

DOMLEC’s Annual Performance Report 2016

Version 1.0

 **Prepared by:**

 **Mrs. Connie Joseph-Louis**

 **Mr. Justinn Kase**

**Table of Contents**

**LIST OF TABLES iii**

**LIST OF GRAPHS iv**

**LIST OF ACRONYMS v**

**DEFINITION OF TERMS vi**

**1.0 INTRODUCTION 1**

**Legal Framework 1**

* 1. **Background 1**
	2. **Purpose of the report 2**
	3. **Information and Data 2**
	4. **Methodology 2**

**2.0 FINANCIAL ANALYSIS 3**

 **2.1 Profitability Ratios 3**

 **a. Profit Margin 3**

 **b. Return on Assets 4**

**c. Return on Equity 5**

 **2.2 CAPITAL STRUCTURE 6**

 **a. Debt to Capital Ratio 6**

 **2.3 LIQUIDITY RATIO 8**

 **a. Cash Flow Interest Cover 8**

 **b. Current Ratio 9**

 **c. Operating Cost Cover by Revenue 9**

 **2.4 MANAGEMENT EFFICIENCY 10**

 **a. Days of Outstanding Accounts Receivables 10**

**3.0 ECONOMIC INDICATORS 11**

 **a. Energy Sales per Employee (kWh) 11**

 **b. Number of Customers per Employee 12**

 **c. Electricity Consumption per Capita 13**

**4.0 ORGANIZATIONAL PERFORMANCE 15**

 **a. Average Tariff 15**

 **b. Operating Cost per (kWh) 15**

 **c. Customer Base 16**

 **d. Energy Purchased 17**

 **e. Energy Sales 18**

**5.0 SECTION II**

**5.1 Generation 20**

 **a. Total Installed Generation Capacity Including**

**Distributed RE 20**

**b. Distributed RE Installed Capacity 20**

**c. Percentage RE Capacity tied to the Grid 21**

**d. Proportion of Diesel and Hydro Generation 22**

**e. Total Energy Generated, Delivered and Sold 23**

**f. Capacity and Load Factors 25**

**g. Ratio of Firm Capacity over Peak Demand 26**

**h. Thermal Generation Specific Fuel Consumption 26**

**5.2 Transmission and Distribution 28**

 **i. System Losses 28**

 **j. System Reliability Indices 29**

**6.0 SUMMARY 31**

**7.0 CONCLUSION 32**

 **Appendix 33**

 **References 34**

**LIST OF TABLES**

**Table : 1 Profit Margin 2012 - 2016 4**

**Table: 2 Return on Assets 2012 - 2016 5**

**Table: 3 Return on Equity 2012 - 2016 6**

**Table : 4 Debt to Capital Ratio 2012 – 2016 7**

**Table: 5 Cash Flow Interest Cover 2012 – 2016 8**

**Table: 6 Current Ratio 2012 – 2016 9**

**Table: 7 Operating Cost Covered by Revenue 2012 – 2016 10**

**Table: 8 Days of Outstanding Accounts Receivables 2012 – 2016 11**

**Table: 9 Sales per Employee (kWh) 2012 – 2016 12**

**Table: 10 –a Number of Full Time Employees 2012 – 2016 12**

**Table: 10 –b Customers per Employee 2012 – 2016 13**

**Table: 11 Electricity Consumption per Capita 2012 – 2016 13**

**Table: 12 Average Tariff 2012 – 2016 15**

**Table: 13 Operating cost per kWh 2012 – 2016 16**

**Table: 14 Number of Customers 2012 – 2016 16**

**Table: 15 Energy Purchased 2012 – 2016 17**

**Table: 16 Energy Sales 2012 – 2016 18**

**LIST OF GRAPHS**

**Figure: 1 Total Installed Generation (kW) 20**

**Figure: 2 Distributed RE Installed Capacity 20**

**Figure: 3 Distributed RE Energy contribution to the Grid (%) 21**

**Figure: 4 Percentage Energy Contribution (hydro and Diesel) 22**

**Figure: 4(a) Trending Hydro to Diesel Generation 23**

**Figure: 5 Total Energy Generated, Delivered and Sold 23**

**Figure: 5(a) Trending Energy Generated, Delivered and Sold 24**

**Figure: 6 Capacity and Load Factors 25**

**Figure: 7 Generation Specific Fuel Consumption 26**

**Figure: 8 System Losses in Percentages 28**

**Figure: 9 System Summary Outage Report – Aggregate 29**

**Figure: 9(a) System Outage Report Summary – T&D 30**

**Figure: 9(b) System Outage Report Summary – Generation 30**

**LIST OF ACRONYMS**

CARILEC Association of Caribbean Electric Utilities

DOMLEC Dominica Electricity Services Limited

LUCELEC St Lucia Electricity Services Limited

GRENLEC Grenada Electricity Services Limited

CDC Commonwealth Development Corporation

USIEU US Investor-Owned Electric Utilities

EEI Edison Electric Institute

GWh Gigawatt hours

IPP Independent Power Producer

IRC Independent Regulatory Commission

IRP Integrated Resource Plan

KW Kilowatt

MW Megawatt

PPA Power Purchase Agreement

ROA Return on Assets

ROE Return on Equity

RE Renewable Energy

T&D Transmission and Distribution

SAIDI System Average Interruption Duration Index

SAIFI System Average Interruption Frequency Index

CAIDI Customer Average Interruption Duration Index

**DEFINITION OF TERMS**

**Capacity Factor -** The ratio of the generation plant output over a period of time, to its potential output if it were possible for it to operate at full nameplate capacity continuously over the same period of time.

**Distributed RE –** Distributed Renewable Energy specifically photovoltaic and mini hydroelectric plants and small wind turbines.

**Watt** – One unit of power

**Kilowatt (kW) –** One thousand watts.

**Load Factor –** Average demand divided by peak demand.

**Megawatt (MW) –** One million watts

**Renewable Energy** - energy derived from renewable sources such as the sun, wind, water, wave energy, geothermal and the like.

**System Losses –** Loss of energy incurred in transmission and distribution over conductors as well as from theft or human error in reading the consumption quantities**.**

**1.0 INTRODUCTION**

**Legal Framework**

The Independent Regulatory Commission (IRC) was established by the Electricity Supply Act, No. 10 of 2006, as the regulator for the supply of electricity in the Commonwealth of Dominica. The Commission’s key objectives are; to monitor the performance of the company, to set tariffs that are cost effective, and to balance the interests of consumers and service providers alike.

Section 19 of the Act provides the IRC with the sole exclusive authority to regulate all electricity entities that are subject to this Act and gives the IRC full powers to regulate all licencees with regard to all economic and technical aspects of regulation. Section 21 (m) gives the IRC the power to monitor the performance of licencees against mutually agreed targets and benchmarking standards. The production of this performance report is, therefore, in keeping with our mandate.

**1.1 BACKGROUND**

The Dominica Electricity Services Limited (DOMLEC) commenced operation in 1949[[1]](#footnote-2) as the

Colonial Development Corporation, which later became the Commonwealth Development Corporation. The Government of Dominica purchased forty-nine percent of the company’s shares in 1976 and acquired the remaining shares in 1983. The Government reduced its ownership interest in the company in 1987 by offering 60% of the shares to the general public and the company’s employees. In 1993, the Government’s shareholdings increased to 72.9% after the company offered a 'rights issue', of two shares for every one owned, to shareholders.

In 1997, the Commonwealth Development Corporation (CDC) purchased the Government’s shares in DOMLEC and became the major shareholder. In May 2004, WRB Enterprises and Dominica Social Security, in a joint effort bought 72.8% of CDC’s shares in DOMLEC. In April 2013, Light and Power Holding, a subsidiary of EMERA Corporation, became the majority shareholders of the electric utility. In 2014, the company was granted a non exclusive generation license and an exclusive transmission, distribution and supply license from the Independent Regulatory Commission.

Currently, the company serves 98% of the population of the Commonwealth of Dominica. DOMLEC operates three run-of-river hydro plants located at Laudat, Trafalgar and Padu in the Roseau Valley with installed capacity of 1.24 MW, 3.52MW and 1.8MW respectively. In addition, the company maintains two diesel stations at Fond Cole and Sugar Loaf with an installed capacity of 13.3MW and 6.8MW respectively. Total installed generation capacity and firm capacity as at December 2016 were 26,740 kWh and 18,060 kWh respectively. Total energy generation amounted to 111,788,823 kWh in 2016, of which 36,366,747 kWh or 32.53% was generated by hydropower and 75,422,076 kWh or 67.47% by diesel generators. As at December 2016, DOMLEC’s customer base stood at 36,467 customers.

# 1.2 PURPOSE OF THE REPORT

This is the first annual performance report prepared by the IRC. By conducting an annual performance review the IRC will be able to assess whether DOMLEC is meeting its regulatory objectives of providing reliable service to customers in a cost effective manner.

Our objectives are to:

Establish a base from which DOMLEC’s performance will be monitored overtime;

Calculate the performance indicators that target DOMLEC’s key functional areas and compare with previous periods, and benchmark against electric utilities in other jurisdictions

# 1.3 INFORMATION AND DATA

# The information and data utilized in this document have been retrieved from the Annual Reports of DOMLEC for the years 2012 to 2016. The EEI’s Report on US Investor Owed Electric Utilities (USIEU) 2014, reports submitted to the IRC by DOMLEC, in accordance with stipulations contained in its licence[[2]](#footnote-3). CARILEC’s Benchmarking Studies of Caribbean Utilities for 2013 and Annual Reports for GRENLEC and LUCELEC for the years 2012 to 2015. It should be noted that the analysis was constrained by the absence of data over some periods, and our inability to compare against all regional utilities.

**1.4 METHODOLOGY**

The IRC utilized financial, economic, operational and technical data to calculate key performance indicators to assess the performance of DOMLEC, and to perform a comparative analysis against regional and other international utilities where possible. These indicators cover the major functional areas of the company such as, generation, transmission and distribution and general operations.

The financial indicators comprise profitability ratios, liquidity ratios, and debt to capital ratio. The operational indicators comprise the number of customers, average tariff, operating cost per kWh, energy purchase and sales. The economic indicators include; energy sales per employees, number of customers per employee and energy consumption per capita. The technical indicators include; total installed capacity, distributed RE installed capacity, percentage of RE tied to the grid, system losses and system reliability indices.

The KPIs are used to compare DOMLEC’s performance against itself, in the first instance, and then against other regional entities and those in other jurisdictions where data are available.

The document is organized into two sections. Section one contains the financial and economic analysis and section two the technical analysis.

## 2.0 FINANCIAL ANALYSIS

In this document a number of financial indicators are utilized to assess the company’s financial soundness and sustainability in relation to other electric utilities. The assessments are made in four (4) areas-:

* Profitability - measures the ability of the utility to use its resources to generate earnings/ profit;
* Operating Efficiency - measures how well the utility uses its input to produce a given level of output;
* Capital Structure – measures how the utility finances its operation by using different sources of funds ( debt and equity);
* Liquidity- measures the ability of the utility to generate sufficient cash to cover short term obligations.

## 2.1 PROFITABILITY RATIOS

The profitability ratios presented in this report include profit margin, return on assets and return on equity. The higher the ratios, the more profitable are the firms. The objective of the ratios is to measure the ability of the company to generate earnings in comparison to its expenses and other relevant costs. The ratios are mainly used by management, investors and creditors for making decisions.

1. **Profit Margin**

Profit Margin measures a firm’s ability to generate profit at a certain level of sales. Companies strive to achieve a higher ratio over time by either generating more revenue or keeping expenses low, or a combination of both. This indicator is calculated as:

Profit Margin = Net Profit/Sales

**Table 1- Profit Margin 2012 -2016**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  | **PROFIT MARGIN %** |  |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** | **Caribbean Electricity Utility Regional Average -CARILEC** | **US investors Owned Electric Utility Industry (Edison Electric Institute)** |  |
|   |   |   |   |   |   |  |
| 2012 | 7.64 | 8.62 | 7.35 | 8.40 | NA |  |
| 2013 | 8.94 | 7.34 | 8 | 9.30 | NA |  |
| 2014 | 14.5 | 8.68 | 10.13 | NA | 7.49 |  |
| 2015 | 13.1 | 12.04 | 12 | NA | NA |  |
| 2016 | 14.48 | NA | NA | NA | NA |  |

*Source[[3]](#footnote-4)*

From the statistics presented in table 1, it can be seen that DOMLEC’s profit margin increased at a satisfactory level from 2012 to 2016. The company realized a compounded growth of 80% over the five year period. From 2014 to 2016, DOMLEC’s profit margin remained within the acceptable limit between 10% and 20% for the electric industry[[4]](#footnote-5). Moreover, the company experienced its highest profit margin of 14.54% in 2014. This was largely attributed to the growth in revenue, a reduction in expenditure, and an adjustment in deferred income tax of $3.3 million.

DOMLEC attained higher profit margins in comparison to LUCELEC and GRENLEC in the years 2013, 2014 and 2015. Although the US economy is significantly larger in comparison to the OECS, the three electric utilities as depicted in the table attained a higher profit margin than that of US Investors Owned Electric Utilities in 2014, the only period for which data are available.

1. **Return on Assets (ROA)**

Return on Assets is an indicator that shows how profitable a utility is. It measures how effectively assets are used to generate earnings. Only noncurrent assets are considered. The ratio is calculated as:

Return on Assets (ROA) = Net Income/Assets

**Table 2- Return on Assets 2012-2016**

|  |  |
| --- | --- |
|   | **RETURN ON ASSETS (ROA) %** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |  **Caribbean Electricity Utilities Regional Average -CARILEC** | **US investors Owned Electric Utility Industry** |
|   |   |   |   |   |   |
| 2012 | 6.73 | 8.09 | 15.64 | 5.2 | NA |
| 2013 | 6.96 | 8.24 | 18 | 5.70 | NA |
| 2014 | 11.66 | 6.85 | 23.26 | NA | 3.12 |
| 2015 | 9.45 | 10.55 | 23.40 | NA | NA |
| 2016 | 9.36 | NA | NA | NA | NA |

A review of table 2 shows that DOMLEC’s return on assets was relatively low in 2012 and 2013 compared to the OECS comparators. However, the indicator increased considerably in 2014 and remained consistent in 2015 and 2016. The company attained a compounded growth rate of 59% from 2012 to 2016. This is an indication that management utilized the assets effectively to generate revenue from normal operations. DOMLEC’s most profitable year was 2014 when profit stood at $14.8 million.

**C.** **Return on Equity**

Return on equity measures how well a company utilizes shareholders funds to generate profit. It should be higher than the cost of capital. The ratio is calculated as:

Return on Equity = Net Income/Shareholders Equity

 **Table 3- Return on Equity 2012 to 2016**

|  |  |
| --- | --- |
|  | **Return on Equity %** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 12.05 | 14.12 | 18.96 |
| 2013 | 11.79 | 10.75 | 19 |
| 2014 | 17.11 | 11.86 | 20.56 |
| 2015 | 12.95 | 14.43 | 17.89 |
| 2016 | 12.45 | NA | NA |
|  |  |  |  |

DOMLEC’s return on equity was fairly consistent from 2012 to 2016, except for 2014, when it was much higher. A compounded growth of 14.76% was achieved from 2012 to 2016. This indicator signals to potential investors and shareholders that the company’s financial performance is strong. It also implies that shareholders can expect reasonable returns on investment because their funds were used effectively to generate profits. In fact, the company realized high profit levels from 2014 to 2016.

**2.2 CAPITAL STURCTURE**

Capital structure refers to the way in which a company finances its operation. It is made up of a mix of debt and equity. The indicator analyzed in the report is the debt to capital ratio.

**Debt to Capital Ratio**

Debt to Capital Ratio measures the extent to which a company is dependent on debt to finance its daily operations, and gives an indication of the level of risk to the utility’s shareholders.

The ratio is calculated as:-

Debt to Capital Ratio = Debt /(Debt + Shareholder’s Equity)

**Table 4 – Debt to Capital Ratio 2012 -2016**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|   |   | **Debt Capital Ratio - %** |
|   | **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** | **Caribbean Electricity Utilities Regional Average -CARILEC** | **US investors Owned Electric Utility Industry** |
|   |   |   |   |   |   |   |
| 2012 | Debt | 40 | 47 | 38 | NA | NA |
| Equity | 60 | 53 | 62 |  NA | NA |
| 2013 | Debt | 35 | 43 | 30 | 49.9 |  NA |
| Equity | 65 | 57 | 70 | 50.1 | NA |
| 2014 | Debt | 30 | 39 | 20 | NA | 42 |
| Equity | 70 | 61 | 80 | NA | 58 |
| 2015 | Debt | 25 | 35 | 13 | NA |  NA |
| Equity | 75 | 65 | 87 | NA |  NA |
|  2016 | Debt | 20 | NA | NA | NA |  NA |
| Equity | 80 | NA | NA | NA |  NA |
|  |  |  |  |  |  |  |

As can be seen from table 4 DOMLEC’s debt to capital ratio declined at a steady rate, primarily because equity grew at a satisfactorily rate from 2012 to 2016. The company experienced its lowest debt to capital ratio of 20% in 2016. In fact, all three OECS utilities evidenced a similar pattern of declining debt to capital ratios. In fact, DOMLEC’s debt to capital ratio fell below the acceptable limit between 35% and 65% for the industry[[5]](#footnote-6). It would seem that the companies took decisions to move away from debt financing and to utilize retained earnings.

DOMLEC’s debt level was lower than LUCELEC from 2012 to 2015, and was also lower than that of the USIEU. Overall, GRENLEC recorded the lowest debt to capital ratio from 2012 to 2015.

**2.3 LIQUIDITY RATIO**

The Liquidity ratio measures the ability of a firm to pay off short term obligations as they become due. The liquidity ratios presented in this document are; cash flow interest cover, current ratio and operating cost covered by revenue. However, no information was available from CARILEC and the USIEU in respect of cash flow interest cover. The higher the ratio, the more liquid is the company.

**a. Cash Flow Interest Cover**

Cash Flow Interest Cover measures the ability of a company to pay interest from generated cash flow, the higher the ratio, the more liquid the company. The indicator is calculated as:

Cash Flow Interest Coverage = Operating cash flow + paid interest \* (1-t) / Paid interest

 \*(1-t) (Where: t is income tax rate)

 **Table 5: Cash flow Interest Cover 2012-2016**

|  |  |
| --- | --- |
|    | **Cash Flow Interest Cover** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 10.15 | 7.78 | 3.38 |
| 2013 | 12.39 | 4.56 | 3.24 |
| 2014 | 14.74 | 4.46 | 6.31 |
| 2015 | 14.73 | 8.19 | 4.15 |
| 2016 | 23.33 | NA | NA |

The indicator shows that DOMLEC’s cash flow interest cover increased at a satisfactory level from 2012 to 2016 and was significantly higher in 2016. DOMLEC’s indicator well exceeded the target limit of 1[[6]](#footnote-7). As can be seen, the statistic grew by 129% from 2012 to 2016. This illustrates that DOMLEC’s liquidity position is rather solid as the company is able to settle interest payment comfortably. From 2012 to 2015, DOMLEC’s liquid position was also better than that of GRENLEC and LUCELEC. Notably, LUCELEC and GRENLEC’s cash flow interest cover was also above the target limit of 1.

1. **Current Ratio**

The Current Ratio is an indicator that measures the utility’s ability to repay short term obligations. The indicator is calculated as:

Current Ratio = Current Assets/Current Liabilities

 **Table 6: Current Ratio 2012 to 2016**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  | **Current Ratio (Times)** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 1.84 | 2.04 | 2.70 |
| 2013 | 1.92 | 2.36 | 2.52 |
| 2014 | 2.13 | 1.91 | 2.33 |
| 2015 | 2.40 | 2.63 | 3.70 |
| 2016 | 2.16 |  NA |  NA |
|  |  |  |  |

DOMLEC’s current ratio increased at a fairly stable rate from 2012 to 2016. The company’s current ratio was well above the acceptable limit of 1.1 times for the industry[[7]](#footnote-8). The compounded growth over the past 5 years was 17.96%. DOMLEC’s best performing year was 2015 when the current ratio was 2.40 times. This suggests that the company was able to settle its short term obligations. Notwithstanding, DOMLEC’s current ratio was lower in comparison to LUCLEC and GRENLEC.

1. **Operating Cost Covered by Revenue**

Operating Cost Covered by Revenue measures the utility’s ability to cover operating expenditure from total revenue. The ratio is calculated as:

Operating cost covered by Revenue = Operating Cost/Revenue

 **Table 7: Operating Cost Covered by Revenue 2012 to 2016**

|  |  |
| --- | --- |
|   | **Operating Cover Covered by Revenue %** |
|   | **DOMLEC** | **LUCELEC** | **GRENLEC** |
| 2012 | 91 | 86 | 84 |
| 2013 | 83 | 86 | 83 |
| 2014 | 81 | 85 | 80 |
| 2015 | 72 | 83 | 76 |
| 2016 | 63 |  NA |  NA  |

A review of table 7 indicates that the operating ratio declined significantly from 91% in 2012 to 63% in 2016. As seen, DOMLEC’s ratio remained well within the acceptable limit, that is, below 100%[[8]](#footnote-9) for the industry. This signaled that the company continues to be liquid. DOMLEC’s most favourable year was 2016 when the ratio stood at 63%. Overall, the three utilities are within the acceptable limit but DOMLEC’s performance was noteworthy.

**2.4 MANAGEMENT EFFICIENCY**

The management efficiency ratio measures the firm success in managing its assets (input) to generate sales (output). The efficiency ratio presented in this report is days of outstanding accounts receivables.

1. **Days of Outstanding Accounts Receivables**

The indicator shows a company’s average collection period. It measures how quickly a company collects payment from customers.

The ratio is calculated as:

Days of Accounts Receivable = 365/Annual Operating Revenues/Year-end Accounts

 Receivable

 **Table 8: Day of Outstanding Accounts Receivables 2012-2016**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|   | **Days of Outstanding Accounts Receivables** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 50 | 58 | 64 |
| 2013 | 52 | 64 | 65 |
| 2014 | 51 | 46 | 56 |
| 2015 | 46 | 65 | 42 |
| 2016 | 40 | NA | NA |

As can be seen from table 8, DOMLEC’s number of days to collect outstanding accounts receivables declined steadily from 2012 to 2016. The most significant reduction occurred from 2015 to 2016 when the number of days was recorded at 46 and 40 days respectively. This was influenced by the growth in the number of prepaid customers following the installation of AMI from 2013. Through this initiative, the company’s cash position improved. It was also noted that the number of days to collect outstanding account receivables was lower for DOMLEC than that of GRENLEC and LUCELEC from 2012 to 2014 but higher when compared to GRENLEC in 2015.

**3. ECONOMIC INDICATORS**

The indicators presented in this report include sales per employee, customers per employee and consumption per capita.

**Energy Sales per Employee (kWh)**

This indicator measures the labour productivity of employees. In essence, an increase in sales per employee is evidence that workers are being utilized more effectively to generate revenue. The ratio is calculated as:

Sales per Employee (kWh) = Total Electricity Sold in kWh/number of Full time Employees

 **Table 9: Sales per Employee (kWh) 2012 to 2016**

|  |  |
| --- | --- |
|  | **Sales per Employee (kWh)** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 395,232 | 1,362,746 | 769,102 |
| 2013 | 397,062 | 1,393,662 | 754,550 |
| 2014 | 416,247 | 1,333,088 | 792,751 |
| 2015 | 398,983 | 1,355,852 | 793,270 |
| 2016 | 414,099 |  NA |  NA |

The table shows that DOMLEC’s sales per employee increased consistently until 2014, then declined significantly in 2015 and rebounded in 2016. The sharp decline observed in 2015 was as a result of Tropical Storm Erica which damaged infrastructure thereby reducing energy production and consequently energy sales. As the company’s recovery continued in 2016 its sales improved markedly. It was noted that DOMLEC’s indicator was considerably lower in relation to LUCELEC and GRENLEC from 2012 to 2015 but this can be easily explained by the larger populations in those jurisdictions.

 **Number of Customers per Employee**

The number of customers per employee (kWh) measures the labor efficiency of the utility. The indicator is calculated:

Customers per employee = Total Customers/Number of Full Time Employees

 **Table 10-a Number of Full Time Employees**

|  |  |  |  |
| --- | --- | --- | --- |
|   | **Number of Full Time Employees** |  |  |
| Years | **DOMLEC** | **LUCELEC** | **GRENLEC** |
| 2012 | 228 | 249 | 235 |
| 2013 | 225 | 240 | 233 |
| 2014 | 219 | 249 | 226 |
| 2015 | 238 | 245 | 232 |
| 2016 | 240 | NA | NA |

 **Table 10-b Number of Customers per Employee 2012 to 2016**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  **Number of Customers per Employee** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 153 | 248 | 194 |
| 2013 | 158 | 274 | 196 |
| 2014 | 161 | 269 | 205 |
| 2015 | 150 | 269 | 205 |
| 2016 | 152 |  NA | NA |

In respect of DOMLEC, the number of customers per employee declined marginally from 2012 to 2016. Over the period of five (5) years, the number of customers per employee increased in all three electric utilities in the OECS. It should be noted that the number of full time employees at DOMLEC increased while it decreased at LUCELEC and GRENLEC.

**c. Electricity Consumption (kWh) per Capita**

Consumption per capita shows a country’s average electricity consumption per individual. The indicator is calculated as:

Consumption per Capita = Total Energy Sold/ Total population

 **Table 11: Electricity Consumption Per Capita (kWh) 2012 - 2016**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Countries** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Trinidad  | 6,628 | 6,876 | 7,456 | NA | NA |
| Suriname | NA | NA | 3,243 | NA | NA |
| Jamaica | 1,154 | 1,126 | 942 |  |  |
| Grenada | 1,658 | 1,619 | 1,738 | 1764 | NA |
| St Lucia | 1,970 | 1,956 | 1,922 | 1,953 | NA |
| Dominica | 1,263 | 1,254 | 1,273 | 1,326 | 1,388 |
| Guyana | NA | NA | 1,087 | NA | NA |
| St Kitts | NA | NA | 3,821 | NA  | NA |
| St Vincent | NA | NA | 977 | NA | NA |
| Ivory Coast | NA | NA | 244 | NA | NA |
| India | 725 | 765 | 768 | NA | NA |
| Antigua | NA | NA | 3,205 | NA | NA |

 Source[[9]](#footnote-10)

 Source[[10]](#footnote-11)

Table 11 shows that the electricity consumption per capita in Dominica increased significantly over the past 5 years. The statistic grew by 9.47% from 2012 to 2016. The major growth was attained from 2014 to 2016 when energy sales (kWh) increased by 2%, 4.2% and 4.7% respectively. This gives a clear indication of the increase in electricity demand among the population.

In comparison to most of the OECS countries, Dominica’s electricity consumption per capita was considerably lower except that of St. Vincent in 2014 (977 kWh). Although the OECS countries are comparable in terms of geographical size and gross domestic product (GDP), the low consumption per capita was perhaps a reflection of the low tourism and manufacturing sectors in Dominica.

Additional data[[11]](#footnote-12) shows Dominica GDP per capita as (7,539) in 2014. Moreover, St. Kitts/Nevis and Antigua experienced the highest (GDP) per capita of 15,029 and 12,363 respectively in 2014. Also in 2014, the two countries attained the highest electricity consumption per capita among the OECS countries. These indicators were most likely influenced by the high tourist arrivals to these islands, resulting in high occupancy and increased economic activities.

As can be seen outside of the OECS jurisdiction, Trinidad and Tobago consumption per capita (7,456 kWh) in 2014 was considerably higher than that of the OECS islands. Trinidad and Tobago consumption per capita grew by 12.48% from 2012 to 2014. Conversely, the OECS countries’ energy consumption per capita was much higher than that of Jamaica and fairly higher when compared to Guyana (1,087 kWh). When compared to countries out of the Caribbean, Ivory Coast and India was much lower. This may be primarily due to the level of poverty and low accessibility to electricity.

**4. ORGANIZATIONAL PERFORMANCE**

1. **Average Tariff**

The average tariff measures the average price paid to the electric utility for each kWh of electricity consumed over a period in time. The indicator is calculated as:

Average Tariff = Total Revenue from Electricity billed/Electricity billed in kWh

 **Table 12 Average Tariff 2012 -2016**

|  |  |
| --- | --- |
|   | **Average Tariff in - EC$** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 1.17 | 0.88 | 1.09 |
| 2013 | 1.10 | 0.86 | 1.08 |
| 2014 | 1.10 | 0.85 | 1.05 |
| 2015 | 0.98 | 0.92 | 0.81 |
| 2016 | 0.68 | NA |  NA |

DOMLEC’s tariff structure comprises of energy charge per kWh, minimum monthly charge and fuel surcharge to consumers of electricity. The average tariff dropped steadily from 2012 to 2016 but the decrease was most pronounced in 2016. As noted from table 12, the company’s average tariff fell by 41.88% over the past five years. This was primarily due to the reduction in the price of oil on the global market and the consequent reduction in the cost of fuel to DOMLEC. Notably, DOMLEC’s average tariff was higher when compared to the two electric utilities in the OECS.

**b. Operating Cost per (KWh)**

Operating cost per kWh measures how much it cost the utility to generate a kWh of electricity. The lower the indicator, the more efficient is the utility. The indicator is calculated as:

Operating Cost per kWh = Operating cost/Gross generation

 **Table 13 Operating cost per kWh 2012 to 2016**

|  |  |
| --- | --- |
|   | **Operating cost per kWh – EC$** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 0.91 | 0.77 | 0.84 |
| 2013 | 0.83 | 0.87 | 0.81 |
| 2014 | 0.81 | 0.74 | 0.76 |
| 2015 | 0.72 | 0.69 | 0.56 |
| 2016 | 0.63 |  NA  |  NA  |

As can be seen, DOMLEC’s operating cost per kWh decreased consistently from year to year, and fell considerably in 2016. Overall, the indicator declined by 30.71% from 2012 to 2016. In fact, the reduction in this indicator was caused mainly by the decrease in fuel cost. DOMLEC’s operating cost per kWh was slightly higher when compared to the other two electric companies. Actually, GRENLEC recorded the lowest operating cost per kWh and this suggests that the company operated more efficiently in comparison to LUCELEC and DOMLEC.

**c. Customer Base**

 **Table 14 Number of Customers 2012 - 2016**

|  |  |
| --- | --- |
|   | **Number of Customers** |
| **Years** | **DOMLEC** | **LUCELEC** |  **GRENLEC** |
|   |   |   |   |
| 2012 | 34870 | 61849 | 45042 |
| 2013 | 35518 | 65862 | 45765 |
| 2014 | 355354 | 67100 | 46478 |
| 2015 | 35792 | 67011 | 47597 |
| 2016 | 36467 | NA | NA |

Table 14 shows that DOMLEC’s customer base increased steadily from 2012 to 2016. The company recorded the largest number of customers in 2016. The customer base grew by 4.57% over the period of five (5) years. DOMLEC’s customer base continues to be low in relation to LUCELEC and GRENLEC. This is mainly because Dominica’s population is smaller in comparison to that of St Lucia and Grenada. It was also noted that LUCELEC and GRENLEC’s customer base increased at a faster rate, 8.34% and 5.67% respectively, when compared to DOMLEC.

**d. Energy Purchased**

 **Table 15 Energy Purchased 2012- 2016**

|  |  |
| --- | --- |
|   | **Energy Purchased (kWh 000s)** |
|  **Years** | **DOMLEC** | **LUCELEC** | **GRENLEC** |
|  |   |   |   |
| 2012 |  117  |  Nil |  Nil |
| 2013 |  60  |  Nil | Nil |
| 2014 |  131  |  Nil |  621  |
| 2015 |  95  |  Nil |  1,011  |
| 2016 |  114  |  Nil | NA  |

In 2010, DOMLEC began purchasing energy from the distributed generators. As at December 2016, eighteen (18) distributed generators were selling excess energy to the Grid. The trend showed that the lowest quantum of energy was purchased in 2013 while the largest amount was purchased in 2014. Actually, there was a minimal decrease in energy purchased of 2.57% from 2012 to 2016. As can be seen, between 2014 and 2015 the quantum of energy purchased by GRENLEC increased by 63%.

**e. Energy Sales**

**Table 16 Energy Sales 2012-2016, kWh 000s**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **2012** | **2013** | **2014** | **2015** | **2016** |
| **DOMLEC** |   |   |   |   |   |
| Domestic |  40,795  |  40,800  |  41,684  |  43,256  |  45,847  |
| Commercial |  38,692  |  37,631  |  37,503  |  39,163  |  40,820  |
| Industries |  7,868  |  7,949  |  8,721  |  9,260  |  9,492  |
| Hotel  |  1,071  |  1,192  |  1,377  |  1,299  |  1,245  |
| Streetlight  |  1,697  |  1,767  |  1,874  |  1,980  |  1,980  |
| **TOTAL** |  **90,123**  |  **89,339**  |  **91,159**  |  **94,958**  |  **99,384**  |
| **LUCELEC** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Domestic |  112,272  |  112,743  |  111,922  |  116,133  |  NA  |
| Commercial |  198,847  |  193,199  |  191,294  |  192,442  |  NA  |
| Industries |  17,679  |  17,624  |  17,673  |  17,999  |  NA  |
| Streetlight  |  10,526  |  10,913  |  11,050  |  10,966  |  NA  |
| **TOTAL** |  **339,324**  |  **334,479**  |  **331,939**  |  **337,540**  |  |
| **GRENLEC** | **2012** | **2013** | **2014** | **2015** | **2016** |
| Domestic |  69,123  |  68,455  |  68,229  |  70,083  |  NA  |
| Commercial |  98,783  |  96,822  |  100,432  |  103,664  |  NA  |
| Industries |  5,845  |  5,907  |  5,803  |  5,594  |  NA  |
| Streetlight  |  4,680  |  4,627  |  4,698  |  4,698  |  NA  |
| **TOTAL** |  **178,431**  |  **175,811**  |  **179,162**  |  **184,039**  |   |

From the table above, it is evident that energy sales grew over the five year period by 10.28%. The increase in consumption of energy was mainly attributed to the growing demand for electricity among domestic and commercial customers. On the basis of information obtained from business entities in Dominica, the sales of electric appliances primarily air condition units and refrigerators have increased steadily over the year. Moreover, the reduction in fuel cost on the global market has a direct effect at lowering fuel surcharge.

DOMLEC’s energy sales were lowest among the three electric utilities in the OECS. This is partly because the company’s customer base is rather smaller when compared to LUCELEC and GRENLEC. Furthermore, the level of economic activity in St Lucia and Grenada is higher than in Dominica. As can be seen, energy demand among commercial and industrial customers in LUCECLEC and GRENLEC was much higher than DOMLEC’s figures. However, further analysis shows that DOMLEC’s energy sales grew at a faster rate, 5.37%, in relation to LUCELC’s 1.48% and GRENLEC’s 3.14% respectively from 2012 to 2015.

#  5.0 SECTION TWO

# 5.1 GENERATION

**a. Total Installed Generation Capacity including distributed RE**

Figure 1 above depicts the total installed generation capacity which is the sum of DOMLEC’s total generation provision and that of the entire grid connected RE systems that are licensed.

DOMLEC’s reported total installed generation capacity remained at 26,740 kW throughout the five year period. The licensed distributed RE installed capacity for each year is stated below.

**b. Distributed RE Installed Capacity**

The graph below depicts the distributed RE Installed (cumulative) capacity over the five year period with percentage increases over the previous year.

As can be seen from the graph the grid has experienced a steady increase in distributed RE, specifically PV systems. There was approximately a 59% increase of installed systems in 2015. This was the highest recorded increase in installed distributed PV for the period.

This increase occurred due to the fact that more commercial entities invested in distributed PV installations in order to reduce their electricity bill from DOMLEC since the fuel surcharge at that point was still very high.

Distributed PV installations have slowed down as the cap cited between DOMLEC and the IRC in DOMLEC’s interconnection policy was reached. This cap is currently set at 6% of the peak load and is equivalent to 1066 kW. A review of this cap is in process as DOMLEC is performing a grid connected intermittent renewable energy penetration (IREP) study in order to arrive at the optimum quantity of distributed RE systems that could be connected to the public grid.

## c. Percentage RE Capacity tied to the Grid

Figure 3 above displays the percentage of distributed RE yearly generation in kWh contribution to the grid. As can be seen, the highest output of distributed RE generation was in 2012 at 0.13%. Energy output from distributed RE declined to less than half that amount (0.06%) in 2013. The non-operation of the Rosalie wind turbine was the main reason for this decline. The year 2014 saw the second highest increase as more PV units were added to the grid. This almost sinusoidal type of energy output over the period could indicate, on the one hand that customers used more of their self generated energy, but on the other hand that some units were faulty.

## d. Proportion of Diesel and Hydro Generation

Figure 4 below shows the proportion of Diesel and Hydro generation over the five year period. The two most significant drops below 30% were recorded in the years 2012 and 2015.

In 2012, there was an issue with the Padu turbines and one of the units at New Trafalgar was out of service as it developed a fault. This caused a reduction in output.

The drop in Hydro output in 2015 was due to the passage of Tropical Storm Erika, and the consequent damage to the hydro infrastructure. The output of the hydro facility was reduced for six months following the storm.

The Hydro output is significantly dependent on the availability of water and that in turn is dependent on rainfall. Less rain means less water and translates into reduced output from the Hydro plants.

The normal output of the hydro is in the range of 30% to 37% of total generation. However, this output can be affected by reduced capacity due to low rainfall, disasters or generator failure.

Figure 4(a) – Percentage increase/decrease hydro/diesel contributions

 Figure 4(a) shows the trending percentage increase/decrease in the contribution between Diesel and Hydro generation from year to year over the period.

As can be seen above, low output was realized from hydro during the years 2012, 2014 and 2015. At those annual points the hydro was affected either by generator failure or by a disaster that compromised part of the hydro infra-structure. On the other hand, the thermal generation suffered from generator failure affecting the total diesel output in 2013 and 2016.

Hydro generation is cheaper than thermal (Diesel) generation. As such, the more output derived from the Hydro the less thermal generation is needed. This translates to a reduction in tariff for all customers.

## e. Total Energy Generated, Delivered and Sold

The energy generated, delivered and sold over the period is shown in figure 5 above. As can be seen the energy usage rose steadily from 2013 by the percentages shown below in figure 5a.

From the above trending curve, it can be seen that DOMLEC experienced a 0.9 percent drop in gross generation in 2013. This was followed by corresponding drops in net generation and energy sold by 0.74% and 0.86% in 2013, respectively.

From 2014, there was a steady increase in overall gross and net generation, with corresponding increases in the energy sold.

Overall, this shows that the company experienced positive growth in demand over the last three years (2014 to 2016) that would translate to an improvement in its financial well being.

A 10.3% increase in energy sales was realized over the period 2012 to 2016. This increase in energy sales is not necessarily restricted to only an increase in energy consumption. The price of oil dropped significantly in 2015. As such, customers that stuck to their normal purchase received more energy for the same price as compared to previous years when the fuel cost was higher. This is primarily responsible for the steep increase in energy sales in 2015 and 2016.

## f. Capacity and Load Factors

**Capacity Factor**

The net Capacity Factor represented by the color blue in figure 6 above is the ratio of the generation plant output over a period of time, to its potential output if it were possible for it to operate at full nameplate capacity continuously over the same period of time.

This quantity can vary depending on numerous factors, ranging from design of the installation, fuel type, location and type of electricity production. It can also include downtime due to reliability, or scheduled and unscheduled maintenance. Thus, it is computed over the period of one year.

DOMLEC’s capacity factors over the period are within the range expected for diesel/hydro combination power plant and are typical of the same.

**Load Factor**

The Load Factor is defined as the average load divided by the peak load over a specified period of time. A high load factor means that power usage is relatively constant while a low load factor shows that occasionally a high demand is set.

Its value is always less than one (1), as maximum demand is always higher than average demand.

DOMLEC seems to be maintaining its Load Factor within the accepted limits for the type of plant that it operates as shown in figure 6 above.

## g. Ratio of Firm Capacity over Peak Demand.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 2012 | 2013 | 2014 | 2015 | 2016 |
| Ratio | 1.05 | 1.03 | 1.01 | 1.01 | 1.02 |

As can be seen, over the period 2012 to 2016 there is a slight decrease in firm capacity over peak demand, from 1.05 to 1.02. It demonstrates that DOMLEC’s capacity to meet the peak dropped from 2012 to 2014 (by 3.96%) and increased from 2014 to 2016 (by 0.98%).

This ratio is close to 1:1 which indicates that DOMLEC can barely meet the peak demand. However, by working closely with the IRC, DOMLEC has in place a contingency plan that in the event of any significant shortfall in their generation capacity, the first course of action is to allow the biggest customers who can self-generate to come off the grid. This has proven very effective over the period.

With the establishment of the proposed 7MW geothermal plant by 2020, this ratio should increase.

This ratio can be used to represent security of supply by indicating that there is enough supply to meet the expected demand.

## h. Thermal Generation Specific Fuel Consumption

Figure 8 depicts the trend in average specific fuel consumption for DOMLEC’s diesel plant over the five year period. DOMLEC’s generation license specifies that it should maintain its thermal plant fuel efficiency at no less than 17.25 kWh/Imperial gallon.

As can be seen from the above graph, from 2012 DOMLEC has experienced an increase in its fuel efficiency for all thermal plants.

The energy efficiency of a conventional thermal generator is considered scalable energy produced as a percentage of the heating value of the fuel consumed.

Questions surround the reliability of this specific quantity as DOMLEC has been challenged in ensuring accurate metering of the fuel used by its thermal generators. Some of the generators’ fuel usage has most times been calculated by utilizing an algorithm when there are faulty meters. Empirically it can be shown that whenever an algorithm is utilized there can be a positive or negative margin of error that can skew the calculation.

**5.2 TRANSMISSION AND DISTRIBUTION**

1. **System Losses**

System losses comprise of two components. They are:

1. Technical losses; and
2. Non-technical losses.

Technical losses cannot be avoided as they are incurred due to the conductor’s resistance. However, Non-technical losses can be due to human error, pilferage, among other extraneous factors.

Non-technical losses can be derived by subtracting technical losses from total losses. There are various approaches to calculate total network technical losses that are quite accurate and can be used to deduce the non-technical losses. In this report total losses are being reported.

Distribution losses are displayed above in Figure 8 in red; and in percentages as per the formula utilized. As can be seen, based on DOMLEC’s loss reduction program that started early in the last decade the distribution losses have progressively declined. Ongoing efforts in that area can only seek to reduce the same to its natural threshold which could be a minimum of 7%.

From 2015, IRC’s investigation into losses revealed that the energy metering was on the wrong side of the generator station power transformers at a few of DOMLEC’s power stations. DOMLEC was then ordered to have the same corrected; thus, the reasons for the slight increase from 2015 to 2016 in Network Delivery Losses since the correction from 8.6% to 9.28% respectively.

 A reduction in distribution losses reflects the work done by DOMLEC in improving the efficiency of distributing power to their customers. This should translate into savings for the company. However, as can be seen above, when the metering was corrected in 2015 the network delivery losses were on the increase and therefore, could serve to mitigate any gains that they would have received from reduced distribution losses.

1. **System Reliability Indices**

Most people expect that their supply of electrical energy will be continuously available on demand. Reliability of supply is therefore an important indicator of service delivery. System reliability indicator include; SAIDI, SAIFI and CAIDI

System Average Interruption Duration Index (SAIDI) is the average outage duration for each customer served. System Average Interruption Frequency Index (**SAIFI)** represents the average number of interruption that a customer experiences over a specific period. The formulas used to calculate SAIDI and SAIFI are included in the Appendix.

CAIDI which is calculated by dividing SAIDI by SAIFI gives the average outage duration that any given customer would experience. CAIDI can also be viewed as the average restoration time.

Figure 9 above depicts the aggregated SAIDI, SAIFI and CAIDI over the period. As can be seen from the graph, between 2014 and 2015 there was a slight increase in SAIDI with SAIFI tapering downward.

In 2016, significant decreases of 32.4% and 33.1% were realized over 2015 for SAIDI and SAIFI respectively, however, over the same period CAIDI remained relatively flat.

Figures 9a and 9b below depict SAIDI, SAIFI and CAIDI for Transmission and Distribution (T&D) and Generation respectively.

As per Figure 9a, DOMLEC in trying to improve their reliability in T&D over the years has achieved a progressive decline in outage rates from 2012. Both the duration and frequency of outages have dropped by 64.24% and 61.41% respectively to 2016.

For Generation Figure 9b shows that SAIDI and SAIFI have remained within a specific range between 2012 and 2014. Spikes in the duration and frequency indices occurred in 2015, with SAIDI and SAIFI at an all time high. This was primarily due to the passage of Tropical Storm Erika. However, normalization occurred in 2016.

CAIDI is measured in units of time, often minutes or hours. It is usually measured over the course of a year, and according to IEEE Standard 1366-1998 the median value for North American utilities is approximately 1.36 hours.

DOMLEC has remained within the range of 1.4 and 2.2 hours. Though DOMLEC has reduced significantly the duration and frequency of interruptions it still needs to do work to achieve the IEEE milestone of 1.36 hours.

# 6.0 SUMMARY

This is the first attempt to benchmark DOMLEC’s performance. Going forward similar exercises will be conducted to track progress utilizing pertinent indicators.

From a technical point of view, efficiency in the utility’s operations is the main objective. Achieving reliability, low losses, offering a high quality service at fair prices are byproducts of improved efficiency. The indices that were chosen above gave a good representation of DOMLEC’s progress over the years.

It can, therefore, be safely established that DOMLEC has improved significantly in its operations over the last five (5) years. In future years as this report is further developed, and with the introduction of more benchmarking parameters, the IRC will utilize appropriate international standards by which DOMLEC can be compared with, so as to gauge its performance against best performing utilities.

# 7.0 CONCLUSION

The report focuses on a comparative analysis that addresses the progress made between 2012 and 2016 and the performance of similar utilities in the OECS. Several performance indicators utilized by the regulators, that target key aspects of the company’s operation such as Technical, Financial, Economical and Organizational performance were analyzed to determine whether or not growth was achieved in the general operation of the company. The indicators also indicated the level of efficiency or inefficiency denoted in the areas of generation, transmission and distribution of energy.

An overview of DOMLEC’s financial and organizational performance illustrated that between 2012 to 2016 profit grew by 63.10%. This was mainly due to a decrease in total expenditure of 25% over the same period. It was also influenced by the reduction in fuel costs on the global market from 2015. In general, the financial indicators showed that DOMLEC is financially sound. Most of the financial indicators showed that GRENLEC performed better than its counterparts in the OECS between 2012 and 2015.

The economic indicators showed that DOMLEC enjoyed growth in productivity and made best use of its resources in key functional areas.

**APPENDIX**

Technical Formulas

|  |
| --- |
| 1. Capacity Factor(%)=(Gross Generation (MWh)\*100/Total Installed Generation Capacity(MW)\*8760
 |

2. Delivery Losses(%)=(Net Generation MWh-Electricity Sold (MWh) \*100/Electricity Sold (MWh)

3. Distribution Losses(%)=(Electricity Delivered (MWh)-Electricity Sold(MWh)\*100/Electricity Delivered to

 Distribution Network

4. Load Factor(%)=(Gross Generation(MWh)\*100/Maximum Demand\*8760

 5. Specific Fuel Oil Consumption (kWh/L) = Total Fuel Oil Generation (kWh)/Total Fuel Usage(L) or (Imp. G)

**REFERENCES**

1. CARILEC’s Benchmark Studies of Caribbean Utilities, 9th – 10th Update 2012 , 2013

2. CARICOM Demographic and Economic Indicators,” last modified June 1, 2016

<http://www.Caricom> Stats.org/databases. html.

3. DOMLEC. Annual Reports 2012 -2016.

4. EEI. 2014. Financial Review of US Investors Owned Electric Utility Industry.

5. Electricity Supply Act. 10 of 2006

6. Generation Licence for DOMLEC Document Ref. 2012/0012/D

7. GRENLEC. Annual Reports 2012 – 2015.

8. LUCELEC. Annual Report 2012 – 2015

9. List of Countries by Electricity Consumption. https.//en.wikipedia.org/wiki/list\_of countries-by-electricity consumption

10. Pacific Power Utilities. Benchmarking Report. 2011 Fiscal Year

11. Prasad Tallapragada V.S.N et al., Monitoring Performance of Electric Utilities Indicator and Benchmarking in Sub-Sahara Africa - The World Bank. 2009.

12. Regulated Industry Commission. T & TEC Annual Performance Indicator Report. 2014.

13. Review,<https://tradingeconomics.com/antigua-and-barbuda/gdp-per-capita>;

14. Review, https://tradingeconomics.com/st-kitts-and-nevis/gdp-per-capita

15. Review, http:// www. Domlec.dm/Index.php/our-history.

16. Transmission, Distribution and Suppy Licence for DOMLEC Document Ref. 2012/003/3

1. The information was obtained from [www.domlec.dm/index.php/our](http://www.domlec.dm/index.php/our)-history [↑](#footnote-ref-2)
2. Generation Licence for DOMLEC – Document Ref: 2012/002/D, Transmission, Distribution and Supply Licence. [↑](#footnote-ref-3)
3. Table 1 to 16 the data to compute the financial and economic indicators were identified from DOMLEC’s Annual Report 2012-2016, GRENLEC‘s Annual Report 2012 -2015, LUCELEC’s Annual Report 2012-2015, CARILEC’s Benchmark Studies of Caribbean Utilities (9th Update- Year 2012 and 10th Update Year 2013), EEI 2014 Financial Report of US Investors Owned Electric Utility Industry. [↑](#footnote-ref-4)
4. CARILEC’s Benchmark Studies of Caribbean Utilities 10th Update – Year 2013 [↑](#footnote-ref-5)
5. CARILEC’s Benchmark Study of Caribbean Utility 10th Update – year 2013 [↑](#footnote-ref-6)
6. RIC - T & TEC’s Annual Performance Indicator Report 2014 [↑](#footnote-ref-7)
7. Performance Benchmarking Report for Pacific Power Utilities 2011 [↑](#footnote-ref-8)
8. Monitoring performance of Electric Utilities Indicators and Benchmarking in Sub-Sahara Africa – The World Bank 2009 [↑](#footnote-ref-9)
9. List of Countries by Electricity Consumption. https.//en.wikipedia.org/wiki/list of countries-by-electricity consumption; [↑](#footnote-ref-10)
10. UN Data Electric power consumption per capita;

http://data.un.org/Data.aspx?d=WDI&f=Indicator\_Code%3AEG.USE.ELEC.KH.PC [↑](#footnote-ref-11)
11. CARICOM Economic Indicator.www caricomstats.org; <https://tradingeconomics.com/antigua-and-barbuda/gdp-per-capita>; https://tradingeconomics.com/st-kitts-and-nevis/gdp-per-capita.

. [↑](#footnote-ref-12)