Office of Utilities Regulation

Consultation Document

Proposed Criteria
Jamaica Public Service Company Limited
2019 - 2024 Rate Review Process

Publication Date 2018 May 1

OFFICE OF UTILITIES REGULATION

3rd Floor
PCJ Resource Centre
36 Trafalgar Road
Kingston 10
Jamaica

ABSTRACT

On 2016 January 27, the Jamaica Public Service Company Limited (JPS) was issued a new licence, the Electricity Licence, 2016 (the Licence). The Licence has introduced a number of changes in the regulatory framework governing the electricity sector. The two most notable changes are (1) the introduction of a revenue cap approach which replaces the price cap mechanism; and (2) the substitution of a forward looking approach to the calculation of the tariff for the historic test-year approach.

The forward looking approach requires that JPS' rates be based on, among other things, forecasted expenditure, revenue and demand. While such an approach allows for a better matching of JPS' activities with its revenues, it may be problematic if there are wide variances in the projections. Consequently, the Licence stipulates that rate setting ought be based on JPS' five-year Business Plan which should be guided by an Integrated Resource Plan produced by the Ministry responsible for energy and Criteria developed by the the Offices of Utilities Regulation ("OUR/Office").

The Licence requires that the Office publishes its Proposed Criteria and consults with stakeholders to arrive at the Final Criteria. Consequently, the purpose of this Consultation Document is to present an outline of the principles, methodologies and procedures that the OUR proposes to use in the rate setting exercise and to elicit comments and inputs from all stakeholders. All responses and comments will be taken into consideration in the process of development and promulgation of the Final Criteria.

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CONSULTATION PROCESS

Persons who wish to express opinions on this Consultation Document are invited to submit their comments in writing to the Offices of Utilities Regulation ("OUR) by post, facsimile or email addressed to:-

Office of Utilities Regulation
P.O. Box 593
36 Trafalgar Road
Kingston 10

Attention: Proposed Criteria – JPS 2014 – 2024 Rate Review Process

Fax: (876) 929-3635
E-mail: jpstariff@our.org.jm

Responses are requested by 2018 July 01

Responses which are not confidential pursuant to any relevant legislation, will be posted to the OUR's website (www.our.org.jm). Respondents are encouraged to supply their responses in electronic form to facilitate such postings.

Any information respondents deem confidential should be submitted separately and clearly identified as such. In the interest of promoting transparent debate, respondents are requested to limit as far as possible the use of confidentiality markings.

Comments on Responses

There will be a specific period for respondents to view other responses (non-confidential) and to make comments on them. The comments may take the form of correcting a factual error or putting forward counterarguments. As in the case of the responses, comments which are not confidential will be posted to the OUR's website.

Comments on responses are requested by 2018 July 15

Arrangements for viewing responses

This Consultation Document and the responses and comments received by the OUR will also be made available to the public through the OUR's Information Centre ("OURIC"). Persons who wish to view this Consultation Document, responses and comments should make an appointment by contacting:

Mr. Lyndon Adlam
Acting Manager – Records and Information Management
Telephone: (876) 968-6053
Fax: (876) 929-3635
Email: lyndon.adlam@our.org.jm

Individuals with appointments should visit the OUR's offices at:

3rd Floor, PCJ Resource Centre,
36 Trafalgar Road,
Kingston 10

Photocopies of selected responses and comments may be provided on request at a price which reflects the cost to the OUR.

Consultation Timetable

The timetable for the consultation is summarized in the table below:

Event	Date
Publish Consultation Document	2018 May 01
Responses to Consultation Document	2018 July 01
Comments on Responses to Consultation Document	2018 July 15
Publication of Determination Notice	2018 August 01

ACRONYMS, ABBREVIATIONS AND DEFINITIONS

AFUDC	-	Allowance for Funds Used During Construction
Base Year	-	shall comprise the latest twelve months of operation of the Licensed Business for which there are audited accounts adjusted to reflect:

1) Normal operation conditions, if necessary;

2) Such changes in revenues and costs as are known and measurable with reasonable accuracy at the time of filing and are demonstrated as part of a five (5) year Business Plan.

The Base Year shall represent the first year of the Business Plan

Business Plan	-	shall be a five (5) year plan incorporating the final criteria set by the Office, the Integrated Resource Plan (IRP) and forms the basis for the Rate Review process to establish the non-fuel rates.
CAIDI	-	Customer Average Interruption Duration Index
CAPM	-	Capital Asset Pricing Model
CCGT	-	Combined Cycle Gas Turbine
CIS	-	Customer Information System
CPI	-	Consumer Price Index
CRP	-	Community Renewal Program
CRR	-	Community Renewal Rate
Criteria	-	means the set of targets, conditions, methodologies and principles, which are promulgated by the Office that will govern the Rate Review Process.
CWIP	-	Construction Work In Progress
dI	-	The annual growth rate in an inflation and devaluation measure
dPCI	-	The rate of change of the Revenue Target
EGS	-	Electricity Guaranteed Standard
FAC	-	Fuel Adjustment Clause
FCAM	-	Fuel Cost Adjustment Mechanism
FOR	-	Forced Outage Rate

FRA	-	Fuel Rate Adjustment
GCT	-	General Consumption Tax
GDP	-	Gross Domestic Product
GOJ	-	Government of Jamaica
GIS	-	Geographic Information System
GS	-	Guaranteed Standards
IPP	-	Independent Power Producer
IRP	-	Integrated Resource Plan
JEP	-	Jamaica Energy Partners Limited
JPS	-	Jamaica Public Service Company Limited
KVA	-	Kilo Volt Amperes
KWh	-	Kilowatt-hours
Licence	-	The Electricity Licence, 2016
Licensed Business	-	means the business of Generation, Transmission Distribution, Supply and Despatch of electricity as carried out by the Licensee under the Licence.
LRMC	-	Long Run Marginal Cost
MAIFI	-	Momentary Average Interruption Frequency Index
MED	-	Major Event Day/s
MSET	-	Ministry of Science Energy and Technology
MHI	-	Manitoba Hydro International
MVA	-	Mega Volt Amperes
MW	-	Megawatt
MWh	-	Megawatt-hours
NG	-	Natural Gas
Office/OUR	-	Office of Utilities Regulation
O&M	-	Operating and Maintenance

OPEX	-	Operating Expenses (prudently incurred)
OUR Act	-	The Office of Utilities Regulation Act, 1995
PBRM	-	Performance Based Rate-Making Mechanism
PPA	-	Power Purchase Agreement
PPE	-	Property Plant and Equipment
RE	-	Renewable Energy
Rate Review Process	-	means the five (5) year rate setting process of the Office to determine the non-fuel rates to be charged by the Licensee as well as the targets related to the Licensee's performance.
Regulatory Accounts	-	means the reports on the financial and operational performance of the Licensee in such detail and format as designed by the Office.
Revenue Cap	-	is the revenue requirement approved in the last Rate Review process as adjusted for the rate of change in non-fuel electricity revenues (dPCI) at each Annual Adjustment date as set out in Exhibit 1 of Schedule 3 of the Licence.
ROE	-	Return on Equity
ROI	-	Return on Investment
ROR	-	Rate of Return
SAIDI	-	System Average Interruption Duration Index
SAIFI	-	System Average Interruption Frequency Index
T&D	-	Transmission & Distribution
TOU	-	Time of Use
WACC	-	Weighted Average Cost of Capital

1. INTRODUCTION

1.1 On 2016 January 27, the Jamaica Public Service Company Limited (JPS) was issued a new licence, the Electricity Licence, 2016 (the Licence), which fundamentally changed the regulatory framework and the methodology for the rate reviews and the calculation of the tariff. The two most notable changes in the Licence arise from (1) the introduction of a revenue cap approach which replaces the price cap mechanism; and (2) the substitution of a forward looking approach to the calculation of the tariff for the historic test-year approach.

1.2 While this new rate review methodology has the advantage of being more proactive in its orientation, it relies to a significant degree on the capacity of the utility and the regulator to forecast with a fair degree of accuracy, customer preferences; technological developments; changes in input prices; the nature of competition within the industry, as well as the trajectory of key macroeconomic variables and other elements.

1.3 Against, this background the Rate Review Process is a rigorous and time consuming one, which in order to be effective must begin at least two (2) years prior to the actual submission of the Rate Review application by JPS. A key part of the Rate Review Process is the publication of the Proposed Criteria and Final Criteria fifteen (15) months and nine (9) months respectively before JPS' submission of its Rate Review application.

1.4 The Rate Review Process is conducted at five (5) year intervals and the next such review is scheduled for 2019 April. The Criteria is designed to provide guidance to JPS with respect to the elements of the tariff mechanism that are integral to the Rate Review Process. In this respect it provides a channel for stakeholders in the industry to discuss critical issues related to the tariff, thereby minimizing the risk for significant disputes after the rates are determined by the Office of Utilities Regulation (Office/OUR).

1.5 The Licence requires that the Office publishes its Proposed Criteria and consults with stakeholders to arrive at the Final Criteria. Consequently, the purpose of this Consultation Document is to present an outline of the principles, methodologies and procedures that the OUR proposes to use in the rate setting exercise and to elicit comments and inputs from all stakeholders. All responses and comments will be taken into consideration in the process of development and promulgation of the Final Criteria.

Structure of the Consultation Document

1.7 This Consultation Document is structured into six (6) main sections as set out below:

- o   Introduction

- o   Legal and Regulatory Framework – discusses the Office's authority to conduct JPS' Rate Review Process;

- o Proposed Criteria: Five-year Rate Review Process – identifies the basis on which the utility's tariff will be established for the five (5) year period 2019 -2024;

- o Proposed Criteria: Annual Review Targets – addresses the proposed methodology to be used in the determination of the targets comprised in the Annual Revenue Target;

- o Proposed Criteria: Fuel Cost – examines how the OUR intends to set the heat rate target associated with the monthly fuel rate; and

- o Supporting Documents – lays out the additional information that JPS should provide in its Rate Review Application.

2. LEGAL AND REGULATORY FRAMEWORK

2.1 The primary legislative instruments governing the electricity sector in Jamaica are the Office of Utilities Regulation Act (OUR Act), the Electricity Act, 2015 and the Licence.

2.2 Pursuant to section 4(1) of the OUR Act, the OUR regulates prescribed utility services in Jamaica. Specifically, pursuant to section 4(1)(a) of the OUR Act, the Office has regulatory authority over, inter alia, the generation, transmission, distribution and supply of electricity.

2.3 Section 4(3) of the OUR Act provides, inter alia, that the Office in the performance of its functions thereunder may *"undertake such measures as it considers necessary or desirable to:*

   a) *"...*
   b) *protect the interests of consumers in relation to the supply of a prescribed utility service;*
   c) *...*
   d) *promote and encourage the development of modern and efficient utility services…"*

2.4 In addition, specific to the electricity sector, section 4(d) of the Electricity Act, 2015 provides that "the Office shall regulate the electricity sector generally." The Electricity Act, 2015 defines the Jamaican electricity market as a "Single Buyer" model and designates JPS as the Single Buyer. According to section 2 of the said Act, the Single Buyer (the sole owner of the national grid), is obliged to purchase electricity generated by independent power producers ("IPPs") and persons having net billing arrangements.

2.5 Pursuant to Condition 2 of the Licence, the generation of electricity may be carried out by several players in the industry, including JPS. However, Condition 2 further states that JPS

has the exclusive right to transmit, distribute and supply electricity throughout Jamaica until 2027 July 8.

2.6   With regard to the fixing of rates, section 11 of the OUR Act provides that except in instances where *"an enabling instrument specifies the manner in which rates may be fixed by a licensee or specified organization"*:

> *"(T)he Office may, either of its own motion or upon application made by a licensee or specified organization … or by any person, by order published in the Gazette prescribe the rates or fares to be charged by a licensee or specified organization in respect of its prescribed utility services".*

2.7   More specifically, Condition 15 (1) and (2) of the Licence, which deals with price controls, provides as follows:

> *"1. The Licensee is subject to the conditions in Schedule 3.*
>
> *2. The rates to be charged by the Licensee in respect of the Supply of electricity shall be subject to such limitation as may be imposed from time to time by the Office."*

2.8   Schedule 3 of the Licence, which is predicated on the revenue cap principle, sets out the principles and process of establishing rates for JPS. The revenue cap principle outlined in Schedule 3 of the Licence is as follows:

> *"The basis of rate setting shall be the revenue cap principle which looks forward at five (5) year intervals and involves the de-coupling of kilowatt hour sales and the approved revenue requirement."*

2.9   Schedule 3, paragraphs 6 to 9 of the Licence outlines the filing of JPS' Rate Review application. Paragraph 6 reads as follows:

> *"The Licensee shall file with the Office proposed non-fuel rate schedules and shall demonstrate that the non-fuel rates proposed for the various rate categories will generate the non-fuel requirement on average over the five year rate review process."*

2.10   Thereafter, the Office, within ten (10) working days of the submission of the Rate Review application, shall indicate its acceptance or rejection of the application. The Rate Review exercise begins in earnest upon acceptance of the rate filing and pursuant to Schedule 3, paragraph 26, the OUR is mandated to make a determination within one hundred and twenty (120) days after acceptance of the application.

2.11   Pursuant to Schedule 3, paragraph 10, the publication of an Integrated Resource Plan (IRP) by the responsible ministry, the establishment of the Criteria by the OUR and the development of a Business Plan by JPS are critical to the five-year rate setting process. Paragraph 10 reads as follows:

"The Business Plan, the most recent Integrated Resource Plan ("IRP"), the published final criteria, the Base Year and the cost of service study shall comprise the justification for the rate proposal of the Licensee."

2.12 Schedule 3, paragraphs 11 and 12 stipulates as follows:

"11.   The criteria published by the Office shall include but not be limited to the following:

- *Anticipated change to the demand for electricity;*
- *The productivity improvement;*
- *Allowed return on equity ("**ROE**"); and*
- *All annual targets.*

"12.   The published final criteria, the most recent IRP and the Base Year shall form the basis of the Business Plan."

2.13   Schedule 3, paragraphs 19 and 20 set out the timeline within which the Proposed Criteria is to be developed, consulted on and to publish the Final Criteria. The said paragraphs read as follows:

"19.   At least fifteen months before the commencement of the Rate Review, the Office shall publish the proposed criteria for the next Rate Review process.

20.   No later than twelve (12) months before the rate review, the Office shall initiate a consultative process by which the criteria should be arrived at. The Licensee and other stakeholders shall be afforded sixty (60) days to respond and comment on the criteria. Taking these responses and comments into consideration, the Office shall publish the final criteria no later than nine (9) months before the rate review."

3. PROPOSED CRITERIA: RATE REVIEW PROCESS

3.1 Publication and Consultation

3.1.1 The Licence stipulates that the Rate Review Process is to be conducted at five (5) year intervals, and shall be done in accordance with the revenue cap principle. Pursuant to the provisions of the Licence, the next Rate Review is scheduled for 2019 April. The Licence also outlines the "Pre-Rate Review Process activities", which is designed to facilitate transparency and efficiency in the Rate Review exercise. Based on the provisions of the Licence, the activities and timelines are summarized in Table 01 below:

Table 01 – Pre-Rate Review Activities and Timelines as Prescribed by the Licence

	ACTIVITY	DATE	BEFORE REVIEW (Months)	RESPONSIBLE AGENCY
A	Publication of IRP	2018 Jan	15	MSET
B	Publication of Proposed Criteria	2018 Jan	15	OUR
C	Consultation on Proposed Criteria			
C1	Commencement of Consultation	2018 Apr	12	OUR
C2	Feedback	2018 Apr - Jun	12 - 10	JPS/Stakeholders
C3	Publication of Final Criteria	2018 Jul	9	OUR
D	Submission of Rate Review Application	2019 Apr	-	JPS

3.1.2 The stipulated date for the initial publication of the Proposed Criteria, that is 2018 January, was not achieved due delays experienced with respect to the publication of the IRP. Having regard to the fact that the initial publication of the Proposed Criteria is meant to facilitate consultation with stakeholders, in light of the delay in the publication of the IRP, the OUR considers it prudent to proceed directly to the consultation process.

3.2 Revenue Requirement

3.2.1 The Licence defines Revenue Requirement as the non-fuel cost that the Licensee should recover through the non-fuel rates. This is so because the fuel cost net of efficiency adjustments is passed on directly to customers through the tariffs.

3.2.2 According to the provisions of the Licence, the Revenue Requirement under the revenue cap principle comprises two (2) main elements:[1]

1. The Return on investment (ROI) for the Licensed Business;[2]; and

2. Recovery of all prudently incurred operating expenses of the Licensed Business.

3.2.3 The Revenue Requirement may be expressed as follows:

$$RR = ROI + OPEX$$

Where:

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[1] Schedule 3, paragraph 27 of the Licence

[2] The ROI is net investment (Rate Base) in the Licensed Business multiplied by the WACC to calculate the capital recovery

RR	= Revenue Requirement
ROI	= Return on investment; and
OPEX	= Operating expenses (prudently incurred)

3.2.4 In delineating the Criteria, the two components of the Revenue Requirement will be examined, starting with the Rate of Return followed by the approved operating expenses.

3.3 Return on Investment

3.3.1 The ROI is the product of the utility's Rate Base (RB) and its Weighted Average Cost of Capital (WACC). Mathematically, this may be expressed as:

$$ROI = RB \; x \; WACC$$

Where:

| RB | = Rate Base |
| WACC | = Weighted Average Cost of Capital |

3.3.2 WACC combines the approved rate of return (ROR) of all category of funds in the business in proportion to each funds' contribution to the actual or deemed capital structure to yield a single ROR for the company. WACC (pre-tax) may be expressed as[3]:

$$WACC_{(pre-tax)} = \frac{r_D}{(1-t)}\left(\frac{D}{D+E}\right) + r_E\left(\frac{E}{D+E}\right)$$

Where;

r_D	= Cost of debt
r_E	= Rate of return on equity (or ROE)
D	= Value of debt in the capital structure
E	= Value of equity in the capital structure
t	= Tax rate.

3.4 Cost of Debt

3.4.1 Consistent with the practice in previous Rate Reviews, the OUR proposes that the cost of debt should be based on the weighted average borrowing cost for JPS' long-term debt. The approved cost of debt in the 2014 – 2019 Rate Review was 8.07%.

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[3] Note, $\left(\frac{D}{D+E}\right)$ represents the 'gearing ratio'.

3.5 Rate of Return on Equity

3.5.1 In all previous Rate Reviews conducted by the OUR, the Capital Asset Pricing Model (CAPM) approach has been the methodology used for the determination of JPS' approved Return on Equity (ROE). While there has been acceptance on the part of both JPS and the OUR of the CAPM approach, there have been disagreements with respect to the interpretation and application of specific components of the methodology. In this regard, the OUR engaged the services of global economic consultant, NERA Economic Consulting, in 2017 to provide advice on an appropriate approach to the determination of the ROE for JPS.

3.5.2 In keeping with the requirements of Schedule 3 paragraph 30 (c) of the Licence, the OUR in carrying out the assessment of the ROE, sought and obtained guidance from the Bank of Jamaica (BOJ). In addition, JPS was consulted during the exercise and the OUR shared the results of the study with the company and the Ministry of Science, Energy and Technology (MSET).

Comparison of ROE Methodologies

3.5.3 The OUR at the outset made no assumptions with regards to the use of the CAPM approach. As such, the CAPM approach was compared with the Dividend Growth Model and the Market to Asset Ratios method. Arising from this exercise, the OUR concluded that the CAPM model remains the most appropriate model for estimating JPS' ROE for the following reasons:

- CAPM has very *strong theoretical underpinnings* that are supported by empirical evidence for explaining stock returns, including those in emerging markets.

- The *practicality of its use in the Jamaican context* particularly, as it relates to access to relevant data.

- It affords *balanced regulatory discretion* regarding the estimation of the parameters in the CAPM formulation.

3.5.4 In general, the data required for estimating the ROE under the CAPM is readily available and the application of different methodologies for estimating individual parameters has been extensively debated in international regulation. In this regard, the CAPM methodology allows JPS and the OUR to draw on international best practice in the calculation of the ROE.

The Computation of the ROE

3.5.5 It is worth noting that the CAPM model now being applied by the OUR deviated in some respects from the one employed in JPS' 2014 – 2019 Rate Determination. Table 02 below provides a comparison of the proposed approach to the CAPM calculation of ROE versus the approach employed in the JPS' 2014 – 2019 Rate Determination.

Table 02: The Proposed ROE Approach vs. the 2014 – 2019 OUR Determination Approach

CAPM Parameter	2019 – 2024 OUR Proposal	Rationale	2014 – 2019 OUR Determination	Rationale
Risk Free Rate (R$_f$)	10-Year Treasury Bond	• U.S. long-run historical average return on bonds (1996-2016, real) assuming it reverts to the mean	10-year Treasury Bond	• Used a point in time estimate instead of historical data to reflect the fact that ROE is forward-looking • Suggested the tenure of the bond should reflect the investment duration (life) of JPS assets.
Beta (β)	Professor Damodaran's Power Sector data		Professor Damodaran's adjusted Power Sector data	• Adjusted to include only power utilities • Excluded energy and infrastructure funds, renewable energy suppliers and manufacturers and oil and gas exploration and distribution firms
Mature Market Equity Risk Premium (MMRP)	Computed indirectly by subtracting the risk free rate (R$_f$) from the Total Market Return (TMR) Real TMR is the arithmetic average of long-run historical data of U.S. Market (1900-2016)	• TMR eventually returns to the mean • Less volatile than implied equity risk premium	S&P 500 implied equity risk premium	• Accepted JPS' proposal • ROE should be forward looking so implied equity risk premium was more reflective of market expectations
Country Risk Premium (CRP)	1 and 3 year average of the bond yield spread of the 8 year Jamaican sovereign bond and the US 10-year Treasury bond.	• The period over which the average is computed should align with the rate review period	Spread between Jamaican sovereign bond and US 10-Year Treasury bond as at end of test year (Dec 31, 2013) The OUR determined the return on a 10-year Jamaican sovereign bond by constructing a yield curve.	• Used a point in time estimate instead of historical data to reflect the fact that ROE is forward-looking • Accepted JPS proposal to multiply the CRP by beta

3.5.6 By applying the proposed approach delineated in Table 02 and based on the latest data available in 2017, JPS nominal ROE was computed to be in the range of 11.9% to 13.2%. The CAPM parametric values are shown in Table 03 below.

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Table 03
2017 ROE Range for JPS compared to OUR 2014 Estimate

		2017		
	Low	**High**	**OUR 2014**	**2017 Approach**
Gearing	50%	50%	50%	OUR estimate for 2014
Tax rate	33%	33%	33%	Jamaica 2017 corporate tax rate
Real Risk-free rate	2.5%	2.5%	-	US long-run historical average of bond returns
Nominal Risk-free rate	4.5%	4.5%	2.9%	Real RfR inflated by US medium-term 2% inflation target
Equity Risk Premium	5.9%	5.9%	5.0%	US long-run historical average of stock returns
Total Market Return	8.4%	8.4%	7.9%	*Calculation: sum of Risk-free Rate and ERP*
Country Risk Premium	3.10%	4.20%	5.58%	1Y Avg and 3Y Avg of Difference between Jamaican and US sovereign bond yields
Unlevered Beta	0.43	0.45	0.49	Current and 6Y Avg beta from Damodaran global utilities (power) comparators
Levered Beta	0.72	0.75	0.88	*Calculation*
Return on Equity (based on NERA CRP formula)	**11.9%**	**13.2%**	**-**	***Calculation***
Return on Equity (based on OUR 2014 CRP formula)	**11.0%**	**12.1%**	**12.2%**	***Calculation***

Source: OUR/NERA analysis

Criterion 2:

a) In computing the ROE, it is proposed that JPS should use the CAPM methodology based on the formula below:

$$Rate\ of\ Return\ on\ Equity = R_f + [\beta * (TMR - R_f)] + CRP$$

Where;

R_f = Risk free rate

β = Beta

TMR = Total Market Return

CRP = Country Risk Premium

b) In addition, the following should be observed with regards to the data used in the ROE calculation:

    i. R_f shall be the U.S. long-run historical average return on bonds (1998-2018, real);

    ii. β shall be based on the latest information in Professor Damodaran's Power Sector data base;

    iii.   The Mature Market Equity Risk Premium shall be computed indirectly by subtracting the risk free rate (R_f) from the Total Market Return (TMR)

    iv.   The Real TMR is the arithmetic average of long-run historical data of U.S. Market (1900-2018)

    v.   The CRP shall be derived from the one (1) year average of the bond yield spread of the eight (8) year Jamaican sovereign bond and the US 10-year Treasury bond.

3.6 The Rate Base[4]

3.6.1 The Rate Base is the value of the net investment in the Licensed Business. JPS' Rate Base includes the assets that are in use, will be expected to be in use over the 5-year Rate Review period and are deemed useful in providing electricity services to its customers. The Rate Base

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[4] Schedule 3, paragraph 29 of the Licence

shall be based on the approved net book value of the company's assets for the period 2019 – 2024 as informed by JPS' Business Plan.

Criterion 3:

a) Consistent with Schedule 3 (29) of the Licence 2016 the Rate Base shall be computed as follows:

$$Rate\ Base = Property\ Plant\ and\ Equipment\ +\ Intangible\ Assets\ +\ Working\ Capital + Long\ Term\ Receivables + Other\ Assets\ -\ offsets$$

b) The components of the Rate Base identified in the above formula shall be as follows:

    i.   The Property Plant and Equipment ("PPE") ; along with the net book value of the company's assets it shall also include construction work in progress; offset by; impaired assets, customer financed assets (including electricity efficiency improvement fund assets), rural electrification assets, less revaluation balance/capital reserve;

    ii.   Intangible Assets (i.e. assets that are not physical in nature e.g. copyright, software licences)

    iii.   The working capital (i.e. accounts receivable + cash & short term deposits + tax recoverable + inventory – account payable – customer deposits – bank overdraft – short term loans) deployed;

    iv.   Long Term Receivables; and

    v.   Other Assets

    vi.   Offsets which, refer to:

- Employee benefit obligations; and
- Deferred revenue.

c) EEIF, SBF and other customer contributed assets shall not be included in the rate base but JPS will be required to list these assets along with their net book value as of December 31, 2018.

d) The value of the Electricity Disaster Fund (EDF) assets as of December 31, 2018 shall be clearly stated and shall not be included in the rate base. JPS shall also clearly identify the forecasted value of EDF assets for the 2019 – 2024 period.

3.6.2 For the avoidance of doubt, as provided in the Licence, it is important to note that:

1. The current portion of long term debt (CPLTD) should not be an off-set in the Rate Base, since this is part of the long term funding of the Licensee; and

2. The Revenue Requirement shall not include any Allowance for Funds used during Construction (AFUDC)[5], since provision is made in the Rate Base for Construction work in progress (CWIP)[6].

<u>Reporting of Property Plant and Equipment</u>

3.6.3 At the time of filing its Rate Review application, JPS shall submit its fixed asset register, in a format (preferably excel format) that separates each asset into its various asset class/sub-categories. That is, property plant and equipment shall be broken down into its respective sub-categories namely: land and buildings, production (generation) plant and equipment, transmission and distribution plant and equipment, general plant and machinery, computer equipment, office fixtures and fitting and CWIP.

3.7 Operating Expenses

3.7.1 Operating expenses (OPEX) encompasses the cost associated with a range of activities including - labor, third party services, insurance, and other costs that recur regularly. In addition, they also include taxes, power purchase costs and depreciation expense, all of which are discussed below.

3.7.2 From a regulatory perspective any item of cost to be included in the company's OPEX for the purposes of establishing the Revenue Requirement, must have been necessary and prudent expenditure. In addition, under the Revenue Cap regime, it is expected that JPS will achieve operational efficiencies over time. In light of this, JPS shall be required to clearly identify the improvement in efficiencies it expects to attain on its OPEX; and same shall be reflected in the Business Plan to be filed with the Office.

<u>OPEX attributable to Random Factors</u>

3.7.3 Inevitably, some operating expenses of the Licensed Business will arise from sporadic events such as storms, foreign exchange losses/gains and changes in tax policy. Such events may have significant implications for the profitability of the Licensed Business. Random events that impact the company's costs are provided for through:

   a) The Annual Revenue Target Mechanism

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[5] AFUDC represents the net cost for the period of construction of borrowed funds used for construction purposes and a reasonable rate on other funds when so used.

[6] CWIP represents the balance of funds, which are invested in the utility plant under construction but not yet placed in service.

b) The Z-Factor component of the Revenue Cap mechanism; and

c) The Electricity Disaster Fund (EDF)

3.7.4 In this regard, JPS will not include any provision in its OPEX forecasts on account of random events.

<u>Taxes</u>

3.7.5 The Licensed Business is required to pay a variety of taxes, including General Consumption Tax (GCT), import taxes, income taxes and property taxes. These taxes are all included in allowed operating expenses since they are payable under the law.

<u>Power Purchase Cost</u>

3.7.6 Schedule 3, paragraph 31 of the Licence specifies that power purchase costs are a component of the non-fuel operating costs and is therefore correctly an operating expense. However, it is important to recognize that operating expenses can be classified into two categories; "production" and "non-production" costs. For reasons of transparency and accuracy in the attribution of cost, it is sometimes necessary to separate these costs by way of a decoupling mechanism. One purpose of employing such a mechanism is to isolate the cost over which the utility actually has control in the short run (i.e., the period between rate cases).[7]

3.7.7 Currently, non-fuel purchase power cost is an embedded component in JPS' non-fuel tariff and fluctuations in the monthly non-fuel purchase power costs are addressed via adjustments to the fuel rate. However, the fact that these costs are embedded in the non-fuel tariff and the annual adjustment to the tariff by growth rate (dI) is not usually in sync with the escalation factors in the various power purchase agreements (PPAs), this may lead to under or over-recovery of a purchase power costs.

3.7.8 Given that the non-fuel purchase power cost is recognized as a part of JPS' OPEX, even though it is out of the control of JPS, it should be decoupled from other non-fuel costs and treated as a direct pass through on customers' monthly bill.

<u>Depreciation</u>

3.7.9 The regulatory literature defines depreciation, essentially, as the decline in or loss of value in an asset. Depreciation is also a systematic and rational accounting process that is used to allocate (not valuate) tangible capital assets, less salvage value (if any), over the estimated useful life of the item. The costs are allowed operating expense, which results in the reduction to Rate Base.

3.7.10 Condition 15 (5) of the Licence provides as follows:

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[7] Regulatory Assistance Project (RAP); "Revenue Regulation and Decoupling: A Guide to theory and Application" November 2016. http://www.raponline.org/wp-content/uploads/2016/11/rap-revenue-regulation-decoupling-guide-second-printing-2016-november.pdf

"Annual depreciation allowance shall be computed by applying reasonable annual straight line depreciation rates to the value of property, plant and equipment stated at book value…"

3.7.11 In addition, Schedule 3, paragraph 32 of the Licence also makes provisions for the derivation of the depreciation component to be:

"...calculated by applying annual depreciation rates, as provided at Schedule 4 (as may be updated from time to time in accordance with this Licence), to the gross value of the individual plant assets accounts included in the approved Rate Base[8]."

3.7.12 In an Extraordinary Rate Review submission to the OUR on 2016 October 25, JPS claimed that changes in its depreciation rates set out in Schedule 4, which were introduced in the Licence, had resulted in a cost impairment of US$13.4M in 2016 and incremental depreciation expenses amounting to US$15.1M over the period 2017 – 2018.

3.7.13 In the JPS Extraordinary Review 2017 Determination Notice[9], the OUR determined that JPS was entitled to recover the said cost impairment and incremental depreciation expenses up to 2018 December 31, in its tariff. However, the final decision of the magnitude of the adjustment was delayed until the 2017 Annual Review. In the JPS Annual Review 2017 & Extraordinary Rate Review – CPLTD: Determination Notice[10], compensation was effected by way of an adjustment to the Revenue Requirement.

3.7.14 Notably, the incremental depreciation for 2019 and beyond is still to be addressed. The OUR in the said JPS Extraordinary Review 2017 Determination Notice, Determination 1 stated that *"[a]ll projected increases in depreciation expenses in 2019 and beyond shall be addressed in future Five Year Rate Reviews"*. Therefore, the 2019 – 2024 Rate Review shall also take into account, the incremental depreciation arising from the changes to the depreciation schedule in 2016.

3.7.15 Further, arising from the Extraordinary Rate Review in 2017, the OUR concluded that:

"Based on the evidence that the existing depreciable lives in Schedule 4 of the Licence 2016 may be predicated on an analysis that is less than robust, JPS shall be required to conduct a new depreciation study following guidelines established by the OUR. Such a study is to be conducted prior to its application for the 2019 Five Year Rate Review.[11]"

This study is to be filed with the OUR on or before 2019 April 30.

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[8] See Schedule 4 of the Licence – Schedule of Rates for Depreciation
[9] Document No. 2017/ELE/001/DET.001 dated 2017 February 1
[10]Document No. Ele 2017/ELE/006/DET.003 dated 2017 August 31
[11] Determination 2, ibid 9

> **Criterion 4:**
>
> JPS in presenting its Operating expenses (OPEX) shall:
>
> a) Clearly identify the improvement in efficiencies it expects to attain on it OPEX over the Rate Review period and the Business Plan should clearly delineate JPS' plan to improve efficiency over the rate review period.
>
> b) Exclude from its OPEX any component associated with random events.
>
> c) Provide details of all taxes payable by the company
>
> d) Provide details on its power purchase costs which shall be decoupled from other operating expense to allow for a direct pass-through to customers
>
> e) Perform its depreciation calculation on the basis of a revised deprecation schedule approved by the OUR based on a depreciation study done by the company in 2018.
>
> f) Provide detail calculations of the increases in depreciation expenses in 2019 and beyond in order that they may be taken into account in the Rate Review.

3.8 Revenue Recovery

3.8.1 The Licence mandates that JPS' Revenue Requirement shall be recovered through the rates approved by the OUR.[12] JPS, as in the case of many electric utilities, recovers its revenues over three different billing variables:

1. Energy consumption – kWh

2. Power demand – kVA

3. Number of customers

3.8.2 Pursuant to the Licence, JPS' tariff will now be based on a five (5) year forecast rather than a one (1)year historical test year regime that existed previously. Therefore, the billing variables assume greater significance when compared to previous Rate Review exercises, particularly, because of the change from the price cap regime to the revenue cap methodology. In this regard, the over or under projection of the billing variables may result in JPS profit falling outside of an acceptable band which could put excessive pressure on the

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[12] Schedule 3, paragraph 28

review process by way of Z-Factor adjustments or Extraordinary Rate Reviews within the five (5) year Rate Review period.

3.8.3 In addition, the rapid development in renewable technologies and changes in consumer energy preferences could make the conventional forecasting tools used in the Jamaican context less reliable.

3.8.4 Against this background, the OUR in the last quarter of 2017 with the assistance of MSET engaged the services of forecasting experts, Manitoba Hydro International Limited (MHI), to review the OUR's demand forecasting methodology. This review primarily focused on kWh sales, since kVA demand is derived from it and customer numbers are generally (but not always) derived from simple interpolation. A consultative approach was adopted in the review and both JPS and MSET participated in the exercise.

3.8.5 The methodology adopted by the OUR in developing the long term demand forecasts, incorporates the following three (3) steps:

1. The employment of a model that uses a combination of extrapolation, statistical and econometric approaches in forecasting the model variables for each rate class.

    a. Rates 10, 20, 40 and 60 customer categories are based on projections of number of customers multiplied by projected unit consumption (average consumption) for the rate class.

    b. Rate 50 sales forecast is derived from a regression analysis of total sales. Table 04 below provides a summary of the final factors used to develop the base forecast of the number of customers and unit consumption for each rate class or, in the case of Rate 50, total consumption.

2. The computation of gross system losses by adding net system losses to station use. The model projected net system losses and station use from extrapolated trends, but also considered JPS' system loss reduction plans and JPS' stated objective of reducing station use over time[13]. Each component of gross system losses is allocated to the rate classes to derive gross electricity kWh consumption.

3. The derivation of projected system peak demand, using following methodology:

    a. The estimation of the system load factor from recent historical trends, which is held constant across the forecast horizon.

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[13] See the MHI's Report dated 2018 XXX (p.72-73) for the proposed plans for system losses reduction and its allocation between its various sub-components (i.e. Station Use, Technical Low Voltage Losses, Technical Medium Voltage Losses and Unbilled (Non-technical) Losses)

b. The computation of the peak demand for each year, by dividing the projected gross generation by the number of hours in the year multiplied by the system load factor.

c. The estimation of the contribution of each rate class to the system peak, using JPS' 2009 load research information (coincident and non-coincident peak data).

d. Adjustments to the system peak contributions through a reconciliation process which adjusts the non-coincident and coincident factors[14].

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[14] See the MHI's Report (p.74-75) for the details

Table 04: Summary of Variables used in Demand Forecast Model

Rate Class	No. of customers	Unit (Average) consumption	Total Consumption	Comments
Residential (R10)	▪ Number of households	Average consumption extrapolated from average growth between 2005 and 2016	Number of customers × Average consumption	Rate Class is divided into: • Block 1 – Consumption ≤ 100kWh/month • Block 2 Consumption > 100kWh/month Analysis completed for each block and then aggregated MHI conducted a demographic analysis to forecast growth in the number of households.
Small Commercial (R20)	Population over age 15	▪ Wholesale and retail trade per capita ▪ Government services per capita	Number of customers × Average consumption	The forecasts of consumption for two (2) large interchange customers were done separately and then aggregated with the total consumption for the other Rate 20 customers
Large Commercial LV (R40)	Customer growth rate estimated from historical trend	▪ Mining and Quarrying component of GDP growth rate ▪ Hotel and restaurants component of GDP growth rate ▪ Electricity and Water Supply component of GDP growth rate	Number of customers × Average consumption	
Large Commercial LV (R50)			Producers of Government Service as a component of GDP	Total consumption was adjusted for expected changes in load due to analysis of expansion and demand reduction plans supplied by JPS' key account customers
Street Lighting (R60)	Customer growth rate extrapolated from trend from 1997 - 2016	Urban population growth rate	Number of customers × Average Consumption	Forecast of total sales was adjusted for expected reduction in sales due to the street light replacement programme which is expected to be completed by 2021

3.8.6 Based on the methodology outlined above, the demand forecast (kWh) by rate class for the period 2016 – 2040 was derived (see Table 05 below). These results represent the base case and may be adjusted/updated through the OUR-MSET-JPS consultative process.

Table 05 – Demand forecast results by Rate Category 2016-2040

Year	Sales in GWh							Total Losses	Generation Requ. (GWH)	Peak (MW) Calculated	Peak (MW) Adjusted	Load Factor
	Rate 10	Rate 20	Rate 40	Rate 50	Rate 60	Others	Total					
2016	1,079	599	784	626	71	25	3,184	1,178	4,362	655	656	76.0%
2017	1,097	601	787	614	71	26	3,196	1,167	4,363	656	656	76.0%
2018	1,115	604	801	596	72	27	3,215	1,100	4,315	649	649	75.9%
2019	1,134	607	828	578	74	28	3,249	1,040	4,289	645	645	75.9%
2020	1,154	612	850	561	76	28	3,281	980	4,261	641	641	75.9%
2021	1,175	616	883	555	79	29	3,337	927	4,264	641	642	75.9%
2022	1,192	625	919	555	81	30	3,403	904	4,307	647	648	76.0%
2023	1,210	634	954	557	84	31	3,471	881	4,352	653	654	76.1%
2024	1,229	644	989	564	87	32	3,545	858	4,403	660	661	76.1%
2025	1,248	653	1,024	576	90	33	3,624	836	4,460	668	669	76.2%
2026	1,267	664	1,060	594	93	34	3,712	815	4,527	678	679	76.3%
2027	1,287	674	1,096	618	96	35	3,806	796	4,602	689	689	76.3%
2028	1,308	684	1,131	647	99	36	3,904	789	4,693	702	702	76.4%
2029	1,329	696	1,165	682	101	36	4,010	781	4,791	716	717	76.4%
2030	1,351	709	1,198	722	104	37	4,121	773	4,894	730	731	76.5%
2031	1,373	722	1,232	763	107	38	4,236	765	5,001	746	747	76.5%
2032	1,391	737	1,266	803	110	39	4,347	755	5,102	760	761	76.6%
2033	1,410	753	1,300	844	113	40	4,460	744	5,204	774	775	76.7%
2034	1,429	770	1,335	886	116	41	4,576	764	5,340	794	795	76.8%
2035	1,448	786	1,371	928	119	42	4,694	783	5,477	814	814	76.8%
2036	1,468	803	1,407	970	122	43	4,811	803	5,614	833	834	76.9%
2037	1,487	819	1,443	1,013	125	43	4,931	822	5,753	853	854	77.0%
2038	1,508	836	1,480	1,056	127	44	5,051	843	5,894	873	874	77.0%
2039	1,528	853	1,517	1,100	130	45	5,174	863	6,037	894	895	77.1%
2040	1,550	870	1,554	1,144	133	46	5,297	884	6,181	915	916	77.1%
Average annual growth Rates in percentages												
2016 - 2020	1.7%	0.5%	2.0%	-2.7%	1.6%	3.3%	0.8%	-4.5%	-0.6%	-0.6%	-0.6%	0.0%
2020 - 2025	1.6%	1.3%	3.8%	0.5%	3.5%	2.9%	2.0%	-3.1%	0.9%	0.9%	0.9%	0.1%
2025 - 2030	1.6%	1.6%	3.2%	4.6%	3.0%	2.5%	2.6%	-1.6%	1.9%	1.8%	1.8%	0.1%
2030 - 2035	1.4%	2.1%	2.7%	5.1%	2.7%	2.3%	2.6%	0.3%	2.3%	2.2%	2.2%	0.1%
2035 - 2040	1.4%	2.1%	2.5%	4.3%	2.3%	2.0%	2.4%	2.4%	2.4%	2.4%	2.4%	0.1%
2016-2040	*1.5%*	*1.6%*	*2.9%*	*2.5%*	*2.6%*	*2.6%*	*2.1%*	*-1.2%*	*1.5%*	*1.4%*	*1.4%*	*0.1%*
2016-2033	*1.6%*	*1.4%*	*3.0%*	*1.8%*	*2.8%*	*2.8%*	*2.0%*	*-2.7%*	*1.0%*	*1.0%*	*1.0%*	*0.1%*
2016-2030	*1.6%*	*1.2%*	*3.1%*	*1.0%*	*2.8%*	*2.9%*	*1.9%*	*-3.0%*	*0.8%*	*0.8%*	*0.8%*	*0.0%*

3.9 Revenue Cap 2019 – 2024 and Tariff 2019/2020

3.9.1 Schedule 3, paragraph 6 of the Licence requires that JPS demonstrates that its proposed non-fuel rates for the various rate categories will generate the non-fuel revenue requirement on average over the rate review process. It is on this basis that the OUR will establish the revenue requirement and an annual revenue cap (RC) for each of the five (5) years of the Rate Review period and the tariffs for 2019/2020.

3.9.2 The approved non-fuel revenue requirement for each year of the Rate Review period shall be determined by the OUR following an analysis of JPS' five (5) year Business Plan and financial model.

3.9.3 The OUR, in establishing the revenue caps over the rate review period, is mindful of a key regulatory objective of maintaining price stability. In that regard, while the revenue requirement for each year between 2019 – 2024 will be established on the basis of JPS' Business Plan, the revenue cap for each year is designed to ensure that:

1) Non-fuel rates for the various rate categories will generate the non-fuel revenue requirement on average over the rate review period; and

2) The tariffs are relatively stable from year to year.

3.9.4 In light of this the following outlines how the annual caps (RC) are to be derived.

The average tariff over the rate review period, denoted as *T*, is decomposed into three components:
1. Average kWh Tariff – T_{kWh}
2. Average kVA Tariff – T_{kVA}
3. Average Customer Charges – T_c

The computation of each of these component is given as follows:

$$T_{kWh} = \frac{\sum_y RR_y^{kWh}}{\sum_y kWh_y}$$

$$T_{kVA} = \frac{\sum_y RR_y^{kVA}}{\sum_y kVA_y}$$

$$T_C = \frac{\sum_y RR_y^C}{\sum_y C_y}$$

Where,

RR^{kWh}_y = the revenue requirement to be recovered through kWh charges for year y;

RR^{kVA}_y = the revenue requirement to be recovered through kVA charges for year "y"

RR^C_y = the revenue requirement to be recovered throw customer charges for year y.

And,

kWh$_y$, kVA$_y$ and C$_y$ are the forecast of energy consumption, kVA demand and customer count respectively for each year "y" in the rate review period.

3.9.5 The revenue cap RC$_y$ for each year "y" in the rate review period will then be computed as:

$$RC_y = T_{kWh} \cdot kWh_y + T_{kVA} \cdot kVA_y + T_C \cdot C_y$$

3.9.5 In order to protect customers from delays in the implementation of JPS' capital expenditure programme, Schedule 3, paragraph 46(d)(iii) of the Licence stipulates:

"where the Licensee's capital & special program expenditure are delayed and such delay results in a variation of 5% or more of the annual expenditure, the Z factor adjustment will take into consideration the over-recovery of such expenditures plus a surcharge at the WACC."

3.9.6 In addition, Schedule 3, paragraph 48 states that failure by the Licensee to undertake activities in its capital programme should be treated as follows:

"If the Licensee does not undertake the investment activities stated in the Business Plan on an annual basis, subject to a variation of 5% of the annual expenditure, the Office shall adjust the next year's rates commensurate with the present value amount that was given to the Licensee in the rate but was not utilized for the investment activities…"

3.9.7 On the other hand, to protect JPS from unplanned increase in its capital expenditure programme, Schedule 3, paragraph 46(d)(v) states:

"where the Licensee demonstrates and the Office agrees that an extra-ordinary level of capital expenditure or a special programme is required (i.e. greater than 10% for any given year relative to the previously agreed five year Business Plan)"

3.9.8 For the avoidance of doubt, in all instances where there are variations in the capital expenditure programme, the adjustments to the tariff shall be project specific. In other words, the adjustment will be done on a project by project basis and not on the aggregation of projects.

Criterion 6:

a) The revenue cap (RCy) for each year "y" of the Rate Review period shall be set during the 2019 Rate Review and will be determined as follow:

$$RC_y = T_{kWh} \cdot kWh_y + T_{kVA} \cdot kVA_y + T_C \cdot C_y$$

b) The average kWh tariff (T_{kWh}), kVA tariff (T_{kVA}) and average customer charges (T_C) is determined by:

$$T_{kWh} = \frac{\sum_y RR_y^{kWh}}{\sum_y kWh_y}$$

$$T_{kVA} = \frac{\sum_y RR_y^{kVA}}{\sum_y kVA_y}$$

$$T_C = \frac{\sum_y RR_y^{C}}{\sum_y C_y}$$

c) Delays on any specified capital project that results in a variation in expenditure of 5% or more in any given year shall trigger a commensurate adjustment to the tariff in the following year.

d) Failure by JPS to undertake any specified capital project that results in a variation in expenditure of 5% or more in any given year shall trigger a commensurate adjustment to the tariff in the following year.

e) Should an extraordinary capital expenditure or special project arise and it can be demonstrated that such an expenditure could not have been reasonably anticipated, with the Office's approval *and where the cost is greater than 10% for any given year relative to the previously agreed five year Business Plan* in any given year, this shall trigger a commensurate adjustment to the tariff in the following year.

f) Clearly indicate all assumptions (including load factor) made along with rationale for their use in its billing data projections.

3.10 Rate Design

3.10.1 In developing its proposed rates, the Licence prescribes that JPS follow the following rate design principles[15]:

1. Cost reflectiveness
2. Economic efficiency
3. Non-discriminatory cost allocation and transparency
4. Compliance with all applicable rules and regulation
5. Consideration of GOJ policy directives with respect to the electricity sector

3.10.2 In addition, as a matter of Prudent Utility Practice, JPS should also aim as much as possible to meet the following, often conflicting, regulatory objectives[16]:

1. Revenue adequacy
2. Stability and predictability
3. Simplicity

3.10.3 As a part of its Rate Review application, JPS is required to conduct and submit a cost of service study. This study shall be used as the basis for establishing tariffs for each rate class which (with the possible exception of prepaid customers), shall at minimum include customer charges and non-fuel energy charges. Standard and Time of Use (TOU) demand charges shall also be incorporated for applicable rate classes. The proposed rate structure should clearly identify the tariffs for each rate class (existing and proposed) and shall include proposed tariffs for:

a) distributed generation (renewable and thermal)
b) electric vehicles
c) wheeling customers
d) auxiliary interconnection customers
e) stand-by service
f) Prepaid customers.

3.10.3 JPS may also propose social tariffs and any special economic development tariffs that it may deem necessary. However, where such tariffs are proposed, JPS must provide a full justification stating why the tariff is necessary, and the legislative and regulatory basis for the proposal.

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[15] Schedule 3, paragraph 36
[16] Eurelelectric (2013). *Network Tariff Structure for a Smart Energy System*.

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<u>Criterion 7:</u>

    a)   The cost of service study shall form the basis of JPS' tariff design which, should aim much as possible to meet the regulatory objectives of:

        i.   Economic efficiency

        ii.   Revenue adequacy

        iii.   Cost reflectiveness

        iv.   Non-discrimination

        v.   Stability; and

        vi.   predictability.

    b) JPS rate design shall include proposed tariffs for distributed generation, electric vehicles, power wheeling and auxiliary interconnection, stand-by service and prepaid customers.

    c) JPS should provide a full justification to support any proposals for social or economic development tariffs.

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3.11 Productivity Improvement Factor

3.11.1 Notwithstanding the absence of an explicit X-Factor in the PBRM, Schedule 3, paragraph 11 of the Licence stipulates that the final criteria shall include the productivity improvement (X-Factor). In keeping with this provision, the Office through the Caribbean Development Bank engaged the consulting firm, DNV GL, to provide advice on tariff productivity improvement for the electricity sector. JPS and other electricity sector stakeholders were consulted and they provided data and feedback on the study.

3.11.2 Arising from that productivity improvement study, the OUR has developed a methodology for incorporating an X-Factor into the revenue cap system[17].

3.11.3 The proposed methodology for the calculation of the X-Factor is as follows:

    1.   An efficiency target for the utility based on a benchmarking analysis shall be computed by using Data Envelopment Analysis (DEA). **Error! Reference source not found.**06 elow provides a summary of the input and output factors to be employed in the DEA model. The utilities included this benchmarking analysis are described in Annex 1 of the Productivity Report.

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[17] For more details on the study see "Tariff Productivity Improvement Advice for the Electricity Sector – Jamaica" prepared by DNV GL hereafter called the "Productivity Report".

Table 06: DEA Model Input/ Output Specification

Scale:	Variable Return to Scale	
Input Factors:	OPEX	operating expenses these include staff cost, maintenance expenses, cost of supply services
Output Factors:	Sales [kWh]	The total electricity that is delivered to customers
	Customers (#)	Total number of customers
	Network Length (km)	Total length of network (includes overhead lines and underground cables)
	Supply Size Area (km^2)	The area size in which the distribution companies' serves

The results of the DEA analysis provide a measure of JPS' level of efficiency, which along with other considerations, will be used by the Office to determine an efficiency target (E_T). The Office will determine the number of years over which this target should be achieved (Y_{ET}). The Office will utilize these two factors (E_T and Y_{ET}) and any considered cap on productivity improvement in determining the final X-Factor. The Office reserves the right to consider other benchmarking tools such as partial benchmarking in determining the annual X-Factor adjustment.

2. JPS' controllable OPEX established by the Office for the base year, will be adjusted by the X-Factor to determine the adjusted controllable OPEX for each year "y" of the rate review period (2020 - 2023). The controllable OPEX includes items such as payroll costs, maintenance expenses, administrative overheads and bad debt expenses. Section 6.2.3 of the Productivity Report delineates the computation of the adjusted controllable OPEX for each year of the rate review period. **Error! Reference source not found.** below provides graphical summary of the proposed methodology for computing the adjusted OPEX. Note that the numbers included in the figure are for illustration only and are not to be interpreted as proposals of the Office. Also, in addition to the X-Factor adjustment, the OPEX is adjusted for a factor which is a weighted average of the projected sales, demand and customer number growth rates.

3. Finally, the revenue requirement (RR_y) for each year, "y" of the Rate Review period shall be computed by adding the adjusted controllable OPEX for that year to the other components of the revenue requirement for that year. These include:
   - Non-controllable OPEX (e.g. interest and financing expenses, sinking fund contribution)
   - Capital Expenditure (Depreciation and return on capital)
   - Taxes (Grossed Up)
   - Revenue Offsets and other adjustments (e.g. Carib Cement Revenues)

Figure 01 illustrates the process used to derive RR_y.

Figure 01: Buildup of Revenue Cap[18] (RR_y)
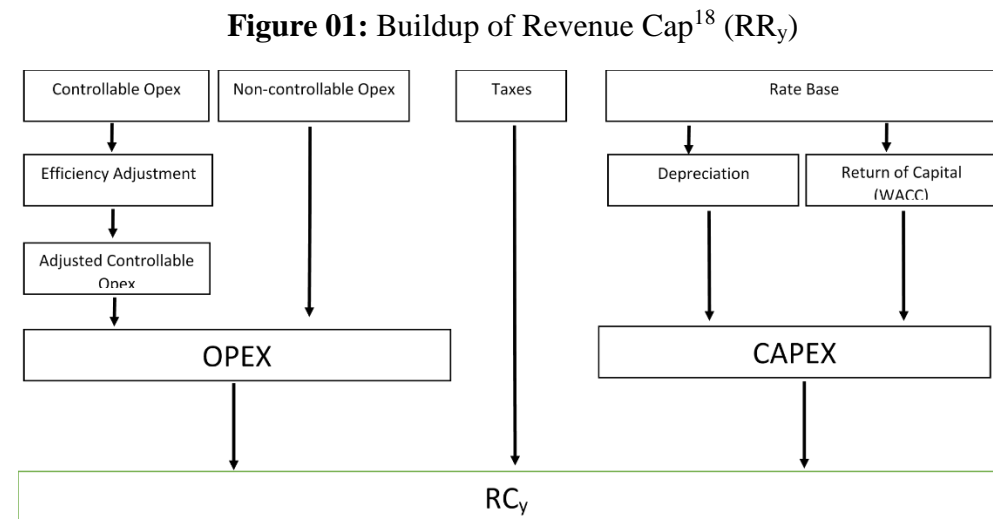
3.11.4 JPS is required to update the OUR's proposed productivity approach using audited data for the base year. The update shall include updated input factor and output factors data as described in Annex 1 of the Productivity Report and a re-computation of the efficiency score using an appropriate set of utilities including those proposed in Annex 1 of the Productivity Report. JPS is also required to submit a partial benchmarking analysis which shall include analysis of:
- OPEX per kWh sold
- OPEX per kWh generated
- OPEX per customer

3.11.5 In the case of any suggested changes or improvements to the OUR's proposed approach, JPS should clearly state why each change/improvement is necessary and provide theoretical and/or empirical justification to support its arguments.

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[18] Note that in this particular interpretation of the revenue requirement depreciation is treated as a component of CAPEX rather than OPEX.

Criterion 8:

a) The productivity improvement factor or (X-Factor) to be used in the annual adjustment of JPS' revenue cap shall be based on a DEA analysis.

b) In the DEA analysis, only OPEX should be considered as the input factor, CAPEX shall not be included unless JPS provides a sound justification for doing so. Output factors should include kWh sales, customer count, network length and size of service area.

c) JPS shall include an updated productivity study based on its latest audited financial statement in the 2019 – 2024 Rate Review submission. The updated productivity study shall be based on the method proposed by the OUR.

d) The OUR will utilize the results of the updated productivity study to determine the productivity improvement factor (X-Factor) for the Rate Review period.

e) JPS' controllable OPEX for 2020 – 2023 shall be adjusted by the X- Factor and a factor which is the weighted average of the projected sales, demand and customer number growth rates.

3.12 Quality of Service Standards

3.12.1 Quality of service delivered by the utility is important since it determines the level of satisfaction customers experience while consuming a service. An important dimension to the delivery of quality service is the establishment of Guaranteed and Overall Standards. These standards represent minimum service level agreements between the OUR and the utility companies to ensure value to customers.

3.12.2 Currently, JPS is held accountable to fifteen (15) Electricity Guaranteed Standards spanning among other things:

- Access to service
- Response to emergency
- Customer complaints/Queries
- Reconnections and disconnections
- Estimated bills
- Meter replacements

3.12.3 These EGS focus on dimensions of service quality which are:

a) Important to consumers;
b) Controllable by the utility; and
c) Measurable by the regulator

3.12.3 A breach of an EGS results in a compensatory payment to the affected customer/account that may trigger either an automatic compensation by the utility provider or alternatively, the affected customer may be required to submit a claim to be compensated.

3.12.4 While the Overall Standards do not offer a compensatory payment to customers where specified service levels are not met, JPS is required to monitor and report on its performance to the OUR. The Overall standards covers service delivery areas that include:

- Restoration of service after planned and unplanned outages
- Percentage of line fault repairs after report being made
- Frequency of meter testing
- Responsiveness and effectiveness of call centre representatives

3.12.5 The 2019 - 2024 Rate Review provides an opportunity for the evaluation and improvement of the existing Quality of Service Standard Schemes. Consequently, JPS shall be required to assess the company's performance over the 2014 - 2019 Rate Review period and indicate their recommendations with respect to the current schemes.

Criterion 9:

JPS shall be required in its 2019 - 2024 Rate Review application to:

a) Review its performance on all the EGS over the 2014 – 2019 Rate Review period. This should also include any challenges that were or are being faced in meeting the performance criteria for these standards, as well as the proposed measures to mitigate against those challenges.

b) Indicate any proposed changes, it deems appropriate, to the EGS Scheme and provide the rationale for its proposal. This should include the proposal for the development of a List of Exemptions to the Guaranteed Standard.

c) Outline its proposed performance targets on the Overall Standards over the 2014 – 2019 Rate Review period. This should also include any challenges that were or are being faced in meeting the performance criteria for existing standards as well as the proposed measures to mitigate against those challenges.

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4. PROPOSED CRITERIA: ANNUAL TARGETS

4.1 Annual Adjustment Mechanism

4.1.1   A revenue cap is a mechanism that establishes the maximum allowed revenue, a regulated entity can earn in a given year, while creating the incentive for it to maximize profit by reducing cost. The main difference between the revenue cap and the price cap is that *"if the actual number of units sold differ from the number of forecast units, this will be corrected in the following year to ensure that only the allowed revenue is collected.[19]"* As such, the customers bears the demand or volumetric risk under revenue cap regulation.

4.1.2   Additionally, revenue cap can create the framework within which the utility is allowed to set prices and this has the potential for promoting more efficient pricing.

4.1.3   Revenue caps are deemed to be appropriate under conditions where:

    a)   there is a high degree of predictability in forecasting demand, as this decreases the risk of price volatility; and

    b)   fixed cost expressed as a proportion of total cost is high. In this regard, the utility would not have a perverse incentive to manipulate the demand forecast to maximize profit in the short run.

4.1.4   In order to make adjustment to the revenue cap for inflation, exchange rates and variations from volumetric and efficiency targets, it is vital to have annual adjustments to the revenue cap. Under the Licence, the annual adjustment mechanism is captured in the following equation:

$$\text{ART}_y = \text{RC}_y(1 + (\text{dI} + \text{Q} \pm \text{Z})) + \left(\text{RS}_{y-1} + \text{SFX}_{y-1} - \text{SIC}_{y-1}\right) * (1 + \text{WACC})$$

Where:

$\text{ART}_y = Allowed\ Revenue\ Target\ for\ current\ year (i.e., y)$

$\text{RC}_{y-1} = the\ Approved\ Revenue\ Cap\ for\ previous\ year\ (i.e., y-1)$

$\text{dI} = change\ in\ inflation$

$\text{Q} = the\ quality\ of\ service\ improvement\ factor$

$\text{Z} = the\ exogenous\ factor$

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[19] Alexander, Ian & Shugart, Cris, "Risk, Volatility and Smoothing: Regulatory Options for Controlling Prices" p.11; retrieved from: http://regulationbodyofknowledge.org/wp-content/ uploads/ 2013/03/ Alexander_Risk_Volatility_ and.pdf on 2016-02-23

$$RS_{y-1} = Adjustment\ for\ previous\ year\ Revenue\ under/over-recovery$$

$$SFX_{y-1} = Adjustment\ for\ previous\ year\ Net\ Foreign\ Exchange\ Losses$$

$$SIC_{y-1} = Adjustment\ for\ Net\ Interest\ Income\ on\ unpaid\ Customer\ bills$$

$$WACC = the\ Weighted\ Cost\ of\ Capital$$

4.1.5 It is important to note that although a productivity factor (or X-factor) is not explicitly included in the annual adjustment formula above, provision is made for annual efficiency adjustments in the Licence and productivity improvement will be accounted for in the 2019 - 2024 Rate Review.

4.2 Inflation Adjustment Factor (dI)

4.2.1 The inflation adjustment factor (dI) is the component in annual adjustment mechanism that keeps JPS' revenue requirement constant in real terms. The growth rate (dI) represents the changes in the value of the Jamaican dollar (JMD) against the United States dollar (USD) and the inflation in the cost of providing electricity products and services.

4.2.2 Specifically, dI is:

$$dI = (EX_n-EX_b)/EX_b\{USP_b+INF_{US}(USP_b-USDS_b)\}+INF_{us}(USP_b-USDS_b)+(1-USP_b)INF_J$$

Where:

EXb	=	Base US exchange rate at the start of the Rate Review period.
EXn	=	Applicable US exchange rate at Adjustment Date.
INFUS	=	Change in the agreed US inflation index as at 60 days prior to the Adjustment Date and the US inflation index at the start of the Rate Review period.
INFJ	=	Change in the agreed Jamaican inflation index as at 60 days prior to the Adjustment Date and the Jamaican inflation index at the start of the Rate Review period.
USPb	=	US portion of the total non-fuel expenses as determined from the Base Year.

USDSb   =   US debt service portion of the non-fuel expenses as determined from financials in the Base Year of the rate setting period.

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Criterion 10:

a) In the Annual Review exercises between the 5-Year Rate Reviews, JPS' Revenue Requirement (before adjustments) shall be preserved in real terms by the Growth Rate (dI) equation:

$$dI=(EX_n-EX_b)/EX_b\{USP_b+INF_{US}(USP_b-USDS_b)\}+INF_{us}(USP_b-USDS_b)+(1-USP_b)INF_J$$

a) JPS shall provide the supporting schedules, documentation, calculations and relevant data to substantiate its Growth Rate proposals.

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4.3 Q-Factor Adjustment

4.3.1 With respect to the Q-Factor, Schedule 3, paragraph 46(a) of the Licence provides as follows:

> "The Q-Factor … is the annual allowed price adjustment to reflect changes in the quality of service provided by the Licensee to its customers. The Office shall measure the quality of service versus the annual target set in the 5 year rate review determination."

4.3.2 For the 2017/2018 rate adjustment period, the OUR evaluated the reliability performance of JPS' system based on prescribed output measures (reliability indicators). However, it recognized that there were lingering issues relating to the collection and accuracy of JPS' system outage data. This data set is critical to the regulatory review process as it involves the validation of JPS' proposed reliability indicators, required for the establishment of the Q-Factor baseline and by extension, the implementation of the Q-Factor incentive scheme. JPS' response to these issues will be critical in setting the final criteria for the Q-Factor to be used in the 2019 Rate Review. In light of this, the OUR has provided additional information with respect to the data improvement strategy and the Outage Management System (OMS) data quality and process improvements for 2019-2024 Rate Review in Annex 2 herein.

4.3.4 The Licence prescribes three (3) quality indices for the determination of the Q-Factor, SAIFI, SAIDI and CAIDI. The definitions of these indices, as set out in the Licence, are consistent with the accepted IEEE Standard 1366 – 2012 and the "IEEE Guide for Electric Power Distribution Reliability Indices" (IGEPDR)[20].

4.3.5 In establishing the Q-Factor target, Schedule 3, paragraphs 37 and 39 of the Licence, respectively, stipulates that the Office shall:

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[20] See Annex 1 attached hereto for definitions

1. Set reasonable and achievable targets, with appropriate referencing of the Base Year values to historical performance.
2. Targets should be set, normally, at the Rate Review for each of the five (5) years and broken out year by year.

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Criterion 11:

    a) In the 2019-2024 Rate Submission, JPS shall include its proposed Q-Factor Baseline, projected annual quality of service performance, and proposed annual Q-Factor targets for each of the 12-month adjustment periods, during the five (5) year price control period.

    b) JPS shall provide the supporting schedules, documentation, calculations and relevant data to substantiate its Q-Factor proposals.

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4.4 Y-Factor (System Losses) Adjustment

4.4.1 In all previous Rate Reviews conducted by OUR, the methodology for determining JPS' system losses target was predicated on a simple system that distinguished the technical losses target from the non-technical target and the application of the established target to the company's fuel rate. With the introduction of the Licence, a new approach to the establishment of the system losses targets has been established. In essence this new methodology:

- Recognizes that JPS is not completely responsible for all of the non-technical losses, as there is a socioeconomic dimension to this aspect of losses;
- Does not allow JPS system losses incentive/penalty payment to fluctuate with the vagaries of the fuel market. As such, the losses incentive/penalty mechanism is now anchored to the non-fuel tariff rather than the fuel tariff; and
- Allows for annual rather than monthly incentive/penalty adjustments.

4.4.2 In keeping with Schedule 3 of the Licence, the system losses differential between the target and the actual has been disaggregated into three components:

    a) Technical losses (Y_a): TL
    b) Non-technical losses fully under JPS' control (Y_b): JNTL
    c) Non-technical losses partially under JPS' control (Y_c): GNTL

4.4.3 The Responsibility Factor (RF) is critical to the determination of the portion of the non-technical losses under Yc for which JPS is held accountable. The portion of system r which JPS is held accountable is the product of Yc and the Responsibility Factor[21]. The total system losses for which the company is held accountable, may be expressed in percentage term as:

$$Y_{y-1} = Ya_{y-1} + Yb_{y-1} + Yc_{y-1}$$

Where:

Ya_{y-1} = (Technical losses target – Actual Technical losses)

Yb_{y-1} = (Controllable Non-technical losses target – Actual controllable non-technical losses)

Yc_{y-1} = (Partially controllable Non-technical losses target – Actual partially controllable non-technical losses)*RF

And, y-1 refers to the event in the previous year

4.4.4 In translating system losses to a monetary value, the total system losses differential (Y_{y-1}) must be multiplied by Actual Revenue Target in the previous year (ART_{y-1}) which may be expressed as:

$$TULos_{y-1} = Y_{y-1} * ART_{y-1}$$

4.4.5 It is significant to note that the system losses adjustment construct delineated above, is a symmetrical incentive/penalty mechanism. If JPS underperforms, it will be penalized since its revenues would be reduced. Alternatively, if the company out-performs the targets in aggregate terms, then it will receive additional compensation by way of higher revenues.

4.4.6 According to Schedule 3, paragraph 37 of the Licence, the Office shall have the power to set system losses targets for JPS, which should:

- Be reasonable and achievable;

- Take into consideration the Base Year and historical performance;

- Take into account agreed resources included in the five (5) Year Business Plan;

- Incorporate correction for extraordinary events (where necessary);

- Give due recognition of the role of the GOJ in addressing the non-technical aspect of the system losses that are not entirely within the control of JPS.

4.4.7 In this regard, in support of the system losses criterion below, there is the need to identify the general areas of focus and the specific requirement that will be employed in the regulatory assessment of system losses in Annex 3 hereof.

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[21] See Annex 3 for further information on the definition of system losses

5. PROPOSED CRITERIA: FUEL TARIFF

5.1 Fuel Tariff

5.1.1 Fuel accounts for a significant portion of the cost associated with the production of electricity, particularly given the fact that approximately 95% of electricity generation in Jamaica come from imported fossil fuel sources. In this regard, the total fuel cost is sensitive to the volatility of global fuel prices and the instability of the Jamaican dollar on foreign exchange markets. Given the degree of this risk, fuel costs net of efficiency adjustments, are passed through directly to electricity customers via the monthly tariff on a per kilo-watt-hour (kWh) basis.

5.1.2 Schedule 3, Exhibit 2 of the Licence states that the fuel cost (net of efficiencies) shall be calculated based on the *"total fuel computed (inclusive of fuel additives) to have been consumed by the Licensee and Independent Power Producers (IPPs) in the production of electricity"*.

5.1.3 It further states that the cost of fuel per kilo-watt-hour shall be computed on a monthly basis (*having regard to the applicable efficiency adjustment*) as follows:

$$F = \frac{F_m}{S_m}$$

Where:

F	$=$	Monthly Fuel Rate in J$ per kWh rounded to the nearest one-hundredth of a cent applicable to bills rendered during the current Billing Period[22]
Fm	$=$	Fuel Cost Pass Through for the given month in J$ per kWh rounded to the nearest one-hundredth of a cent applicable to bills rendered during the current Billing Period
S_m	$=$	the kWh sales in the Billing Period.

The kWh sales in the billing period is the actual kWh sales occurring in the previous calendar month.

5.2 H-Factor (Heat Rate) Adjustment

5.2.1 The overall heat rate for JPS thermal plants is indicative of the efficiency with which the company coverts fuel into electricity. Accordingly, the Fuel Cost Adjustment Mechanism (FCAM) sets a heat rate performance target for the conversion of fuel to energy for JPS. FCAM is a symmetrical incentive/ penalty mechanism which allows JPS to benefit financially if it outperforms the target (i.e. register a lower actual heat rate) and penalizes the company for under-performing (i.e. register a lower actual heat rate).

5.2.2 Under the FCAM, the monthly Fuel Cost Pass Through (F_m) is:

$$F_m = [IPPs\ Fuel\ Cost + (JPS\ Fuel\ Cost \times H)]$$

Where the heat rate adjustment (H) factor is;

$$H = \left(\frac{JPS\ Heat\ Rate\ Target\_Thermal}{JPS\ Heat\ Rate\ Actual\_Thermal}\right)$$

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[22] See Annex 4 for the components of the fuel cost pass through

5.2.3 Based on FCAM formula above, the monthly derived fuel rates allow JPS to pass through its monthly total fuel costs to electricity customers on a dollar for dollar basis subject to adjustment by an efficiency factor related to its actual heat rate versus the heat rate target. The calculated monthly rates are also adjusted to account for movements in the exchange rate between the United Sates dollar (USD) and the Jamaican dollar (JMD).

5.3 Heat Rate Evaluation

5.3.1 To determine the reasonableness of JPS' Heat Rate proposals, and to determine the Heat Rate targets for the price control period, the approach set out below will be employed by the OUR.

1) An initial review of JPS' Heat Rate proposals including all supporting schedules to ascertain adequacy and completeness of the submission before acceptance of the proposal.

2) Upon acceptance of the proposal, the OUR will embark on a comprehensive evaluation of the Heat Rate proposals guided by the legal and regulatory framework. This is required to validate the reasonableness of the projected Heat Rates and proposed targets as well as the degree to which they are consistent and achievable with the System configuration at the respective times.

3) Such Heat Rate evaluation may include detailed simulations of the entire generating system, incorporating the inputs and assumptions defined in the Heat Rate proposal and information requirements.

   a. This may require a full generation assessment using established generation simulation software

4) Generation simulations and analyses conducted will be based on economic generation dispatch principles, taking into consideration credible generation and transmission system constraints.

5.3.2 In this regard, JPS will be required to submit detailed information, among other things, in relation to system load, generation system, transmission system as well as other data outlined in Annex 4.

6. PROPOSED CRITERIA: SUPPORTING DOCUMENTS

6.1 The JPS Business Plan

6.1.1 In light of the forward-looking nature of the revenue cap regime, JPS rates are to be set based on the company's five (5) year outlook outlined in the Business Plan. This is critical for three main reasons:

    a) It provides JPS with a tool that aligns its activities with its goals within the regulatory framework;

    b) It is a means of holding the company accountable for its actions in the five (5) year Rate Review period;

    c) It provides an objective basis for the regulator to assess whether the utility is efficient in the management of its resources and prudent in its operations.

6.1.2 It is expected that the Business Plan will present a market analysis, sales and customers service strategies, a corresponding funding requirement and a financial projection. Table 07 below shows some of the issues the OUR expects JPS to address in the Business Plan.

Table 07 – Suggested Features to be Included in JPS' Business Plan

FEATURES	COMPONENTS
Performance Review	• Operational Performance – Reliability, Quality, Heat Rate, System Losses • Asset Performance – Production, T &D Plant maintenance and asset condition • Efficiency – Organization and Financial Performance
Strategic Direction of the Utility	• Assessment of Current Conditions and Priority Issues • Strategic Goals • Alignment with Customer Needs • Key Planning Assumptions
Service Obligations and Target Outputs	• Customer Satisfaction, Reliability, Heat Rate, Losses Targets • Other Business KPIs

Capital Expenditure and Investment Forecast	• Capital Program Summary
	  o Generation
	  o Transmission
	  o Distribution
	  o IT
	  o General Plant
	• Program Development and Investment Drivers (e.g. growth, replacement/maintenance, enhancements, statutory, efficiency improvement)
	• Program Development Methodology
	• Cost Estimation Methodology
	  o Capital cost estimation
	• Key Assumptions
	• Large Projects Justification
	  o Description of Project
	  o Substantiated Need for Project
	  o Analysis of Options
	  o Cost Estimate
	  o Rate Impact and other Customer Impacts

Operations and Maintenance Budget Forecast	• Overview of Budgeted O&M Cost Components (e.g. Payroll & Employee Benefits, Third Party Services etc.) • HR Resource Strategy • Procurement Strategy
Financial Strategy	• Financing Requirements • Financing the Plan • Risk and Uncertainty Management
Customer and Stakeholder Impact	• Bill Impact • Other Customer Benefits/Cost

6.1.3 In addition, for regulatory purposes, the Business Plan must conform to the conditions delineated in Schedule 3, paragraph 13 of the Licence.

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<u>Criterion 14:</u>

   a) JPS shall submit a Business Plan predicated on a five (5) year time horizon and this plan shall be the basis for the Rate Review.

   b) Consistent with in Schedule 3, paragraph 13 of the Licence Business Plan shall include but not be limited to the following:

       i.   The matters listed in the published criteria;

      ii.   The most recent IRP;

     iii.   Investment activities;

     iv.   System loss mitigation activities and related funding requirements;

      v.   Grid Security;

     vi.   Annual targets for losses (Y-factor), heat rate (H-factor) and quality of service (Q-factor);

    vii.   Operating and maintenance expenses;

</div>

6.2 Financial and Regulatory Accounts

6.2.1 Critical to the effective regulation of infrastructure services, such as electricity, is a framework which facilitates the periodic publication of accounting statements that explicitly support the regulatory function. In modern utilities, financial reporting involves the presentation of aggregate information that is designed primarily to meet the needs of management and shareholders. These reports, while useful in a general way, do not provided sufficient details for the regulator. Consequently, it is essential that utilities generate reports that allow for the analysis of costs and revenues, as well as the evaluation of assets employed, in a way that is consistent with effective regulation.

6.2.2 In previous Rate Reviews, JPS consistently included its latest audited financial report as a part of its rate submission. For the 2019 -2024 Rate Review, JPS will be required to submit, along with its Audited Financial Accounts and Regulatory Accounts.

6.2.3 According to Condition 5(2) of the Licence:

"The Licensee shall maintain such Regulatory Accounts as may reasonably be specified by the Office consistent with generally accepted accounting principles and the EA[23]."

Section 46 of the Electricity Act, 2015 provides that JPS *"...shall, at all times, keep the accounts for its generation, transmission, distribution and activities separate and distinct from each other and from accounts kept by it in respect of any other part of its undertaking or business."*

6.2.4 Consequently, the OUR has issued a consultation document to set up the regulatory framework for accounts separation[24]. These Regulatory Accounts are important for the following reasons:

1. measuring the relationship between cost and price of the products/services offered by the utility;
2. monitoring the utility's return on the products/services regulated under the revenue cap;
3. identifying cross-subsidies if and where they may exist across customer categories and products/services; and
4. ensuring that there is proper alignment of cost and price for transactions between the regulated utility and related entities

6.2.5 It is anticipated that JPS will prepare separated accounts as a key component of its rate submission in 2019 April. The account separation shall be conducted in accordance with the rules established by the OUR and the approved Accounting and Cost Allocation Manual to be developed by JPS.

> **Criterion 15:**
>
> JPS shall submit as 2019 – 2024 Rate Review application its:
>
> a) 2018 Audited Financial Accounts
>
> b) 2018 Audited Regulatory Accounts (based on the Accounting Separation Rules established by the Office and consistent with the approved Accounting and Cost Allocation Manual).
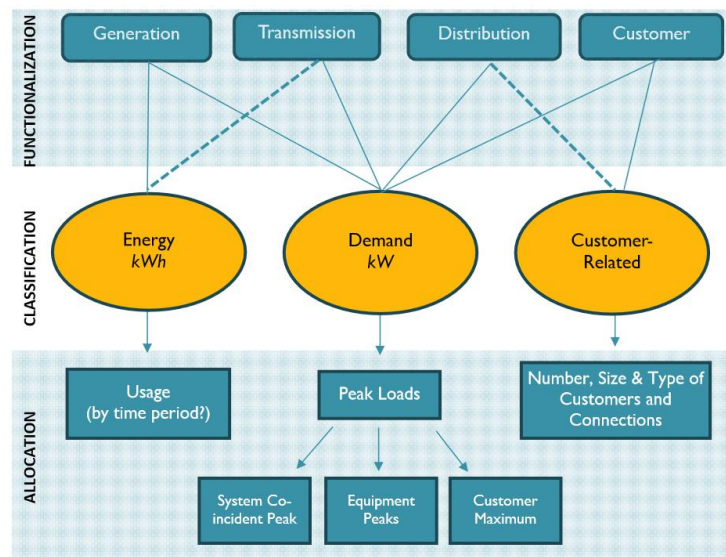
6.3 Cost of Service & Load Research Studies

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[23] EA refers to the Electricity Act, 2015

[24] NPRM: Accounts Separation Guidelines for Jamaica Public Service Company Limited, Document No. 2018/ELE/008/NPR.01 dated 2018 April 18

6.3.1 The starting point in assessing the reasonableness of the rates to be charged by a utility is to evaluate the cost of providing the services, that is, through a cost of service study. The objective of the cost of service study is to apportion all costs required to serve customers among each customer class in a fair and equitable manner. There are two broad approaches to conducting a cost of service study: (1) the embedded cost of service approach, and (2) the marginal cost of service approach.

6.3.2 An embedded cost of service study takes the total revenue requirement and allocates it among customer classes. The marginal cost study analyzes how the cost of the System would change to provide an incremental increase in service. Typically, marginal cost is below average cost and thus, pricing at marginal cost would not allow the utility to recover its full cost; a revenue reconciliation to the approved revenue requirement of the company is also required

6.3.3 Economic theory suggests that rate design should be based on marginal cost since it provides efficient price signals. This is consistent with the approach that the OUR has promulgated for rate design in previous Rate Review determinations and, as such, JPS is required to submit a long run marginal cost (LRMC), cost of service study to support its tariff design in the 2019 – 2023 rate review submission.

6.3.4 The LRMC cost of service study shall include:

   a)   the LRMC of generation, transmission by feeder type and distribution by feeder type and the supply of one unit of additional capacity to the power system at the peak period by main voltage levels;
   b)   the short run marginal cost (SRMC) (energy and other variable O&M) at generation, transmission, and at distribution and supply;
   c)   the economic cost of supply (covering customer service and facilities and administration and general function), expressed as (a) capacity cost (cost/kw/year) or/and fixed charge per month, (b) energy and other variable O&M cost (cost/kWh), and (c) as a composite of (a) and (b) cost/kWh at generation, at transmission, at distribution and supply; and
   d)   The process for marking up the marginal cost to allow for full cost recovery.

6.3.5 JPS shall also submit an embedded cost of service study, which shall be used to establish average costs for each rate class. Both the embedded and the LRMC cost of service study shall include detailed reports on the cost functionalization, classification and allocation process of the major electricity system components as illustrated in Figure 02 below.

Figure 02: Functionalization, Classification and Allocation Process

6.3.6 JPS shall also establish a load research programme to determine cost allocation factors, which will be used in both the embedded and LRMC cost of service studies. In carrying out its load research programme, JPS should ensure that interval data recorders (meters), which will enable the statistical estimation of demand by hour for each rate class, are installed at the premises of a selected sample of customers in each rate class. The samples shall be selected to ensure at minimum a relative precision of peak hour demand estimate of plus or minus 10% at a 90% confidence level.

> **Criterion 16:**
>
> JPS shall submit as part of its 2019 – 2024 Rate Review application:
>
> a) an embedded cost of service study based on the revenue cap for 2019
>
> b) a study done on a bottoms up Long Run Marginal Cost basis with reconciliation to the revenue cap for 2019.
>
> c) a load research study report detailing the sampling technique and methodology used in its programme as well as an analysis of the structure of demand over a typical day (weekdays, Saturday and Sunday) for each rate class.

6.3.7 In submitting its Rate Review application, JPS shall submit a load research study report utilizing at least twelve (12) months of load research data to justify the computation of cost allocation factors such as class coincident peak demand, class non-coincident peak demand and other relevant data required to establish cost allocation factors.

ANNEXES

ANNEX 1 – Proposed Methodology for Computing Controllable OPEX

Year:	Unit	0	1	2	3	4	5	6	7	8	9	10
Green cells are data cells												
Yellow cells are policy decisions												
1. Policy decisions												
Opex starting level	USD	147,736										
Long-term target	%	53%										
Achievement period	years	15										
Cap on annual X	%	3.0%										
2.Resulting efficiency target												
Implied X-factor (computed)	%	4.1%										
X-factor (implicit)	%	3.0%										
3. Efficient opex (exc. demand growth)	USD	147,736	143,304	139,005	134,835	130,790	126,866	123,060	119,368	115,787	112,313	108,944
4. Demand growth projections												
Sales MWh	%		1.91%	2.06%	2.21%	2.14%	2.77%	2.77%	2.77%	2.77%	2.77%	2.77%
Demand MW	%		1.91%	2.06%	2.21%	2.14%	2.77%	2.77%	2.77%	2.77%	2.77%	2.77%
Customer number	%		1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%	1.40%
5. Revenue shares												
Sales MWh	%	50%										
Demand MW	%	25%										
Customer number	%	25%										
6. Weighted average demand growth			1.8%	1.9%	2.0%	2.0%	2.4%	2.4%	2.4%	2.4%	2.4%	2.4%
7. Efficient opex (inc. demand growth)		147,736	145,858	144,164	142,646	141,072	140,161	139,257	138,358	137,465	136,578	135,697

ANNEX 2 – Q-Factor Definitions, Strategy & Derivations

A2.1 Definitions

For the annual Q-Factor adjustment, Exhibit 1 of Schedule 3 of the Licence provides as follows:

"The Q-factor should be based on three quality indices until revised by the Office and agreed between the Office and the Licensee:

SAIFI–this index is designed to give information about the average frequency of sustained interruptions per customer over a predefined area

$$SAIFI = \frac{Total\ number\ of\ customer\ interruptions}{Total\ number\ of\ customers\ served}$$

(Expressed in number of interruptions (Duration > 5 minutes) per year)

SAIDI–this index is referred to as customer minutes of interruption and is designed to provide information about the average time that customers are interrupted

$$SAIDI = \frac{Customers\ interruption\ durations}{Total\ number\ of\ customers\ served}$$

(Expressed in minutes)

CAIDI–this index represents the average time required to restore service to the average customer per sustained interruption. It is the result of dividing the duration of the average customer's sustained outages (SAIDI) by the frequency of outages for that average customer (SAIFI).

$$CAIDI = \frac{Customer\ interruption\ durations\ or\ SAIDI}{Total\ number\ of\ interruptions\ or\ SAIFI}$$

(Expressed in minutes per interruption (Duration > 5 minutes))

Until revision by the Office the quality of service performance should be classified into three categories, with the following point system:

- *Above Average Performance (Greater than 10% below target) — would be worth 3 Quality Points on either SAIFI, SAIDI or CAIDI;*
- *Dead Band Performance (+ or – 10% of target) — would be worth 0 Quality Points on either SAIFI, SAIDI or CAIDI; and*

- *Below Average Performance (Greater than 10% above target) — would be worth -3 Quality*
  Points on SAIFI, SAIDI or CAIDI.

Until revision by the Office, the adjustment factors that would be assigned to cumulative quality points scores for the three reliability indices as follows: If the sum of the quality points for:

- *SAIFI, SAIDI, and CAIDI is 9, then Q = +0.50%*
- *SAIFI, SAIDI, and CAIDI is 6, then Q = +0.40%*
- *SAIFI, SAIDI, and CAIDI is 3, then Q = +0.25%*
- *SAIFI, SAIDI, and CAIDI is 0, then Q = 0.00%*
- *SAIFI, SAIDI, and CAIDI is -3, then Q = -0.25%*
- *SAIFI, SAIDI, and CAIDI is -6 then Q = -0.40%*
- *SAIFI, SAIDI, and CAIDI is -9 then Q = -0.50%"*

A2.2 Data Improvement Strategy

Since 2013, JPS has made significant strides in addressing its outage data quality issues. This includes the implementation of an Outage Management System (OMS) to enable the company to accurately collect and record system outage data. According to JPS, the OMS is currently integrated with its existing Geographic Information System (GIS), and has exhibited reasonable performance. However, there have been prevailing issues with the OMS recorded outage data. These were evident in the OUR's review of the 2014 - 2016 outage data sets, which revealed a number of instances of duplicate outage events, outage events with negative duration, incorrectly classified outage events, among other things. Consequently, this induced significant errors in the calculation of the prescribed quality indices. Recognizing these concerns, JPS reportedly took corrective measures by engaging the OMS vendor to rectify the identified anomalies. This included the formulation of a "Rule Based Management" approach to address existing and other potential issues that may emerge. JPS asserted that the established rules are necessary for calibration purposes when outage characteristics are abnormal.

As a result of these hurdles and interventions, the full implementation of the OMS was delayed. These conditions also impacted the quality and reliability of the OMS recorded data required for the evaluation of the Q-Factor. Accordingly, since then, there has been no credible basis for the establishment of the Q-Factor baseline, thus preventing a definitive determination on the Q-Factor adjustment system.

A2.3 OMS Data Quality and Process Improvements for Rate Review

The information requirements pertaining to JPS OMS data and improvements, shall include among other things, the following:

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1) Evidence indicating that all outstanding OMS data issues are corrected;
2) Evidence indicating that OMS/GIS interface problems are fixed;
3) Report on the review and update of the existing "Rule Based Management" approach, including the "*Rules Base Data Dictionary*", used to normalize outage data. This must be done in consultation with the OUR;
4) Report addressing JPS designated "Non-Reportable" outages, including scope, total number of these outages, nature of outages, reason for classifying outages as non-reportable, efforts to reduce or eliminate them;
5) Report addressing the following:
    a) Review and update of "Customer-to-Feeder" mapping, in terms of accuracy (%), completeness (%), actual number of customers per feeder and feeder sections, number of customers linked to switching devices, etc.;
    b) Review and update of "Transformer-to-Feeder" mapping, in terms of accuracy (%) and completeness, actual number of transformers per feeder and feeder sections, etc.;
    c) Review and update "Customer-to-Transformer" mapping, in terms of accuracy (%) and completeness (%), actual number of customers per transformer, etc.;
    d) Transformer Mapping.

A2.4 Derivation of JPS Quality Indices

The prescribed quality indices required for the calculation of the Q-Factor are SAIFI, SAIDI and CAIDI. Notwithstanding, for information and monitoring purposes the OUR also requires JPS to report on as well MAIFI. The quality indices, including MAIFI, shall be computed by JPS in accordance with the requirements of the Licence and supported by the IEEE Guide for Electric Power Distribution Reliability. The relevant computations shall show, among other things, the following:
1) The average monthly value of SAIFI, SAIDI, CAIDI and MAIFI, based on the annual outage data sets specified above;
2) The average annual value of SAIFI, SAIDI, CAIDI and MAIFI, based on the annual outage data sets specified above;
3) Stage restoration;
4) Daily Total Customer Count;
5) Customer Minutes Loss (CML); and
6) Other relevant information.
7) Major Event Days (MED) for reference but not will not be applied to the Q-Factor

ANNEX 3 – System Losses -Definitions, Strategy & Derivations

A3.1 Definitions

Losses in an electric utility System are generally measured as the difference between the amount of electrical energy generated and the energy delivered to the loads (customers), and in practice include losses due to theft. Energy losses tend to occur at all levels of the System, from generation, through T&D, to the supply to customers inclusive of metering systems. The total System losses for any given period is usually expressed as a percentage of total energy input to the System (net generation) and can be computed as follows:

System Losses (%) = [(Electricity to System (MWh) – Total Electricity Billed (MWh))/Electricity to System] X 100

System losses can be divided into two main categories:

- Technical Losses (TL); and
- Non-technical Losses (NTL).

<u>Technical Losses</u>

TL are mainly due to power dissipation in the System's electrical components such as transmission and distribution (T&D) lines, measurement systems and other auxiliary systems. These are inherent in the operation of the power System and can be computed and reduced to an optimum level.

<u>Non-Technical Losses</u>

NTL are caused by actions external to the power system and consist primarily of electricity theft, errors in accounting, metering, billing and customer information systems. NTL are more difficult to measure and are often inaccurately accounted for by the electricity system operator. Non-technical losses tend to have several perverse effects, some of which are manifested when legitimate electricity customers who are billed for accurately measured consumption and regularly paying their bills to the electric utility company, are required to subsidize those users who do not pay for their electricity consumption.

Accurately accounting for the quantities of electricity consumed by users is critical to the efficient operation of an electric utility as this impacts revenues, and by extension, the financial viability of the company. Given this dynamic, the utility should be encouraged to keep System losses at minimal levels.

A3.2 General Areas of Focus

1. System losses data requirements
2. Energy Losses Spectrum (ELS):
   a. Rolling twelve (12) months methodology for computation

b. Inclusion of the actual system losses performance for the said billing month of the ELS in MS Excel format showing the relevant calculations

c. Include usual display of TL across the value chain

d. More information on the estimation of energy losses due to illegal users

3. Decomposition of System losses in lowest sub-components
4. Causation Factors
5. Allocation of Losses approach
6. CIS System and data recording approach – inconsistencies in data reporting, customer count, sales etc.
7. Integrity of JPS database and data management system – details on system used by JPS to manage System losses data
8. System loss calculation methodology – sales figures used (billed vs total sales)
9. Measurement methodologies – Technical Losses (TL) and Non-technical Losses (NTL)
10. Proper accounting for station service energy usage
11. Reconciliation of Peak and net generation on net basis
12. Metering requirements – customer and check meters, communication and calibration issues
13. Effectiveness of previous technological measures to reduce NTL
14. Customer-to-transformer mapping and customer-to-feeder mapping
15. Network visibility – network intelligence, communication systems, DMS, etc.
16. Internal Controls – credibility of related systems, reconciliation process for recovered energy
17. The human element
18. Regulatory/utility perspective on the Rolling ten (10) year system losses targets

A3.3 Requirements for Evaluation of Technical Losses

Transmission Losses

- Breakdown of TL losses for each transmission line, substation transformer, and other relevant equipment/apparatus.
- Measurement and modelling approach – including optimal power flow simulations, security contingency, etc. based on system present and projected future configuration
- Details on verification process

Primary Distribution Losses

- Breakdown of losses for each feeder, transformer, and other relevant equipment
- Measurement and modelling approach – including simulations as applicable
- Energy balance validations

- Breakdown of losses where possible,
- Measurement approach

Optimality

- Assessment to determine optimal TL level based on system configuration in 2024 and 2029

TL Loss Reduction Strategy

- Details of JPS TL Loss reduction plans and programmes

A3.4 Requirements for Evaluation of Non-Technical Losses

NTL as defined above continues to be problematic for the Jamaican electricity System for various reasons. Notwithstanding, these losses can be largely avoided by JPS if appropriate measures are implemented to eliminate or substantially reduce them. It is clear that the major portion (approximately 70%) of the overall System losses is attributed to NTL, which has several perverse consequences. In recognition of these undesirable effects, urgent and robust action is required to prevent further escalation and ultimately their elimination. From, an economic perspective, the realization of tangible reductions in NTL would be a favourable outcome for JPS in terms of its overall efficiency and financial sustainability. Meaningful reductions in NTL also provide added benefits, such as releasing overburdened capacity to enable JPS to satisfy its service obligations under its Licence. While such considerations are recognized, it must be noted that certain treatment of these losses tends to result in inefficient pricing driven by the burden of cross-subsidization. This is usually manifested in a way that customers who are billed for legitimate usage and regularly paying their bills are required to subsidize those users who illegally abstract electricity.

Classification of JPS' Non-Technical Losses

According to JPS' System losses data and ELS, total NTL are due to energy losses which occur in three main areas:

- NTL caused by Billed customers (RT10, RT20, RT40&50, and RT60)
- NTL that are Internal to JPS operations and "Unquantified" energy losses
- NTL due to illegal users (non-customers)

According to Schedule 3, paragraph 38 of the Licence, the total NTL should be divided into two categories:

- The aspect of NTL that are within the control of JPS - designated by JPS as "JNTL"
- The aspect of NTL that are not totally within the control of JPS – designated by JPS as "GNTL"

A4.1 Monthly Adjustment to Fuel Rates

Regarding the monthly adjustment to fuel rates, Schedule 3, Exhibit 2 of the Licence, provides as follows:

> "A. *Alternative 1 Fuel Cost Adjustment Mechanism*
>
> *The cost of fuel per kilo-watt-hour (net of efficiencies) shall be calculated each month on the basis of the total fuel computed (inclusive of fuel additives) to have been consumed by the Licensee and Independent Power Producers (IPPs) in the production of electricity. Effective January 1, 2016, this will be calculated each month based on the Licensee's generating heat rate as determined by the Office at the adjustment date and the IPPs generating Heat Rate as per contract and system losses, as determined by the Office at the adjustment date, applied to the total net generation (the Licensee and IPPs). Effective July 1, 2016, this will be calculated each month based on the Licensee's generating heat rate as determined by the Office as at June 30, 2016 (an each succeeding rate review date) and the IPPs generating as per contract."*

> *The cost of fuel per kilo-watt-hour shall be computed on a monthly basis under the appropriate rate schedule in the following manner having regard to the applicable efficiency adjustments and effective dates as outlined in the paragraph:*

> "$F = Fm/Sm$

> *Where:*
>
> | | |
> |---|---|
> | *Billing Period =* | *The billing month during the effective period for which the adjusted fuel rates will be in effect as determined by the Office.* |
> | *F =* | *Monthly Fuel Rate in J$ per kWh rounded to the nearest one-hundredth of a cent applicable to bills rendered during the current Billing Period* |
> | *Fm =* | *Total applicable energy cost for period* |

Components of the Fuel Cost Pass-through

> *The total applicable energy cost for the Billing Period is:*

> (a) *the cost of fuel, adjusted for the determined heat rate and system losses up to June 30, 2016, and which fuel is consumed in the Licensee's generating units or burned in generating units on behalf of the Licensee or incurred in*

relation to the Licensee's contractual obligation, such as but not limited to the minimum take-or-pay obligation under a gas supply agreement, for the preceding calendar month plus;

(b) the fuel portion of the cost of purchased power (including IPPs), adjusted for the contract Heat Rate, for the said preceding calendar month; and

(c) an amount to correct for the over-recovery or under-recovery of total applicable energy cost for a billing period, such amount shall be determined as the difference between the actual total applicable energy cost for a given month adjusted for the determined heat rate … and the fuel costs billed for such month, using … fuel costs and fuel weights.

(d) An amount to correct for the over-recovery or under-recovery of the non-fuel portion of the purchased power. This amount shall be determined as the difference between the actual IPP non-fuel cost for a given month and the estimated base non-fuel IPP charge billed to customers for such calendar month.

S_m = *the kWh sales in the Billing Period.*

The kWh sales in the billing period is the actual kWh sales occurring in the previous calendar month.

The Fuel Rate Adjustment including the Schedule for the application of the fuel charge to each rate class, shall be submitted by the Licensee to the Office ten (10) days [prior to the end of the month just preceding the applicable billing month] and shall become effective on the first billing cycle on the applicable billing

A4.2 Heat Rate Target Evaluation Data Requirement
a) <u>System Load Data</u>
    i.   System information requirements for the rate review period, shall include:

    ii.   Projected monthly net generation and peak demand for the 2019-2024 price control period, consistent with published final criteria related to electricity demand;

    iii.   Chronological load data (2018) for creation of Load Duration Curve (LDCs)

b) <u>Existing Generation System – JPS and IPPs</u>
  Information requirements for existing conventional and RE generation plants, shall include:

Status report on all operational generating units in the System;

ii. Existing thermal generating plants technical & operational capabilities (JPS & IPPs):

- Output capability – minimum and maximum operating levels (gross and net), dependable capacity, etc.,
- Plant efficiency - heat rate curves, average heat rates, incremental heat rate,
- Ramp rates within the specified operating range,
- Utilization levels - minimum sustained production level, capacity factor, etc.,
- Operating reserves, spinning reserve requirements, constraints on reserves
- Equivalent availability, forced outage rates (FORs), scheduled maintenance days;

iii. Existing RE generation facilities (JPS & IPPs) – installed and contracted capacity, projected monthly net generation, capacity factor, capacity degradation factor, efficiency, output variability, etc.;

iv. Technical and operational constraints on generating units, including capacity deration (JPS & IPPs);

v. Network constraints;

vi. JPS generating units retirement schedule;

vii. The most current heat rate test which must be in accordance with the provisions of the Generation Code;

viii. Variable O&M cost (US$/MWh) projections for each generating unit for each year of the rate review period;

ix. Fuel cost (US$/MWh) projections for each generating unit for each year of the rate review period; and

x. Any other information relevant to the Heat Rate evaluation.

c) <u>Net Billing Data</u>
- aggregate net energy output for the net billing (SOC) generating facilities.

d) <u>Committed Generation Projects Due for Commissioning Within Rate Review Period</u>
Information requirements for conventional and RE generation facilities scheduled for commissioning within the Rate Review period, which will also impact Heat Rate performance, shall include the following, as applicable:

Performance Characteristics
i. Contracted/dependable capacity (MW);
ii. Projected monthly and annual net generation (MWh);
iii. Contracted heat rate (point) or heat rate curve;
iv. Output Capability - minimum and maximum output level;
v. Capacity Factor (monthly and annually);

     vi.   Annual capacity degradation; and

     vii.   Equivalent availability, FOR, scheduled maintenance days;

Cost Data
- i.   Variable O&M costs and indexation;
- ii.   Fuel costs and indexation, as applicable; and
- iii.   Start-up costs, as applicable.

e) Transmission System Data
- i.   Annual maintenance plan for the transmission system for each year of the Rate Review period; and
- ii.   Planned reinforcement or expansion of the transmission system during the 2019-2024 Rate Review period.

f) Annual Generation Maintenance Schedule
- i.   Annual maintenance schedule for the entire generation system for each year of the Rate Review period; and
- ii.   Projection of daily demand, daily available capacity and daily reserve margin in MS Excel format

g) Bogue CCGT Heat Rate Calculations with NG/ADO
- i.   JPS' monthly heat rate calculations for Bogue CCGT when operating on NG/ADO must be clearly shown; and
- ii.   Supporting evidence for input parameters must be provided

h) Generation Dispatch Files
- i.   Description of JPS' generation dispatch computer simulation model;
- ii.   Full data set of all dispatch assumptions/inputs used in the generation dispatch simulation model, including system constraints, to derive the daily generation dispatch projections for each month of the Rate Review period;
- iii.   The simulated daily generation dispatch of all available thermal generating units (JPS & IPPs), for each month of the Rate Review period as extracted from JPS' generation dispatch model (in the same file format of the model).

A4.3 JPS Heat Rate Model

A comprehensive heat rate model in MS Excel will be required to substantiate the projected monthly heat rates for each year of the rate review period, which shall include, among other things, the following:

1) Proper quantification in terms of "volume unit" and "energy unit" of the input fuel energy forecasted to be supplied to each JPS thermal generating unit in each month of the Rate Review period;

2) Heating value (HHV and LHV) of each fuel type applicable to each JPS thermal generating unit;

3) The projected monthly net generation (MWh) of each available generating unit (conventional and RE) to be supplied to the system subject to the generation dispatch process, for each year of the Rate Review period;

4) The projected monthly average heat rate (kJ/kWh) for each JPS thermal generating unit derived from the generation dispatch optimization process, for each year of the rate review period; and

5) Proposed annual average Heat Rate targets to be applied monthly during the price control period subject to the selected Heat Rate target methodology reflected.

6) The JPS Heat Rate model must clearly show all calculations and formulas, connecting outputs to inputs.

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