914	83,657
<i>Average Growth Rate (2014-2033)</i>	2.9%	1.3%	-0.8%

With regard to sales, the company projects that DOMLEC’s total electricity demand (across all customer classes) will increase from 89,177MWh in 2014 to 114,456MWh by the end of 2033; while the average annual growth rate over the planning period is projected to be 1.2% and the number of customers is forecasted to rise from 35,518 in 2013 to 49,120 by the end of the

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planning period (see table 5) while the total usage per customer is expected to decline from 2,515 kWh in 2013 to 2,330 kWh by the end of the planning period.

Table 5
Total Sales Growth Projections

Year	Scenarios (MWh)		
	High Case	Base Case	Low Case
2014	90,742	89,177	87,275
2020	106,192	96,621	86,145
2026	126,406	104,004	81,320
2033	156,479	114,456	76,044
<i>Average Growth Rate (2014-2033)</i>	2.8%	1.2%	-0.8%

Table 6
System Peak Load Growth Projections

Year	Scenarios (MW)		
	High Case	Base Case	Low Case
2014	17.1	16.6	16.4
2020	19.8	17.6	16.8
2026	22.8	18.5	16.6
2033	27.1	19.5	16.2
<i>Average Growth Rate (2014-2033)</i>	2.4%	0.8%	-0.2%

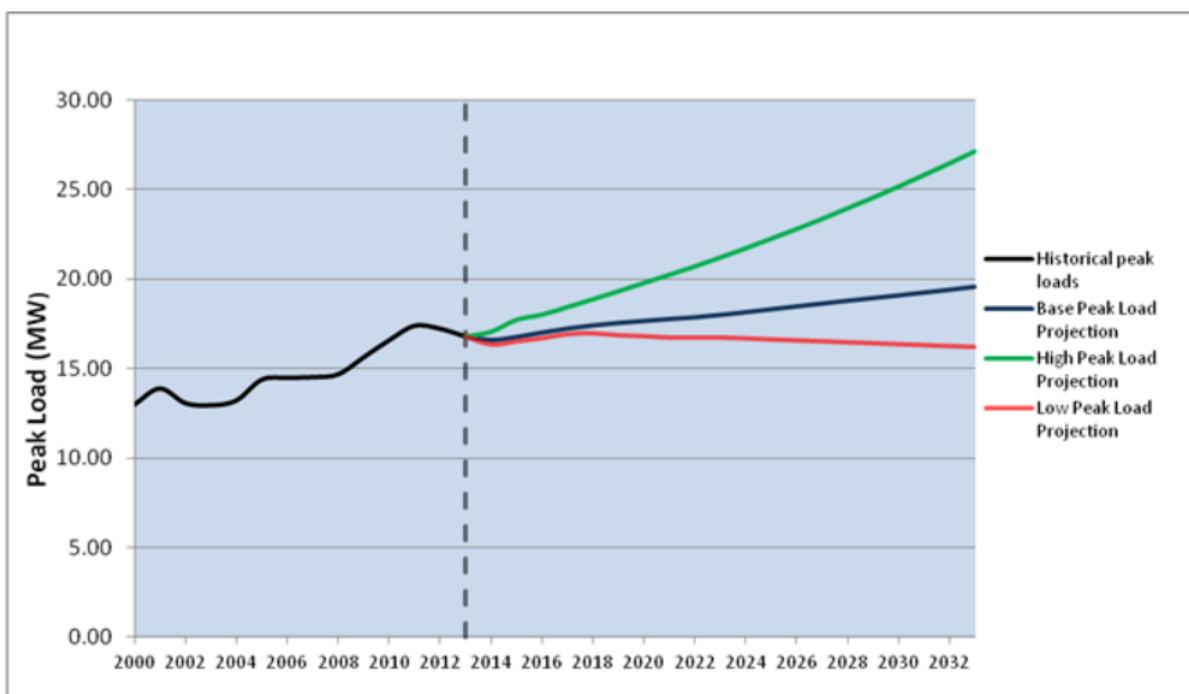
The company also projects the number of customers is to increase from 35,518 customers at the end of 2013 to just over 49,357 customers by 2033

Finally, Table 7 and Figure 2 show the company's projections for system peak demand noting that System peak fell from 17.2 MW in 2012 to 16.8 MW during 2013. The company forecasted Peak demand to fall to 16.6 MW during 2014 while average annual growth of 0.8% in peak is projected over the planning period. System peak demand is forecasted to grow to 19.5 MW by the end of 2033.

Table 7
System Peak Load Growth Projections

Year	Scenarios (MW)		
	High Case	Base Case	Low Case
2014	17.1	16.6	16.4
2020	19.8	17.6	16.8
2026	22.8	18.5	16.6
2033	27.1	19.5	16.2
<i>Average Growth Rate (2014-2033)</i>	2.4%	0.8%	-0.2%

Figure 9
Historical & Projected System Peak Loads for DOMLEC: 2000-2033



Modelling the system

The company makes a number of other assumptions that are needed for the modeling process which include the following critical parameters:

Fuel Price Forecasts – forecasts generated by the US Energy Information Administration were used where fuel price forecasts include Reference, High and Low fuel price scenarios which have been used in the IRP for sensitivity testing

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Reliability Criterion - In order to ensure that service is uninterrupted in the event that the two largest generators on the system are out of service a reliability criterion of N-2 is used.

Firm Capacity - the definition of firm capacity is the dry season capacity of the run-of-the-river hydro units plus the available capacity of the diesel units less the capacity of the two largest units.

Intermittent renewable energy penetration - where intermittent renewable energy generators are utilized, an intermittent renewable energy penetration limit of 10% of annual peak demand was applied.

Largest generating unit - based on past operating experience, in order to maintain system frequency stability during a loss of generation event, it was determined that the maximum capacity of any generating unit on the network should not exceed 20% of the projected peak demand.

Generation spinning reserve - according to the spinning reserve policy the spinning reserve must exceed the dispatched unit with the largest output. A minimum of 3.0MW of spinning reserve was maintained.

System losses - The five year average (2009-2013) for system losses is 9.47% of net generation. Any new transmission lines should not negatively affect the current level of system losses.

Voltage control in the North of Dominica (Generation maintained at Sugar Loaf) - high speed diesels at the Sugar Loaf station are operated continuously for the purpose of voltage control in the north of the island. This requirement will be required until the transmission link between Fond Cole and Sugar Loaf is upgraded. Generation out of Sugar Loaf was therefore constrained to a minimum of 2.4 MW until 2018 when the transmission network is assumed to be upgraded.

Candidate Generation Plant - The candidate plant that was considered during the assessment was:

- 1.8 MW Medium speed diesel units
- 3.5 MW Medium speed diesel units
- 0.5 MW Utility Scale PV Generators
- 3.5 MW Geothermal units
- 7.0 MW Geothermal units

Due to the timelines for construction, the earliest date for plant additions was assumed to be January 1, 2017.

Candidate renewable energy-based generating plant - Only solar PV technology and geothermal technology were considered.

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Modeling Methodology

Software - The software package used by DOMLEC during the study was the PLEXOS 6.301R03 Utility Planning and Risk Management Software by Energy Exemplar³. The Plexos software is reported to be used by utilities, ISO’s, consulting firms and regulatory agents for operations, planning and market and transmission analyses. Plexos is an energy market simulation and optimization software package, which is licensed in the United States, Europe, Asia-Pacific, Russia and Africa and used at over 100 sites.

DOMLEC’s Proposal – Least Cost Expansion Plan (LCEP)

Generation options

DOMLEC proposed three scenarios for generation expansion utilizing a combination of renewable energy and diesel thermal generation as shown below in Table 8, to meet the anticipated growth in demand. A fourth scenario reflecting an injection of 2 MW demand in 2018 was also modelled. These scenarios were modelled using the growth projections for the base, high and low cases indicated at Table 4.

Table 8
Proposed scenario for deployment of candidate options

Technology Options Considered	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Geothermal (7MW by 2018)	√	X	X	√
Geothermal (7MW by 2021)	X	√	X	X
Additional Geothermal capacity from	2020	2023	N/A	2020
Reciprocating Engines	√	√	√	√
Solar PV	√	√	√	√
Injection of 2MW demand in 2018	X	X	X	√

Table 9 shows the resulting recommended build schedule for 2014 to 2018.

Table 9
Recommended build schedule for 2014 to 2018

Year	Capacity Retired (MW)	Capacity Added		Total Installed Capacity (MW)	Peak Demand (MWgross)	Reserve Margin %	N-2 Contingency (MW)
		(MW)	Type				
2014	0.00	0.0		26.7	16.6	45.3	3.2
2015	0.00	0.0		26.7	16.8	43.5	3.0
2016	0.00	0.0		26.7	17.0	41.8	2.8
2017	0.00	1.0	Solar - 2x0.5MW	27.7	17.2	40.1	2.6
2018	0.00	7.5	Geothermal - 2x3.5MW Solar - 1x0.5MW	35.2	17.4	77.8	6.5

³ www.energyexemplar.com

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After much analysis by DOMLEC on the various options (which are included with DOMLEC's submission) to satisfy the demand for electricity for the study period, Scenario 1 was chosen to be the approach that provides the least cost generation expansion solution; this is shown at Table 10.

Table 10
Build Schedule for recommended scenario 1 – Base Sales Forecast

Year	Capacity Retired (MW)	Capacity Added		Total Installed Capacity (MW)	Peak Demand (MWgross)	Reserve Margin %	N-2 Contingency (MW)
		(MW)	Type				
2014	0.00	0.0		26.7	16.6	45.3	3.2
2015	0.00	0.0		26.7	16.8	43.5	3.0
2016	0.00	0.0		26.7	17.0	41.8	2.8
2017	0.00	1.0	Solar - 2x0.5MW	27.7	17.2	40.1	2.6
2018	0.00	7.5	Geothermal - 2x3.5MW Solar - 1x0.5MW	35.2	17.4	77.8	6.5
2019	1.50	0.0		33.7	17.5	69.9	5.2
2020	0.00	3.5	Geothermal - 1x3.5MW	37.2	17.6	88.3	8.5
2021	0.00	0.0		37.2	17.7	87.2	8.4
2022	1.75	0.0		35.5	17.8	76.4	6.6
2023	1.35	0.0		34.1	18.0	68.9	5.4
2024	0.00	0.0		34.1	18.1	68.0	5.3
2025	0.00	3.5	Geothermal - 1x3.5MW	37.6	18.3	84.8	8.4
2026	0.00	0.0		37.6	18.4	83.7	8.3
2027	0.00	0.0		37.6	18.6	81.7	8.1
2028	4.20	0.0		33.4	18.7	60.6	4.4
2029	1.88	0.0		31.5	18.9	51.9	2.9
2030	2.80	0.0		28.7	19.0	37.5	0.3
2031	0.00	0.0		28.7	19.2	36.0	0.1
2032	1.20	1.8	MSD - 1x1.8MW	29.3	19.3	39.4	0.8
2033	0.00	0.0		29.3	19.6	37.9	0.6

The NPV for Scenario 1 Base Sales is stated in Table 11 below:

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

Table 11
NPV for Scenario 1 – Base Sales

Year	Capital Expenditure EC\$ million			Total Capex	Operating Cost EC \$million			Total Operating Cost	Total Cost EC\$ million
	Diesel	Geothermal	Solar		Fuel	O&M			
					Diesel	Fixed	Variable		
2014	-	-	-	-	45.5	-	4.9	50.5	50.5
2015	-	-	-	-	46.6	-	5.0	51.7	51.7
2016	-	-	-	-	48.9	-	5.2	54.0	54.0
2017	-	-	6.3	6.3	49.9	0.1	5.2	55.1	61.5
2018	-	111.9	3.2	115.0	19.0	0.1	3.6	22.7	137.7
2019	-	-	-	-	15.4	0.1	3.8	19.3	19.3
2020	-	55.9	-	55.9	2.7	0.1	3.2	6.0	61.9
2021	-	-	-	-	3.1	0.1	3.3	6.6	6.6
2022	-	-	-	-	3.6	0.1	3.3	7.1	7.1
2023	-	-	-	-	4.3	0.1	3.4	7.8	7.8
2024	-	-	-	-	4.8	0.1	3.5	8.4	8.4
2025	-	55.9	-	55.9	0.0	0.1	3.3	3.5	59.4
2026	-	-	-	-	0.0	0.1	3.4	3.5	3.5
2027	-	-	-	-	0.0	0.1	3.4	3.6	3.6
2028	-	-	-	-	0.1	0.1	3.5	3.7	3.7
2029	-	-	-	-	1.1	0.1	3.7	4.9	4.9
2030	-	-	-	-	1.4	0.1	3.8	5.3	5.3
2031	-	-	-	-	2.0	0.1	3.8	6.0	6.0
2032	10.0	-	-	10.0	2.5	0.1	3.9	6.5	16.6
2033	-	-	-	-	3.4	0.1	4.0	7.6	7.6
NPV 12%	-	-	-	80.2	170.7	0.6	30.9	202.3	282.5

For completeness and the benefit of comparison the NPV sensitivity values for low and high sales forecast are provided at Tables 12.

Table 12
NPV sensitivity values

Sensitivity	Base Demand World NPV (\$ '000)			
	Scenario 1:	Scenario 2:	Scenario 3:	Scenario 4:
Base	282,460	338,352	477,991	303,052
Fuel - High	338,555	420,952	630,882	362,654
Fuel - Low	250,483	287,093	371,360	269,367

Sensitivity	High Demand World NPV (\$ '000)			
	Scenario 1:	Scenario 2:	Scenario 3:	Scenario 4:
Base	331,186	397,414	561,581	363,221
Fuel - High	400,206	498,460	741,810	442,822
Fuel - Low	290,341	333,191	433,980	314,177

Sensitivity	Low Demand World NPV (\$ '000)			
	Scenario 1:	Scenario 2:	Scenario 3:	Scenario 4:
Base	253,577	298,924	396,839	273,794
Fuel - High	304,826	372,434	520,975	329,902
Fuel - Low	225,645	254,875	312,322	241,991

Based on the IRP projections for the next five years, extracting the costs from the associated NPV spreadsheet above, DOMLEC would spend EC\$199.2 Million for establishing 1.5MW of solar and 7MW of Geothermal to meet the demand by 2018.

Transmission and Distribution

The generation capacity expansion will require network upgrade and expansion must follow in order to evacuate the new capacity, to secure system stability and supply quality.

The current transmission and distribution system consists of two main load centers: Roseau (in the south) and Portsmouth (in the north). All the loads are fed through an 11kV distribution network. The existing network was reviewed and recommendations made for its upgrade based on the recommended generation expansion scenario.

DOMLEC’s existing power transmission system contains an 11 kV transmission ring for reliable transfer of power from one station. Included in this transmission ring are the Fond Cole, Padu, and Trafalgar power stations. This ring provides flexibility for the transfer of hydro power to Fond Cole, the largest distribution station on the network. The voltages on the 11kV buses are all acceptable when a minimum of 2.4MW is generated at Sugar Loaf. In the event of the failure of an inter-connector, another inter-connector is able to transfer the power required at the distribution stations.

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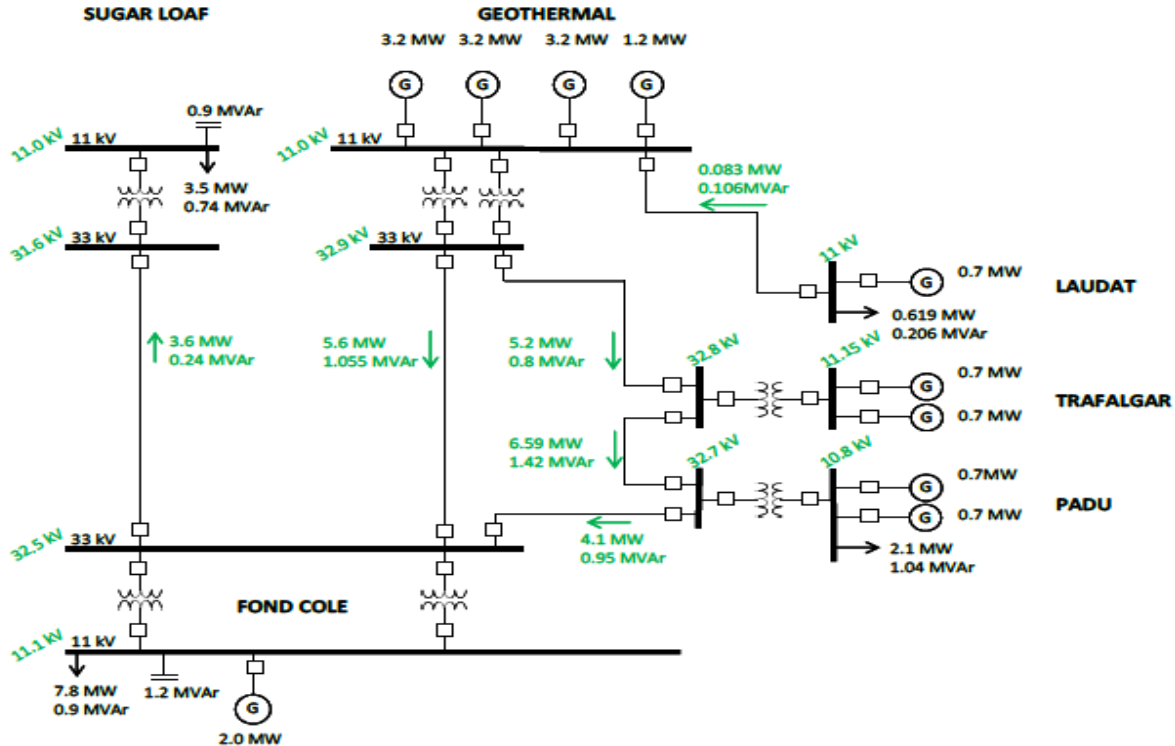
Interconnection Scenarios

DOMLEC evaluated the following scenarios for the interconnection of geothermal energy into the grid via overhead lines.

- Interconnection Scenario 1: Geothermal power station to extant network at 11 kV.
- Interconnection Scenario 2: Geothermal power station at 11 kV, Sugarloaf at 33 kV
- Interconnection Scenario 3a: Geothermal and Laudat station at 33kV, Sugarloaf at 33kV, Padu and Interconnection Trafalgar at 11kV
- Interconnection Scenario 3b: Geothermal power station and Sugarloaf at 33kV, Laudat, Padu, and Trafalgar at 11kV
- Interconnection Scenario 4: Geothermal power station, Fond Cole, Trafalgar and Padu in a 33kV ring, geothermal power station to Laudat station as an 11kV radial, Fond Cole to Sugar Loaf inter-connector at 33kV.
- Interconnection Scenario 5: All other stations at connected at 33kV in a ring configuration, Fond Cole to Sugar Loaf inter-connector at 33kV.

Arising from its analysis, DOMLEC proposes scenario 4 for the new transmission configuration (see figure 10):

Figure 10
DOMLEC- proposed configuration for transmission upgrade



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To support this recommendation DOMLEC summarises that:

The creation of the 33kV interconnectors from Fond Cole to Sugar Loaf and from Fond Cole to the new geothermal station can be leveraged for the future generation expansion of the system. Components of the existing 11kV line in the Roseau Valley have been provisioned for 33kV, creating opportunities to reduce the projected line costs. The ability to estimate and control the planned investments is much better because it involves substation builds and not line builds. Due to the terrain and land constraints, interconnection scenarios that involve more line construction in the Roseau Valley are less predictable and have greater potential for cost overruns.

The benefits of the 33kV interconnectors include the following:

Provision of room for future growth as this is the most cost effective solution for additional geothermal generation (beyond the 20 MW identified for the purposes of this study)

Reduction of land issues by use of existing right of ways

Lower losses with higher transmission voltage.

The cost of performing such an upgrade by constructing a new transmission system to accommodate the new geothermal station and efficiently disburse the power therefrom throughout the network will cost EC\$39,969,930 (US\$14,711,594).

In summary the NPV of the capital costs over the planning period to implement the base generation case is EC\$80.2M while the transmission and distribution system development carries a capital cost of EC\$39,969,930.

The Commission's Considerations

The Commission thanks DOMLEC for its submission and notes the detail of the supporting Appendices which has enabled the Commission to garner a full appreciation of, not only the options available for generation expansion, but also the important considerations for the transmission and distribution system. The Commission believes that there are a number of issues occurring at the national level which will have a direct bearing on the system development and that it would be prudent to have due regard to these in its consideration of this IRP. The impact will be on the capital investment profile and equally important the timing for the addition of new facilities. The Commission therefore believes that in order to conclude this proceeding it must have a full understanding of and a high degree of certainty on the status of negotiations at the Government level on:

- Negotiations for, and the timing and configuration of, the geothermal plant development
- Possible commitments by the Government to fund the construction of transmission line infrastructure with particular reference to 33kV interconnection.

At the date of writing the Commission has not been able to secure responses with sufficient certainty to enable it to consider the implications for the medium and long term development of the public electricity supply system operated by DOMLEC. The challenge is that the IRP informs the development of DOMLEC's investment programme which finds its way as impacts on the company's rate base and therefore becomes important considerations at the tariff review.

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The Commission is mindful that there is an expectation that much of the uncertainties will be clarified by the end of April 2015. If this is the case there will be time to consider any impacts of these clarifications in the tariff review which is scheduled to commence on May 1, 2015. If the situation is such that the Commission will not be able to conclude on the investment plan during the Tariff review it may decide to make a tariff determination without these impacts and commit to reopening the tariff subsequently when there is sufficient clarity.

The Commission is of the view that the following issues have to be resolved

Generation

- Configuration and size of the geothermal plant – from a system perspective 2.5MW units may be ideal but this has to be balanced by the economies associated with larger plant e.g. 3.5 MW units.
- Timing for the first plant
- Details (Term Sheets) of the Power Purchase Agreements

Transmission and distribution

- Definitive commitments on the proposal for the government to secure financing for the 33kV interconnection
- Based on the above the timing for the funding to be available for project implementation
- Details of the terms under which the facility would be made available to DOMLEC to operate

Specific Comments on the Demand Forecast

While the Commission is of the view that the methodology adopted by DOMLEC to forecast demand is appropriate for Dominica, specifically the strategy to link electricity demand growth to GDP, it would have liked to see the historic correlation between the two parameters so as to enable future work and manipulation of the data to be readily done.

There is no indication whether stake holders in government, commerce and industry were consulted to glean information on future developments which could have an impact on electricity demand. For example, a single medium sized hotel development could impact on the forecast. In this regard the Commission is of the view that the next iteration of this study should perhaps include inputs from stakeholders.

Consultation Question No. 1

Are stake holders aware of developments which would impact the assumptions made in the forecast?

Consultation Question No. 2

Do stakeholders agree (subject to any comments in response to Consultation Question No 1) that the derived base, high and low projections for energy growth are reasonable? See Table 5 reproduced below.

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

Year	Scenarios (MWh)		
	High Case	Base Case	Low Case
2014	90,742	89,177	87,275
2020	106,192	96,621	86,145
2026	126,406	104,004	81,320
2033	156,479	114,456	76,044
<i>Average Growth Rate (2014-2033)</i>	2.8%	1.2%	-0.8%

Finally, the Commission is of the view that the development of the geothermal resources will have significant impact on the Dominica economy, the likes of which cannot now be estimated, but as this development takes place, there will have to be a duty of care on the part of the Government, DOMLEC and IRC to ensure that these impacts are adequately planned for. To this end subsequent system planning analyses will perhaps have to be done more frequently than would otherwise be considered normal.

In the meantime for the immediate term, The Commission is of the view that due to the slow pace of economic growth in the Commonwealth of Dominica, the preferred scenario for the next three years i.e. 2015 to 2018, the low demand growth case can be prudently chosen for decision purposes.

Consultation Question No. 3

Do respondents agree that the prudent choice at this time would be the low demand growth scenario?

Specific comments on the Least Cost Expansion planning process

The Commission has considered very carefully the candidate plant that was considered by DOMLEC as inputs to the assessment and notes that these were:

- 1.8 MW Medium speed diesel units
- 3.5 MW Medium speed diesel units
- 0.5 MW Utility Scale PV Generators
- 3.5 MW Geothermal units
- 7.0 MW Geothermal units

It also noted that only solar PV technology and geothermal technology were considered as the candidate renewable energy-based generating plant.

The Commission is curious about the omission of wind technology as a candidate for the renewable energy options. This is against the background where worldwide wind technology is making significant gains as a viable option for utility scale operation but the capital costs are

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

also falling. The Commission would be interested in hearing DOMLEC's reasons for the exclusion of this technology.

Regarding the choice of the other candidate plant, the Commission agrees with DOMLEC's selection for modelling.

The Commission notes that DOMLEC uses the PLEXOS 6.301R03 Utility Planning and Risk Management Software by Energy Exemplar as the modelling software. It is also aware that the following language in the Government's Policy "*Effective capacity planning requires a good load forecast combined with appropriate use of computer-based capacity planning model programme such as (emphasis added) the Wien Automated System Planning (WASP) computer model or the Super OLADE Power System Generation and Inter-Connection Planning Model which are used for multi-year electricity system planning studies, making it possible to simulate, and optimize hydro and thermal power system expansion plans*" does not preclude the use of modelling software other than WASP or Super OLADE. The Commission is not, itself, familiar with the PLEXOS 6.301R03 software but the results of its research suggests that this software is not inappropriate for use by DOMLEC to carry out its planning exercises.

Specific Comments on the LCEP – Adding Generation Capacity

Suffice it to repeat that the decisions on the LCEP feed into DOMLEC's investment programme and ultimately will have an impact on the tariff. The Commission has concerns about taking decisions until it is, itself, fully seized of the information to inform its decisions in this regard. The Commission's overriding concern is to avoid the possibility of inefficient investing activity, lumpy investments and the possibility of rate shock.

The several scenarios modelled by DOMLEC for this demand choice are reproduced below

Low Electricity Demand

For low electricity demand projections, electricity demand is predicted to grow at an average of 0.1% per annum over the planning period. Additional information is detailed in the appendices.

Scenario 1

In scenario 1, 13.3MW of new capacity is required over the planning period. 1.0MW of solar capacity is installed in 2017. 10.5MW of geothermal capacity is installed between 2018 and 2020. A further 1.8MW of medium speed diesel capacity is added in 2030. The net present value of this plan is EC\$ 253,576,565.

Scenario 2

In scenario 2, 13.8MW of new capacity is required over the planning period. This plan features the installation of solar technology in 2017 and 2018. Medium speed diesel technology is added in 2019, just prior to the allowed introduction of geothermal technologies in 2021, and a subsequent geothermal installation in 2023. A total of 10.5MW of geothermal capacity, 1.5MW of solar technology and 1.8MW of medium speed diesel technology is required during the planning period. The net present value of this plan is EC\$ 298,924,362.

Scenario 3

In scenario 3, 13.8MW of new capacity is required over the planning period. This generation scenario has only solar and medium speed diesel technologies available for selection. 1.5MW of solar technology is installed between 2017 and 2018. A total of 12.3MW of medium speed diesel

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capacity is installed between 2018 and 2030. The net present value of this plan is EC\$ 396,838,959.

Scenario 4

In scenario 4, 15.5MW of new capacity is required over the planning period. 1.0MW of solar capacity is installed in 2017 and a further 0.5MW of solar capacity is added in 2018. 10.5MW of geothermal capacity is installed between 2018 and 2020 and a further 3.5MW of geothermal capacity is added in 2029. The net present value of this plan is EC\$ 273,793,639.

The Commission believes that an option is that the geothermal will be available in 2017 or 2018 and that these scenarios should be considered as there may be no choice in the decision as to when the geothermal capacity will be available.

Consultation Question No. 4

Do respondents agree that as there may be no choice as to when geothermal becomes available, it would be prudent to examine the options in the low demand scenario of geothermal being available in 2017 or 2018.

Specific Comments on the LCEP – Transmission and Distribution System Development

The Commission has reviewed proposals for the Transmission and Distribution system development that must occur in tandem with the addition of generating capacity and growth in system demand, and has formed the view that DOMLEC's recommendation is a sensible evolution of the system over time. It does not necessarily agree that the development must take place in a single spate of investment, as this would have significant implications for tariffs but that, once the outstanding concerns regarding the generation development are resolved, the Transmission and Distribution system can be planned to keep pace and reflect the system implications of those developments.

The Commission is however concerned about the economics of the operation in the North of Dominica. It has been noted that the Sugar Loaf Power Station is operated, primarily for quality of supply purposes in the north. While it is also likely that Sugar Loaf also provides load support in that area the Commission believes that the system must be reinforced in the near to medium term. The Commission also believes that there are other options which should be considered and has requested that following additional analyses be carried out

- 1) Generation:
 - a. Analyses of the economics and timing of the alternatives to reinforce the system conditions in the North taking into account scenario such as; (a) the geothermal addition is delayed; and (b) constructing the North - South 33 kV interconnection. Thus, analyses to be performed for the following scenarios:
 - i. keeping existing Sugar Loaf on cold standby;
 - ii. relocating plant from Fond Cole to Sugar Loaf;
 - iii. installing new more efficient plant at Sugar Loaf;
 - iv. doing nothing.

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- b. For the low demand case, conduct analysis where generation is constrained by the addition of 7.0MW of geothermal in (i) 2017 or (ii) 2018. This could be further refined by considering the introduction of 3.5 MW in 2017 and 3.5MW in 2018.
 - c. The impact of the Padu expansion on the investment plan, should geothermal be delayed.
- 2) Transmission:
- a. T&D Options for evacuating the power from the geothermal at 11 kV as a first step in the build out of the transmission infrastructure (does this make economic sense?)
 - b. The reconfiguration of the Trafalgar to Fond Cole interconnector (I) by extending it to the Laudat geothermal station (ii) bundling the conductors on that interconnector thus increasing the capacity (iii) upgrading Padu - Fond cole interconnector utilizing the same approach.
 - c. The construction of a 33KV interconnector between the geothermal plant (Laudat) with Sugar Loaf and associated options for interconnection with Fond Cole.

Consultation Question No. 5

Do respondents agree with the Commission's strategy to examine the options for reinforcing the electricity supply system in the north?

Notwithstanding the issues raised above the Commission is mindful of the importance for DOMLEC to have some certainty for its long term planning development and therefore in deciding on this IRP the Commission will make definitive decision on the plan, although there may be conditions attached. It will, however be sufficiently definitive to enable DOMLEC to take short and medium term decisions regarding project implementation.

Conclusions on the IRP

The Commission is of the view that DOMLEC has an acceptable approach to the IRP/LCEP process and that the demand projections based GDP are not unreasonable in the current Dominican environment. It would however wish to be sure that the views of sector interests, particularly commerce and industry, have been fully taken into account.

In considering the demand projections the Commission considers the low demand projections as being the prudent course initially. It is nevertheless mindful of the potential that the geothermal development has for stimulating economic activity and growth. There will, however, be a lag in this development and the impact would be more properly assessed at the next round of detailed planning due in 2018.

While there is uncertainty as to the exact timing and configuration of the geothermal (mix and size of units for example), the Commission is of the view that based on current information realization of the project between 2017 and 2019 may be possible and accordingly it will consider approval of the IRP/LCEP with these horizons in mind.

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

Summary of Consultation Questions

Consultation Question No. 1

Are stake holders aware of developments which would impact on the assumptions made in the forecast?

Consultation Question No. 2

Do stakeholders agree (subject to any comments in response to Consultation Question No 1) that the derived base, high and low projections for energy growth are reasonable? See Table 5 reproduced below.

Year	Scenarios (MWh)		
	High Case	Base Case	Low Case
2014	90,742	89,177	87,275
2020	106,192	96,621	86,145
2026	126,406	104,004	81,320
2033	156,479	114,456	76,044
<i>Average Growth Rate (2014-2033)</i>	2.8%	1.2%	-0.8%

Consultation Question No. 3

Do respondents agree that the prudent choice at this time would be the low demand growth scenario?

Consultation Question No. 4

Do respondents agree that there may be no choice as to when geothermal becomes available? This being the case, it would be prudent to examine the options in the low demand scenario of geothermal being available in 2017 or 2018.

Consultation Question No. 5

Do respondents agree with the Commission's strategy to examine the options for reinforcing the electricity supply system in the north?

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

SECTION 2 – 5 Year Investment Plan

As has been indicated in the previous section, the IRP and LCEP is the driver for determining the company's investment programmes on a rolling basis. It is therefore important that the IRP/LCEP is reviewed at periodic mile stones to assess whether the driving assumptions remain relevant or were in fact realized. This will result in a necessary regular "tweaking" of the investment plans on an on-going basis. The Commission cannot be unmindful of the implications that the approvals of investment plan have on the rate base and the tariff, where, on the one hand, shortfalls in investment to meet demand or replacement of facilities can impact the quality of supply while, on the other hand, over or ill-timed investment can result in excessive rates and less than efficient utilization of capital invested. So while the Commission will tend to be conservative in its consideration of the investment plan it remains conscious of the importance of balancing the two consequences in the consumers' interest.

In the companion consultation on the IRP, the Commission has raised a number of questions and has also asked DOMLEC to analyze a number of scenarios, the results of which could affect decisions on the Investment Plan. Any conclusions represented in this document will therefore be ultimately conditioned by the outcome of the feedback from the consultation as well as the results of the analyses requested of DOMLEC.

In this regard the Commission's consideration of projects will be two fold (i) those projects or capital sums that will be brought into the rate base during the tariff period and (ii) those projects which although started during the tariff period will be completed and brought into the rate base in the subsequent period.

For the avoidance of doubt, the Commission reminds all stake holders that the outcome of this proceeding will determine DOMLEC's investing activities for the ensuing planning period and thus the values that will be absorbed in the company's regulated rate base. The regulated rate base is a term used to define the rate base to which the WACC is applied for rate making purposes. The Determination provides the following guidance regarding adjustments to the "rate base" in order to derive the regulated rate base.

Adjustments

Adjustments are also referred to as "No Cost Capital." These are funds received by a utility to which it is not entitled to earn a rate of return and as such these amounts are not included in rate base.

These adjustments consist of customer advances, which are funds paid by customers for the construction of facilities required to service those customers, or to finance future payments, such as non-current liabilities, deferred credits, etc...

For the Revenue Requirement estimate, the following would be identified as adjustments and excluded from rate base:

DOMLEC's Integrated Resource Plan and Related Five Year Investment Plan

Customer Advances for Construction (=referred as "deferred revenue" in DOMLEC's financials)
Consumer deposits (i.e. for connections) Capital
Grants and
Other revenue (= interest income)
Deferred tax

Ideally, a weighted average of balances for each of these adjustments would be calculated and subtracted from rate base.

DOMLEC's Proposals

DOMLEC's proposals were submitted under cover of a document "Five Year Investment Programme - Dominica Electricity Services Ltd" dated February 5, 2015. The submission is a detailed one and the justifications for every project listed have been submitted. As DOMLEC introduces its submission:

Total Capital requirements over the five-year period are estimated at approximately EC\$93.8 million: 2015 - \$23.7 million, 2016 - EC\$38.8 million, 2017 - EC\$8.0 million, 2018 - EC\$11.7 million and 2019 - EC\$11.6 million.

The major capital items for the five year period are:

- *T& D related items total \$58 million including \$45 million to be spent on the upgrade of the 11 kV Transmission & Distribution lines to 33kV lines*
- *Generation related items amount to \$16.8 million of which \$10.2 million will be expended on Padu capacity upgrade and \$1.8 million on vehicle replacement.*
- *Commercial related items total \$9.0 million. \$1.8 million will go towards the replacement of approximately 4,000 Keypad type prepaid meters with the AMI meters.*
- *To respond to customer demand for new services, an investment of \$3.8 million will be made. Additionally, to facilitate customer driven request for prepaid services, \$2.3 million will be expended.*

The following tables provide the details of the proposed investment dollars over the 5 year period.

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Table 13
DOMLEC Capex Summary and Generation
5 Year forecast ending December 31 2019

Dominica Electricity Limited

Capex Summary

5 Year Forecast ended December 31, 2019

Capex Ref #	Forecast 2015	Forecast 2016	Forecast 2017	Forecast 2018	Forecast 2019	Total
Summary - Department						
Generation	2,917,923	1,605,000	1,505,000	5,353,138	5,443,138	16,824,198
Commercial	1,890,277	1,997,158	1,868,216	1,663,100	1,388,729	8,807,480
Transmission & Distribution	16,750,179	33,324,085	2,665,111	2,751,677	2,850,238	58,341,290
Engineering	797,572	193,297	299,490	500,000	520,000	2,310,359
Administration	496,350	646,800	580,900	497,300	508,600	2,729,950
Finance	450,000	450,000	450,000	450,000	450,000	2,250,000
Information Technology	479,805	601,520	649,075	460,000	445,000	2,635,400
	23,782,106	38,817,860	8,017,792	11,675,214	11,605,704	93,898,676

DOMINICA ELECTRICITY SERVICES LIMITED
5 YEAR CAPEX FORECAST SUMMARY

	2015	2016	2017	2018	2019	Total
Growth Capital Items	15,346,262	31,966,607	1,714,677	6,451,859	6,455,943	61,935,348
Sustaining Capital Items	8,435,844	6,851,254	6,303,115	5,223,355	5,149,761	31,963,329
	23,782,106	38,817,860	8,017,792	11,675,214	11,605,704	93,898,676

Generation

Padu Diversion Weir Infrastructure Improvement	GEN001	185,000	-	-	-	-	185,000
Extension of Office/Workmen Facility at New Trafalgar Balancing Tank (NTBT)	GEN002	-	60,000	-	-	-	60,000
Replacement for Padu Intake Gate/Winch System	GEN003	-	-	30,000	-	-	30,000
Online Vibration Monitoring System for FCs 5&6	GEN004	270,000	-	-	-	-	270,000
Transformer Blast Wall/Switchgear Protection	GEN005	100,000	-	-	-	-	100,000
Fire Extinguisher Refilling Equipment	GEN006	100,000	-	-	-	-	100,000
Workshop for FCs 7&8 Compound	GEN007	68,000	-	-	-	-	68,000
Maintenance Workshop for Sugar Loaf	GEN008	50,000	-	-	-	-	50,000
FC MAN Compound Fencing	GEN009	70,000	-	-	-	-	70,000
Sugar Loaf Compound Fencing	GEN010	40,000	-	-	-	-	40,000
Online Vibration Monitoring System for FCs 10-12	GEN011	-	200,000	-	-	-	200,000
Gantry Crane System for FC MAN Workshop	GEN012	-	-	100,000	-	-	100,000
Mobile Crane and Lighting Systems for Major Overhauls	GEN013	-	-	90,000	-	-	90,000
Security Surveillance System for FC MAN Compound	GEN014	200,000	-	-	-	-	200,000
Vacuum Circuit Breaker	GEN015	122,000	120,000	120,000	-	-	362,000
Motor Control Center (MCC) for LV Motors at Fond Cole	GEN016	215,000	-	-	-	-	215,000
FC6 Controls and Remote Monitoring Upgrade	GEN017	-	105,000	-	-	-	105,000
Replacement/Upgrade to Black Start Generator at Fond Cole	GEN018	-	-	450,000	-	-	450,000
Replacemet Pickups	GEN019	80,000	80,000	80,000	80,000	80,000	400,000
Vehicles Replacement - T&D	GEN020	360,000	180,000	-	180,000	270,000	990,000
Bucket Upgrade	GEN021	67,923	-	-	-	-	67,923
Crane Truck	GEN022	-	200,000	-	-	-	200,000
Replacement Forklift	GEN023	-	-	185,000	-	-	185,000
FC 10 27K major overhaul	GEN024	460,000	-	-	-	-	460,000
FC 6 40K Major overhaul	GEN025	530,000	-	-	-	-	530,000
SL 4 18K Major overhaul	GEN026	-	330,000	-	-	-	330,000
SL 7 18K Major overhaul	GEN027	-	330,000	-	-	-	330,000
FC 12 27K Major overhaul	GEN028	-	-	450,000	-	-	450,000
Hydro Pipe Line	GEN029	-	-	-	5,093,138	5,093,138	10,186,275
		2,917,923	1,605,000	1,505,000	5,353,138	5,443,138	16,824,198

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Table 14
Commercial and Transmission & Distribution Capex
5 Year forecast ending December 31 2019

Dominica Electricity Limited

Capex Summary

5 Year Forecast ended December 31, 2019

	Capex Ref #	Forecast 2015	Forecast 2016	Forecast 2017	Forecast 2018	Forecast 2019	Total
<u>Commercial</u>							
Metering Upgrade	COM001	30,000	30,000	30,000	30,000	30,000	150,000
Civil Works to Enhance Work Envir	COM002	35,000	-	-	-	-	35,000
Meter Changes - AMI Prepaid	COM003	411,984	432,583	454,212	476,923	500,769	2,276,472
New Service Connections	COM004	690,708	725,243	761,506	799,581	839,560	3,816,598
STS to AMI Upgrade	COM005	465,091	488,346	512,763	346,596	-	1,812,795
Tools	COM006	10,000	10,000	10,000	10,000	10,000	50,000
EA-Inspector	COM007	47,016	26,986	28,335	-	-	102,337
Gatekeepers	COM008	42,000	84,000	71,400	-	8,400	205,800
Meter Testing Console	COM009	147,078	-	-	-	-	147,078
Tropos Network	COM010	-	100,000	-	-	-	100,000
Unicom Probes - Rex & A3 Meters	COM011	11,400	-	-	-	-	11,400
Meter Data Management System	COM012	-	100,000	-	-	-	100,000
		1,890,277	1,997,158	1,868,216	1,663,100	1,388,729	8,807,480
<u>Transmission and Distribution</u>							
Pole and Hardware Replacement	T&D001	858,103	943,913	1,038,305	1,142,135	1,256,349	5,238,805
System Modification	T&D002	272,973	253,865	236,094	219,568	204,198	1,186,698
Street lamp replacement	T&D003	95,492	88,808	82,591	76,810	71,433	415,135
LV distribution upgrade	T&D004	520,956	520,956	520,956	520,956	520,956	2,604,780
Defective Transformer Replacement	T&D005	97,974	98,954	99,943	100,943	101,952	499,765
Hotline Tools	T&D006	20,000	20,000	20,000	20,000	20,000	100,000
Tools & Equipment	T&D007	20,000	20,000	20,000	20,000	20,000	100,000
New Street lights	T&D008	114,004	127,901	129,053	130,216	131,390	632,564
New Service Line Extension	T&D009	282,447	285,271	288,124	291,005	293,915	1,440,764
HV Upgrade	T&D010	230,044	230,044	230,044	230,044	230,044	1,150,220
33 HV Lines - Fone Cole to Sugar Loaf	T&D011	-	30,734,373	-	-	-	30,734,373
33 HV Lines - Laudat to Fond Cole	T&D011	14,238,186	-	-	-	-	14,238,186
		16,750,179	33,324,085	2,665,111	2,751,677	2,850,238	58,341,290

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Table 15
Finance and Information Technology
5 Year forecast ending December 31 2019

Dominica Electricity Limited

Capex Summary

5 Year Forecast ended December 31, 2019

	Capex Ref #	Forecast 2015	Forecast 2016	Forecast 2017	Forecast 2018	Forecast 2019	Total
Finance							
Contingency - General		400,000	400,000	400,000	400,000	400,000	2,000,000
Contingency - IT		50,000	50,000	50,000	50,000	50,000	250,000
		450,000	450,000	450,000	450,000	450,000	2,250,000
Information Technology							
Physical SAN for storage	IT001	80,000	-	80,000	-	80,000	240,000
Redundant Wireless links Roseau/FCLE + Standby power	IT002	100,000	-	-	-	-	100,000
Redundant wireless link Power Stations	IT003	60,000	60,000	-	-	-	120,000
Telephone system upgrade	IT004	30,000	30,000	-	-	-	60,000
New client operating systems (Windows 8)	IT005	-	45,000	45,000	45,000	-	135,000
Security appliances	IT006	-	-	-	80,000	-	80,000
Network monitoring video system	IT007	30,000	-	-	-	-	30,000
Video conferencing equipment	IT008	-	30,000	-	-	-	30,000
Thin client provisioning (Desktops, software & servers)	IT009	-	100,000	100,000	100,000	50,000	350,000
AMI hardware upgrade	IT010	-	50,000	-	-	50,000	100,000
Invensys upgrade	IT011	-	50,000	50,000	-	-	100,000
Desktop phones replacement	IT012	40,000	-	40,000	-	-	80,000
Backup media upgrade	IT013	-	-	40,000	-	-	40,000
Hardware upgrade Virtual Disaster Recovery Infrastructure	IT014	-	80,000	-	-	80,000	160,000
Portable Tablets	IT015	13,505	6,520	4,075	-	-	24,100
UPS Stores, Head office	IT016	15,000	-	15,000	-	-	30,000
Replacement server JUICE application	IT017	-	-	-	50,000	-	50,000
Redundant switches Head Office /Engineering Complex	IT018	-	50,000	-	-	-	50,000
10 gigabit SAN upgrade Roseau/FondCole	IT019	-	-	70,000	-	-	70,000
Image based backups system	IT020	40,000	-	-	-	-	40,000
Sage ERP 300 Upgrade	IT021	-	-	75,000	75,000	75,000	225,000
CRM/Technisoft Service Manager (Job Management)	IT022	-	50,000	50,000	50,000	50,000	200,000
Laptop replacement	IT023	30,000	30,000	30,000	30,000	30,000	150,000
Desktop replacements	IT024	14,500	-	-	-	-	14,500
Printers	IT025	-	-	30,000	30,000	30,000	90,000
Microsoft Office Upgrade	IT026	20,000	20,000	20,000	-	-	60,000
VOI P Gateway Backup	IT027	6,800	-	-	-	-	6,800
		479,805	601,520	649,075	460,000	445,000	2,635,400

The Commission's Considerations

The Commission thanks DOMLEC for its diligence and thoroughness in the preparation of this submission and confirms that the material presented is consistent with the Determination and in sufficient detail to enable the Commission to conduct a fulsome review of the material submitted.

As a rule and consistent with the Commission's commitment to enable DOMLEC to improve and maintain an effective and efficient customer interface and to leverage technology for the organisational efficiency improvements, the Commission intends to approve the Company's proposals for "Commercial" and "Information Technology" without comment, but, consistent

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with its caveat that for rate base and tariff making purposes, only the capital sums projected for the tariff period will be allowed.

The Commission recognizes that the capital works associated with the interconnection of the proposed geothermal plant represents significant investment over and above DOMLEC's normal investing activity. This is illustrated at Table 16 which disaggregates the costs of the transmission and distribution infrastructure.

Table 16
DOMLEC - Proposed Investment Programme (excluding T&D Additions for Geothermal)

	2015 (EC\$)	2016	2017	2018 - 2019 (EC\$)	Total (EC\$)
Generation	2,917,923	1,605,000	1,505,000	10,796,276	16,824,199
Commercial	1,890,277	1,997,158	1,868,216	3,051,829	8,807,480
Transmission and Distribution	2,511,993	2,589,712	2,665,111	5,601,915	13,368,731
Engineering	797,572	193,297	299,490	1,020,000	2,310,359
Administration	496,350	646,800	580,900	1,005,900	2,729,950
Finance	450,000	450,000	450,000	900,000	2,250,000
Information Technology	479,805	601,520	649,075	905,000	2,635,400
Total	9,543,920	8,083,487	8,008,792	23,280,920	48,926,119
Average per annum (2015-2017)			8,545,400		

In the scenario above the capital expenditure associated with the transmission and distribution line infrastructure (Code T&D011) totaling EC\$44,972,559 has not been included. While this item represents the capital expenditure associated with the introduction of the geothermal capacity into the DOMLEC system, the Commission's concern about timing, and phasing remains. As has been indicated earlier, the Commission has been advised by an appropriate authority that the Government might be providing the funding for a 33 kV interconnector to evacuate the energy from the geothermal plant. In this regard, the Commission has asked DOMLEC to conduct additional modelling of possible scenario, in addition to those included with its submissions, for the system configuration and the Commission anticipates that it will be in a position to issue a fulsome decision with reasons at the conclusion of this proceeding. For the avoidance of doubt the Commission wishes to emphasize that DOMLEC will have clear directions on this matter in the final decision.

The Commission notes that in the previous five years DOMLEC's annual capital expansion was as follows (Table 17):

**Table 17
DOMLEC's Historic Capital Investment**

	2013 (EC\$)	2012 (EC\$)	2011 (EC\$)	2010 (EC\$)	2009 (EC\$)
Generation	8,61,0295	9,648,651	7,824,864	7,032,274	6,767,104
Transmission and Distribution	821,410	811,315,	695,634	659,683	634,808
Engineering	209,817	252,526	224,759	227,958	219,362
Information Technology, Admin, others	1,518,939	1,255,569	1,424,829,	1,384,496	1,332,290
Total	11,160,460	11,968,061	10,170,086	9,304,411	8,953,564

The Commission is of the view that as the proposed capital expenditure (see Tables 16 and 17), excluding the transmission and distribution infrastructure to support the geothermal plant, is in line with the historic capital expenditure, it will approve these amounts and the associated projects without further comment.

The Commission continues to have concerns that on a system as small as that of DOMLEC the capitalisation of major but necessary projects can translate to significant impact on the tariff and. while the Commission seeks to minimize these impacts, it is faced with the conundrum where system integrity can be compromised if it resiles from timely approval of necessary projects. In this regard, the Commission has been notified by the appropriate authorities that the Government will most likely undertake to provide grant funding for the construction of a 33kV interconnector to facilitate the geothermal plant. Although at the time of writing the details are to be confirmed, the Commission will include the construction of this line in the expansion plan but notes that, as it will be funded otherwise, it will not form part of the investment capital requirements of DOMLEC. The Commission also anticipates that the arrangements for construction of this line will be concluded so as to enable implementation to meet the system requirements for the addition of geothermal capacity.

The Commission is well aware that, despite the intervention of the Government, DOMLEC will incur capital expenditure associated with the transmission and distribution infrastructure for the geothermal plant. Once the interconnection scenario has been agreed the Commission will authorize the associated capital works and expenditure as part of the capital investment.

Consultation Question No. 6

Do respondents agree with the Commission's approach to the determination of DOMLEC's capital investment programme for the period 2015 - 2017?

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Consultation Question No. 7

Do respondents agree with the Commission's plan to provide for the interconnection arrangements to the geothermal plant when there is certainty as to the timing and the expected contribution by the government to the capital works, noting the Commission's commitment to conclude this matter as part of this proceeding?

Conclusions on the LCEP

The Commission is concerned that at the time of writing there is still uncertainty regarding the geothermal plant in terms of timing, size and interconnection arrangements. Nevertheless the Commission intends to approve DOMLEC's investment plan as proposed but without the provisions for the transmission line infrastructure to support the introduction of the geothermal plant into the system. The Commission has arrived at this conclusion as the residual proposed capital expenditure is in line with the historic capital expenditure. Table 18 provides the summary.

Table 18
DOMLEC - Proposed Investment Programme 2015 - 2017
(excluding T&D Additions for Geothermal)

	2015 (EC\$)	2016	2017	Total (EC\$)
Generation	2,917,923	1,605,000	1,505,000	6,027,923
Commercial	1,890,277	1,997,158	1,868,216	5,755,651
Transmission and Distribution	2,511,993	2,589,712	2,665,111	7,766,816
Engineering	797,572	193,297	299,490	1,290,359
Administration	496,350	646,800	580,900	1,724,050
Finance	450,000	450,000	450,000	1,350,000
Information Technology	479,805	601,520	649,075	1,730,400
Total	9,543,920	8,083,487	8,008,792	25,645,199
Average per annum (2015-2017)			8,545,400	

The Commission has been made aware by appropriate authorities that the Government will undertake to provide grant funding for the construction of a 33kV interconnector to facilitate the geothermal plant. Although at the time of writing the details are to be confirmed, the Commission will include the construction of this line in the expansion plan but notes that as it will be funded otherwise it will not form part of the investment capital requirements of DOMLEC.

The Commission is well aware that, despite the intervention of the Government, DOMLEC will incur capital expenditure associated with the transmission and distribution infrastructure for the geothermal plant. Once the interconnection scenario has been agreed the Commission will authorize the associated capital works and expenditure as part of the capital investment.

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Summary of Consultation Questions

IRP

Consultation Question No. 1

Are stake holders aware of developments which would impact on the assumptions made in the forecast?

Consultation Question No. 2

Do stakeholders agree (subject to any comments in response to Consultation Question No 1) that the derived base, high and low projections for energy growth are reasonable? See Table 5 reproduced below.

Year	Scenarios (MWh)		
	High Case	Base Case	Low Case
2014	90,742	89,177	87,275
2020	106,192	96,621	86,145
2026	126,406	104,004	81,320
2033	156,479	114,456	76,044
<i>Average Growth Rate (2014-2033)</i>	2.8%	1.2%	-0.8%

Consultation Question No. 3

Do respondents agree that the prudent choice at this time would be the low demand growth scenario?

Consultation Question No. 4

Do respondents agree that as there may be no choice as to when geothermal becomes available? This being the case, it would be prudent to examine the options in the low demand scenario of geothermal being available in 2017 or 2018.

Consultation Question No. 5

Do respondents agree with the Commission's strategy to examine the options for reinforcing the electricity supply system in the north?

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Investment Plan

Consultation Question No. 6

Do respondents agree with the Commission's approach to the determination of DOMLEC's capital investment programme for the period 2015 - 2017?

Consultation Question No. 7

Do respondents agree with the Commission's plan to provide for the interconnection arrangements to the geothermal plant when there is certainty as to the timing and the expected contribution by the government to the capital works, noting the Commission's commitment to conclude this matter as part of this proceeding?

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