Jamaica Public Service Company Limited

CHANGING LIVES WITH OUR ENERGY

# THE JAMAICA PUBLIC SERVICE CO. LTD.

# ANNUAL TARIFF ADJUSTMENT

# SUBMISSION FOR 2005

## APRIL 5, 2005

# Preamble

This submission is made in relation to the annual Performance-Based Rate-Making (PBRM) tariff adjustment filing, in accordance with the All Island Electric Licence 2001 (the Licence), Schedule 3, section 4, which states:

> "The Licensee shall make annual filings to *the Office* at least sixty (60) days prior to the Adjustment Date [June 1, 2005]. These filings shall include the support for the performance indices, the CPI indices, and the proposed Non-Fuel Base Rates for electricity, and other information as may be necessary to support such filings…."

In accordance with the Licence and the OUR's June 25, 2004 Determination Notice, the 2005 annual non-fuel tariff adjustment will incorporate changes in relation to inflation, foreign exchange movement and adjustments for the Z-factor. No adjustments will be made at this time in relation to the X-factor and Q-factor, as these adjustments are to be incorporated into the 2006 annual non-fuel tariff adjustment.

This first year under the new regulatory framework, which began effective June 1, 2004, has indeed been a challenging one. Despite the relative stability of the local currency, the annual point-to-point inflation to February 2005 was approximately 12%. While this relatively high rate of inflation affects JPS' local operating costs, the event that caused the high inflation itself had an even more profound effect on JPS in the last year (i.e. Hurricane Ivan). Hurricane Ivan wreaked havoc throughout the Caribbean, doing significant damage in Grenada, before hitting Jamaica on September 10, 2005. JPS has expended tremendous effort and resources in restoring its operating systems back to normal in a timely manner to ensure the efficient and reliable provision of electricity services to its customers. JPS believes that the Licence appropriately contemplates events such as Hurricanes under the Z-factor, with the overall view of providing the correct set of incentives to JPS to ensure that it operates efficiently, continues to improve its productivity and remains financially viable so as to attract the necessary ongoing financing for its operations. This is fundamental to ensuring that JPS is able to meet its service obligations under the Licence and that it operates in an efficient manner.

JPS remains committed to continued improvement in its service provision to its customers. JPS is committed to implementing monthly meter readings for all customers by mid to late 2005, long before the agreed target date of June 2006. Additionally, JPS continues to look at other measures to improve the quality of its service provision, as well as to reduce the overall cost of electricity. To this end, JPS is working with the OUR on a generation expansion plan that will have the long-term impact of diversifying fuel and reducing the cost of electricity.

JPS believes that this submission is made in the best interests of all stakeholders and in accordance with the Licence. JPS remains committed to the long-term development of Jamaica under the regulatory guidance of the OUR. JPS believes that the Z-factor principle is fundamental to achieving this objective, especially when considering that it will be several years before the sinking fund insurance will provide adequate protection against future exogenous shocks.

## Glossary

| | | |
|---|---|---|
| ABNF | - | Adjusted Non-fuel base rate |
| ADC | - | Average Dependable Capacity |
| CAPM | - | Capital Asset Pricing Model |
| CAIDI | - | Customer Average Interruption Duration Index |
| CIS | - | Customer Information System |
| CML | - | Customer Minutes Lost |
| CPI | - | Consumer Price Index |
| CRP | - | Country Risk Premium |
| CT | - | Current Transformer |
| CWIP | - | Construction Work in Progress |
| DCF | - | Discounted Cash Flow |
| DEA | - | Data Envelope Analysis |
| EFLOP | - | Equivalent Full Load Provision |
| EMS | - | Environmental Management System |
| GDP | - | Gross Domestic Product |
| GOJ | - | Government of Jamaica |
| IPP | - | Independent Power Purchase |
| IVR | - | Interactive Voice Response |
| kVA | - | Kilo Volt Amperes |
| kWh | - | Kilowatt-hours |
| Licence | - | The All Island Electric Licence 2001 |
| MVA | - | Mega Volt Amperes |
| MW | - | Megawatt |
| MWh | - | Megawatt-hours |
| NWC | - | National Water Commission |
| O&M | - | Operating and Maintenance |
| PBRM | - | Performance Based Rate-Making Mechanism |
| RDC | - | Required Dependable Capacity |
| REP | - | Rural Electrification Programme Limited |
| RPD | - | Revenue Protection Department |
| SAIDI | - | System Average Interruption Duration Index |
| SAIFI | - | System Average Interruption Frequency Index |

## Glossary (Cont'd)

| | | |
|---|---|---|
| SCADA | - | Supervisory Control and Data Acquisition |
| SFA | - | Stochastic Frontier Analysis |
| PT | - | Potential Transformer |
| T&D | - | Transmission & Distribution |
| TFP | - | Total Factor Productivity |
| TOU | - | Time of Use |
| WACC | - | Weighted Average Cost of Capital |

## Contents

# Section 1: PBRM Annual Adjustment

## 1.1 Overview

According to Exhibit 1 in the Licence:

> "The Non-Fuel Base Rate for each customer class shall be adjusted on an annual basis, commencing June 1, 2004, *(Adjustment Date)*, pursuant to the following formula:
>
> $$\mathbf{ABNFy = ABNFy\text{-}_1\ (1 + dPCI)}$$
>
> Where:
>
> $ABNF_y$ = Adjusted Non-Fuel Base Rate for Year "y"
>
> $ABNF_{y\text{-}1}$ = Non-Fuel Base Rate prior to adjustment
>
> dPCI = *Annual* rate of change in the non-fuel electricity prices as defined below
>
> PCI = Non-fuel Electricity Pricing Index
>
> "The annual PBRM filing will follow the general framework where the annual rate of change in non-fuel electricity prices (dPCI) will be determined through the following formula:
>
> $$\mathbf{dPCI = dI \pm X \pm Q \pm Z}$$
>
> Where:
>
> dI = the annual growth rate in an inflation and devaluation measure;
>
> X = the offset to inflation (annual real price increase or decrease) resulting from productivity changes in the electricity industry;
>
> Q = the allowed price adjustment to reflect changes in the quality of service provided to the customers; and
>
> Z = the allowed rate of price adjustment for special reasons not captured by the other elements of the formula.

The above was modified on page 13 of the OUR's June 25, 2004 Determination Notice as follows:

> "The price cap will be applied on a global basis. Specifically, the annual adjustment factor (1 + dPCI) will be applied to the tariff basket instead of the individual tariff. The adjustment in each tariff will be weighted by an associated quantity for each element. The weighted average increase of the tariff basket must not exceed the price adjustment factor (1 + dPCI)."

## 1.1 Overview (Cont'd)

The OUR's Determination Notice further states that:

> "The inflation adjustment formula (dI) to be used during the 2004-2009 tariff period has been changed to more accurately reflect the inflation costs incurred on JPS. The base non-fuel tariffs shall be adjusted annually, as follows:
>
> $$\mathbf{b_1 = b_0 [1 + dI]}$$
>
> $$\mathbf{dI = [0.76 * e + 0.76 * 0.922 * e*i_{US} + 0.76 * 0.922 * i_{US} + 0.24 * i_j}$$
>
> where:
>
> $b_0$ = Base non-fuel tariff at time period t = 0
>
> $b_1$ = Base non-fuel tariff at time period t = 1
>
> e = Percentage change in the Base Exchange Rate
>
> $i_{US}$ = US inflation rate (as defined in the Licence)
>
> $i_j$ = Jamaican inflation rate (as defined in the Licence)
>
> 0.76 = US factor
>
> 0.24 = Local (Jamaica) factor

## 1.2 Details of the current year annual inflation adjustment (dI)

The annual adjustment allows JPS to adjust its rates to reflect general movements in prices, improvements in productivity, changes in service quality and unforeseen occurrences beyond management control not captured in the licence. The following outlines JPS' proposals in relation to the components of dPCI and its application to the non-fuel tariffs.

The application of the above formula results in an inflation adjustment factor of 6.43%, derived using the following factors:

- The Jamaican twelve month point to point inflation rate to February 28, 2005 of 12.68%, derived from the most recent CPI data[1] (see Appendix I);
- The U.S. twelve month point to point inflation rate to February 28, 2005 of 3.01%, derived from the US Department of Labour statistical data[2] (see Appendix I); and
- The change in the base exchange rate from J$61:US$1 to J$62:US$1

See Table 1.1 for derivation.

[1] Obtained from the Bank of Jamaica Economic Digest (which has the same data as The Statistical Institute of Jamaica, CPI Statistical Bulletin February 2005).
[2] Obtained from US Bureau of Labour Statistics website, http://data.bls.gov/cgi-bin/surveymost

## 1.2 Details of the current year annual inflation adjustment (dI) (Cont'd)

**Table 1.1**

**Escalation Factor**

| Line | Description | Formula | Value |
|---|---|---|---|
| | Base Exchange Rate | | |
| **L1** | Current | | **61** |
| **L2** | Proposed | | **62** |
| | Jamaica Inflation Index[3] | | |
| **L3** | CPI @ Feb 2005 | | **2,041.7** |
| **L4** | CPI @ Feb 2004 | | **1,811.9** |
| | US Inflation Index[3] | | |
| **L5** | CPI @ Feb 2005 | | **191.8** |
| **L6** | CPI @ Feb 2004 | | **186.2** |
| **L7** | Exchange Rate Factor | (L2-L1)/L1 | **1.64%** |
| **L8** | Jamaican Inflation Factor | (L3-L4)/L4 | **12.68%** |
| **L9** | US Inflation Factor | (L5-L6)/L6 | **3.01%** |
| | Escalation Factor | 0.76*L7*(1+0.922*L9)+0.76*0.922*L9+0.24*L8 | **6.43%** |

## 1.3 X – Factor component of PBRM

Schedule 3 Exhibit 1 of the Licence defines X factor as follows:

> "The X- factor is based on the expected productivity gains of the Licensee's Business. The X- factor is to be set to equal the difference in the expected total factor productivity growth of the Licensed Business and the general total factor productivity growth of firms whose price index of outputs reflect the escalation measure 'dI'."

The X- factor was determined by the OUR to be 2.72%. However this factor becomes applicable in 2006 and is therefore equal to zero in this 2005 annual tariff submission.

## 1.4 Q – Factor component of PBRM

Another factor under the PBRM is the Q-factor, being the allowed price adjustment to reflect changes in the quality of service provided to customers.

The OUR's June 2004 determination notice requires JPS to submit the benchmark data for 2004 to calculate the relevant indices (SAIDI, SAIFI and CAIDI). This benchmark data will form the basis for measuring improvements or deterioration in the quality of service provided to customers for the remainder of the tariff period (i.e. as of June 206). Accordingly, the Q-factor is equal to zero in this 2005 annual tariff submission. Please refer to section 3 of this document for the details on the benchmark data being submitted.

[3] See Appendix I for details of CPI indices.

## 1.5 Application of Annual Inflation Adjustment Factor (dI)

Based on Table 1.1, an annual adjustment factor of 6.43% can be applied to the total tariff basket. The adjustment in each tariff will be weighted, thus the adjustment across rates will be dependent on their relative weights in relation to the total tariff basket. The total tariff basket, shown below in Table 1.2, is derived using the actual billing determinants for 2004 and the non-fuel tariffs approved in the June 2004 OUR rate determination (refer to Table 1.6 for the 2004 determined tariffs).

**Table 1.2**

**Total Non-Fuel Tariff Basket**

| Class | | Block/ Rate Option | Customer Charge Revenue (J$'000) | Energy Revenue (J$'000) | Demand (KVA) Revenue (J$'000) | | | | Total Demand Revenue (J$'000) | Total Revenues (J$'000) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Std. | Off-Peak | Part-Peak | On-Peak | | |
| Rate 10 | LV | 0-100 kWh | 9,760 | 2,034,138 | | | | | | 2,043,898 |
| Rate 10 | LV | > 100 kWh | 22,774 | 5,071,392 | | | | | | 5,094,166 |
| Rate 20 | LV | | 8,071 | 4,284,030 | | | | | | 4,292,102 |
| Rate 40A | LV | | 924 | 304,547 | 116,282 | | | | 116,282 | 421,753 |
| Rate 40 | LV | STD | 1,808 | 865,311 | 1,300,482 | | | | 1,300,482 | 2,167,600 |
| Rate 40 | LV | TOU | 281 | 226,775 | | 11,423 | 114,583 | 125,624 | 251,629 | 478,685 |
| Rate 50 | MV | STD | 133 | 323,928 | 399,566 | | | | 399,566 | 723,628 |
| Rate 50 | MV | TOU | 75 | 245,289 | | 12,499 | 124,712 | 131,321 | 268,531 | 513,894 |
| Rate 60 | LV | | 107 | 506,578 | | | | | | 506,685 |
| Total | | | 43,934 | 13,861,987 | 1,816,331 | 23,921 | 239,294 | 256,944 | 2,336,490 | 16,242,411 |

The weights of each tariff relative to the total tariff basket shown in Table 1.2 above are shown in Table 1.3 below.

**Table 1.3**

**Non-Fuel Tariff Basket Weights**

| Class | Block/ Rate Option | Customer Charge | Energy | Demand | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | Std. | Off-Peak | Part-Peak | On-Peak | |
| Rate 10 | 0-100 kWh | 0.1% | 12.5% | 0.0% | 0.0% | 0.0% | 0.0% | 12.6% |
| Rate 10 | >100 kWh | 0.1% | 31.2% | 0.0% | 0.0% | 0.0% | 0.0% | 31.4% |
| Rate 20 | LV | 0.1% | 26.4% | 0.0% | 0.0% | 0.0% | 0.0% | 26.4% |
| Rate 40A | LV | 0.0% | 1.9% | 0.7% | 0.0% | 0.0% | 0.0% | 2.6% |
| Rate 40 | LV - Std | 0.0% | 5.3% | 8.0% | 0.0% | 0.0% | 0.0% | 13.3% |
| Rate 40 | LV - TOU | 0.0% | 1.4% | 0.0% | 0.1% | 0.7% | 0.8% | 2.9% |
| Rate 50 | MV - Std | 0.0% | 2.0% | 2.5% | 0.0% | 0.0% | 0.0% | 4.5% |
| Rate 50 | MV - TOU | 0.0% | 1.5% | 0.0% | 0.1% | 0.8% | 0.8% | 3.2% |
| Rate 60 | LV | 0.0% | 3.1% | 0.0% | 0.0% | 0.0% | 0.0% | 3.1% |
| Total | | 0.3% | 85.3% | 11.2% | 0.1% | 1.5% | 1.6% | 100.0% |

## 1.5 Application of Annual Inflation Adjustment Factor (dI) (Cont'd)

Table 1.4 below shows the annual adjustment factor that JPS proposes to apply to each individual tariff.

**Table 1.4**

**Annual Non-Fuel Inflation Adjustment per tariff**

| Class | Block/ Rate Option | Customer Charge (J$/kWh) | Energy (J$/kWh) | Demand (J$/KVA) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Std. | Off-Peak | Part-Peak | On-Peak |
| Rate 10 | 0-100 kWh | 4.43% | 4.43% | | | | |
| Rate 10 | >100 kWh | 4.43% | 4.43% | | | | |
| Rate 20 | LV | 8.43% | 8.43% | | | | |
| Rate 40A | LV | 7.61% | 7.61% | 7.61% | | | |
| Rate 40 | LV - Std | 7.61% | 7.61% | 7.61% | | | |
| Rate 40 | LV - TOU | 7.61% | 7.61% | | 7.61% | 7.61% | 7.61% |
| Rate 50 | MV - Std | 7.61% | 7.61% | 7.61% | | | |
| Rate 50 | MV - TOU | 7.61% | 7.61% | | 7.61% | 7.61% | 7.61% |
| Rate 60 | STREET-LIGHTS | 7.61% | 7.61% | | | | |
| Rate 60 | TRAFFIC-LIGHTS | 7.61% | 7.61% | | | | |

As per the June 2004 OUR determination, the weighted annual adjustment factor proposed by JPS should equate to the annual adjustment factor (6.43%). Proof of this is shown below in table 1.5.

**Table 1.5**

**Weighted Non-Fuel Inflation Adjustment**

| Class | Block/ Rate Option | Customer Charge (J$/kWh) | Energy (J$/kWh) | Demand (J$/KVA) | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | Std. | Off-Peak | Part Peak | On-Peak | |
| Rate 10 | 0-100 kWh | 0.00% | 0.55% | | | | | 0.55% |
| Rate 10 | >100 kWh | 0.01% | 1.38% | | | | | 1.39% |
| Rate 20 | LV | 0.00% | 2.22% | | | | | 2.23% |
| Rate 40A | LV | 0.00% | 0.14% | 0.05% | | | | 0.20% |
| Rate 40 | LV - Std | 0.00% | 0.41% | 0.61% | | | | 1.02% |
| Rate 40 | LV - TOU | 0.00% | 0.11% | 0.00% | 0.01% | 0.05% | 0.06% | 0.22% |
| Rate 50 | MV - Std | 0.00% | 0.15% | 0.19% | 0.00% | 0.00% | 0.00% | 0.34% |
| Rate 50 | MV - TOU | 0.00% | 0.11% | 0.00% | 0.01% | 0.06% | 0.06% | 0.24% |
| Rate 60 | LV | 0.00% | 0.24% | | | | | 0.24% |
| Total | | 0.01% | 5.32% | 0.85% | 0.02% | 0.11% | 0.12% | **6.43%** |

## 1.5 Application of Annual Inflation Adjustment Factor (dI) (Cont'd)

The non-fuel base rates approved in the 2004 OUR Rate Determination are shown below.

**Table 1.6**

**Approved Non-Fuel Tariffs for 2004**

| Class | | Block/ Rate Option | Customer Charge J$/ kWh | Energy J$/kWh | Demand J$/KVA | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Std. | Off-Peak | Part-Peak | On-Peak |
| Rate 10 | LV | 0-100 kWh | 68 | 4.549 | | | | |
| Rate 10 | LV | >100 kWh | 68 | 8.008 | | | | |
| Rate 20 | LV | | 150 | 6.770 | | | | |
| Rate 40A | LV | | 2,100 | 4.250 | 276 | | | |
| Rate 40 | LV - Std | | 2,100 | 1.728 | 707 | | | |
| Rate 40 | LV - TOU | | 2,100 | 1.728 | | 29 | 308 | 394 |
| Rate 50 | MV - Std | | 2,100 | 1.556 | 636 | | | |
| Rate 50 | MV - TOU | | 2,100 | 1.556 | | 26 | 277 | 355 |
| Rate 60 | STREET-LIGHTS | | 550 | 8.161 | | | | |
| Rate 60 | TRAFFIC-LIGHTS | | 550 | 5.494 | | | | |

Table 1.7 shows the proposed inflation adjusted rates after applying the individual tariff increases proposed in Table 1.4. This essentially captures the annual inflationary change (dI) in the non-fuel electricity prices prior to the application of the Z-factor. Accordingly, this represents dI + Q + X, where Q and X are considered to be zero as at June 2005 (but this does not take into account the effect of Z which is shown in Table 1.8).

**Table 1.7**

**Inflation Adjusted Non-Fuel Tariffs (dI ± X ± Q)**

| Class | | Block/ Rate Option | Customer Charge J$/ kWh | Energy J$/kWh | Demand J$/KVA | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Std. | Off-Peak | Part-Peak | On-Peak |
| Rate 10 | LV | 0-100 kWh | 71 | 4.751 | | | | |
| Rate 10 | LV | >100 kWh | 71 | 8.363 | | | | |
| Rate 20 | LV | | 163 | 7.341 | | | | |
| Rate 40A | LV | | 2,259 | 4.571 | 297 | | | |
| Rate 40 | LV - Std | | 2,259 | 1.859 | 760 | | | |
| Rate 40 | LV - TOU | | 2,259 | 1.859 | | 31 | 331 | 424 |
| Rate 50 | MV - Std | | 2,259 | 1.674 | 684 | | | |
| Rate 50 | MV - TOU | | 2,259 | 1.674 | | 28 | 298 | 382 |
| Rate 60 | STREET-LIGHTS | | 592 | 8.777 | | | | |
| Rate 60 | TRAFFIC-LIGHTS | | 592 | 5.909 | | | | |

## 1.6 Application of Annual PBRM Adjustment

The final tariff for 2005/2006 would be derived by adjusting the inflation escalated rates shown in Table 1.7 above for the Z-factor. The complete details of the Z-factor adjustment are presented in Section 2 of this document. Section 2.4 demonstrates that the total Z-factor impact equates to 46.59¢ per kWh. Accordingly, the full impact of the annual PBRM on non-fuel rates after including the Z-factor is shown below in Table 1.8.

**Table 1.8**

**Summary of Proposed 2005/2006 Non-Fuel Tariffs (dI ± X ± Q ± Z)**

| Class | | Block/ Rate Option | Customer Charge J$/ kWh | Energy J$/kWh | Demand J$/KVA | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Std. | Off-Peak | Part-Peak | On-Peak |
| Rate 10 | LV | 0-100 kWh | 71 | 5.216 | | | | |
| Rate 10 | LV | >100 kWh | 71 | 8.829 | | | | |
| Rate 20 | LV | | 163 | 7.807 | | | | |
| Rate 40A | LV | | 2,260 | 5.039 | 297 | | | |
| Rate 40 | LV - Std | | 2,260 | 2.325 | 760 | | | |
| Rate 40 | LV - TOU | | 2,260 | 2.325 | | 31 | 331 | 424 |
| Rate 50 | MV - Std | | 2,260 | 2.140 | 684 | | | |
| Rate 50 | MV - TOU | | 2,260 | 2.140 | | 28 | 298 | 382 |
| Rate 60 | STREET-LIGHTS | | 592 | 9.248 | | | | |
| Rate 60 | TRAFFIC-LIGHTS | | 592 | 6.378 | | | | |

# Section 2: Exogenous Shocks: The Z-Factor

## 2.1 Background

On September 10, 2004, nearly the entire island of Jamaica was subjected to the category 4 force winds of Hurricane Ivan. This hurricane wreaked havoc across the island over a period of approximately twelve hours, causing much wind and flood damage to real property and basic infrastructure (see further details in Appendix II).

As fully disclosed to the OUR as part of the 2004 rate submission, JPS is not able to reasonably obtain conventional insurance coverage in relation to its T&D assets. It is for this reason that a self-insurance sinking fund was started effective June 2004 with a view of saving approximately US$2 million per year. However, given the magnitude of the damage experienced in September 2004, relative to the current value of the self-insurance fund, JPS does not believe it prudent to utilize the self-insurance funds at this time. These funds are currently less than 5% of the value of the current claim and would be better left to accumulate so as to provide more meaningful mitigation against future catastrophes.

In the absence of adequate protection from the self insurance fund and given the nature of the event, JPS is required to file for recovery of the relevant costs under the Z-factor, as defined in Schedule 3 (Exhibit 1) of the Licence:

"The Z-factor is the allowed percentage increase in the price cap index due to events that:

a) affect the Licensee's costs;
b) are not due to the Licensee's managerial decisions; and
c) are not captured by the other elements in the price cap mechanism."

Accordingly, the Z-factor claim as outlined in detail in section 2.2, relates primarily to hurricane damage suffered by JPS' T&D network as well as damage experienced by JPS' power plants. This claim has been quantified based on the total cash flow impact of the hurricane damage on the company. This is consistent with section 1.2, of the OUR's June 24, 2004, Determination Notice, where the OUR states:

> "It is therefore the objective of the Office to ensure that the tariff determination will:
>
> - further improve upon customer service and service reliability;
> - provide the correct set of incentives for JPS to operate efficiently and to continue improving its productivity;
> - provide a fair return to investors; and
> - ensure that, while the price cap regime imposes a constraint on the company to pass on excessive costs to the customers, it does not unfairly impose upon the company risks that are outside of managerial control.

It is JPS' fundamental position that the costs included in this claim are the result of risks that are outside of its managerial control; and that JPS operates under a regulatory framework which sets its allowed return on investment, and monitors its O&M costs, after properly contemplating appropriate operational risks which JPS should address, as well as providing protection in the form of a Z-factor against unavoidable residual risks.

## 2.2 Z-factor impact on JPS

### 2.2.1 Financial Considerations

Hurricane Ivan had numerous effects on the company from a financial and operational viewpoint. JPS was forced to defer several projects and cost savings initiatives and focus its attention and resources on restoring electricity to its customers in a timely manner. Notably the company dropped its efforts against illegal connections for approximately two months, as well as suspended meter reading, as these resources were redeployed to the hurricane restoration effort during September and October, then again redeployed in November towards attempting to read all customer meters.

In addition to incurring additional costs in the restoration effort, JPS also experienced significant losses in its energy sales during September (by approximately 30%). This has resulted in the inability to recover fixed embedded costs, which form part of the company's revenue requirement.

In the post hurricane period to date, JPS' heat rate and system loss performances have been far below the average performance in the months prior to the hurricane, with penalties being experienced of up to $30M per month on fuel (except for September and October when the OUR granted a temporary reprieve in the overall standards).

To demonstrate JPS' commitment to the restoration effort, and indeed to its customers, the company deferred planned dividend payments to its ordinary shareholders for 2004 amounting to US$20M, to provide much needed working capital to finance the restoration effort.

### 2.2.2 Restoration Costs

The hurricane restoration costs have been appropriately disclosed in JPS' financial statements and reviewed by the independent auditing firm KPMG Peat Marwick, as part of that firm's statutory audit of JPS' financial statements. The costs reflected in the financial statements relate to incremental costs incurred directly as a result of the hurricane restoration cost. No embedded costs (e.g. basic salaries of employees working on the project) have been included in the hurricane restoration costs shown in Table 2.1.

The costs included in the financial statements were based on expenditure up to December 31, 2004, as evidenced by appropriate duly authorized supporting documentation (e.g. third party invoices for contractor services, duly authorized overtime forms for labour charges and duly authorized materials requisition forms for materials issued from inventories). KPMG reviewed this expenditure as a part of the overall statutory audit to ensure that the expenditure incurred was properly authorized and appropriately classified. A summary of these incremental costs subjected to audit are noted in Table 2.1 below:

Table 2.1

| | J$000's |
|---|---:|
| Generation System | 103,968 |
| Distribution System | 550,874 |
| Streetlights | 48,998 |
| Transmission System | 21,514 |
| Total | 725,354 |

## 2.2 Z-factor impact on JPS (Cont'd)

### 2.2.2 Restoration Costs (Continued)

An updated report on the hurricane restoration costs was prepared as at March 31, 2005, which revealed that the total expenditures now amounted to approximately $760M. This increase in cost is the result of expenditure incurred after year-end as JPS sought to complete all restoration related activities. The change is materially due to a $21M increase in the generation costs, primarily as a result of the need to do underwater dredging at the Old Harbour and Hunts Bay Power Stations.

The complete details of the restoration costs incurred by Parish and by major expense classification are included in Appendix III.

### 2.2.3 Revenue Impairment

An adjustment to recover appropriate losses in relation to non-fuel revenues is considered necessary and prudent as JPS lost the ability to recover appropriately approved operating costs which form part of the OUR-approved non-fuel revenue requirement. This is of extreme importance, as JPS has significant operating costs which do not reduce with sales, notably, payroll, depreciation and financing costs (to highlight a few) and the recovery of the revenue requirement represents JPS' basic ability to pay for approved operating costs. Therefore, JPS' approach to the Z-factor claim is to:

(i) claim for all appropriately incurred incremental costs (i.e. costs associated directly with the hurricane restoration effort) and not attempt to include any fully embedded costs to the incremental cost claim (e.g. regular salaries for employees); and
(ii) claim for appropriate embedded costs in the non-fuel revenue requirement that were under-recovered in the energy sales (i.e. sales lost as a result of the hurricane).

While JPS is fully cognizant of the risk which it faces in meeting its sales forecast growth of 4%, it is does not believe that it should be penalised for energy sales that were not realised as a direct result of the hurricane. As it relates to the energy sales performance, a review of the sales growth prior to the hurricane reveals that JPS had achieved 3% sales growth up to August 2004. Accordingly, the company considers that it should only be held accountable for the 1% energy sales deficiency for 2004. Accordingly, the actual sales outturn for 2004 will be grossed up for the 1% deficiency and then compared to the sales forecast used to calculate the 2004 tariffs. This sales shortfall will form the basis for calculating the under-recovered non-fuel costs embedded in the revenue requirement.

The embedded non-fuel costs are based on the OUR-approved revenue requirement, adjusted to exclude costs that are not considered appropriate for these purposes. The items excluded relate to the revenue requirement for IPP costs, sinking fund costs and the revenue components associated with the demand charge and customer charge. These items have been excluded for the following reasons:

(i) There can be no under-recovery of IPP costs due to the IPP surcharge methodology;
(ii) there is not likely to be any notable under-recovery on the demand charge because of lower than planned energy sales, due to the nature of the demand charge;
(iii) there is not likely to be any notable under-recovery in customer charges; and
(iv) there is no necessity to recoup the sinking fund component of the revenue requirement lost to lower than planned energy sales.

## 2.2 Z-factor impact on JPS (Cont'd)

### 2.2.3 Revenue Impairment (Continued)

Based on the actual energy sales outturn for 2004, and after adjusting for the 1% energy sales deficiency noted previously, the value of the operating costs embedded in the non-fuel revenue requirement which were under-recovered as a result of hurricane Ivan is J$421M as reflected in Table 2.2 below.

**Table 2.2**

| | | J$000's |
|---|---|---|
| Approved revenue requirement | | 17,298,260 |
| Less: | - IPP costs | (3,002,542) |
| | - Sinking fund | (122,000) |
| Adjusted revenue requirement | | 14,173,718 |

| Billing determinants - proportions as per revenue requirement | |
|---|---|
| Energy charge | 82.77% |
| Customer charge | 3.08% |
| Demand charge | 14.15% |
| | 100.00% |

| | |
|---|---|
| Adjusted revenue requirement for energy charge only (82.77%) | 11,731,586 |
| Forecast sales (KWh) | 3,075,800 |
| Average per Kwh energy rate | 3.81 |
| Billed sales Sep-Dec'04 (Kwh) | 925,525 |
| Billed sales grossed up for known 1% deficiency | 934,873 |
| Forecast sales Sep-Dec'04 (Kwh) | 1,045,147 |
| Deemed sales short-fall due to hurricane Ivan (2.91%) | 110,274 |
| Estimated Short-fall (J$000's) | 420,601 |

### 2.2.4 Opportunity Cost of Capital

The Z-factor impact on the company is two-fold in terms of its negative effect on working capital. JPS has incurred additional expenditure of approximately $760M while also experiencing unavoidable revenue losses of $421M (i.e. the ability to recover approved embedded costs), making the total cash impact on the company $1,181M.

As mentioned under Section 2.2.1 Financial Considerations, JPS has managed to finance the hurricane restoration effort with internally generated cash flows (i.e. its shareholders profits) as evidenced by the deferral of ordinary dividend payments anticipated by JPS' shareholders in 2004. Accordingly, JPS believes that it should be reimbursed for its opportunity cost of capital at the rate of 14.85% net, being the OUR-approved return on investment rate.

Using non-complex and conservative approach, which assumes that all cash impact was experienced as at November 30, 2004, and assuming recovery of all relevant Z-factor costs over the twelve month period July 1, 2005 to June 30, 2006, would yield an average recovery period of thirteen (13) months. So, on the basis of the total cost being $1,181M, an applicable rate of 14.85%, taxes of 33 1/3%, and an average recovery period of 13 months, the carrying cost incurred by JPS would equate to $285M.

## 2.2 Z-factor impact on JPS (Cont'd)

### 2.2.5 Operating & Maintenance (O&M) Costs for 2004

Since JPS' O&M costs form part of the non-fuel revenue requirement, it is considered important to show how those costs performed in 2004 compared to the OUR-approved revenue requirement. As stated previously, JPS charged all normal operating costs to O&M expenses as usual, while charging only the incremental costs incurred directly as a result of the hurricane restoration programme to the hurricane Ivan work order (totalling $760M as detailed in Appendix III). This point is considered important as JPS wishes to assure the OUR that the embedded costs which JPS seeks to recover under Section 2.2.3 Revenue Impairment, will not result in any 'double dipping' (i.e. JPS' has not included any embedded costs under the incremental restoration charges, and then tried to claim them again under the revenue impairment calculation in Table 2.2).

JPS believes, that, by making the comparison between the actual 2004 O&M costs and the approved embedded costs, it will be able to demonstrate that the actual costs were not significantly different from the OUR approved O&M costs[4] embedded in the non-fuel revenue requirement. In fact, JPS' 2004 O&M costs exceeded the revenue requirement by 2% or $144M, as shown in Table 2.3 below.

**Table 2.3**

**Total Operating & Maintenance Costs**

| 2004 | Actual O&M Costs ( $ Millions) | OUR Determined O&M costs ( $ Millions) | Difference ( $ Millions) | % |
|---|---|---|---|---|
| Payroll & related expenses | 3,445 | 3,217 | 228 | 7% |
| Third Party Services | 1,130 | 1,099 | 31 | 3% |
| General Supplies | 108 | 117 | (9) | -8% |
| Materials & Equipment | 463 | 453 | 10 | 2% |
| Office Expenses | 283 | 354 | (71) | -20% |
| Transportation Expenses | 420 | 456 | (36) | -8% |
| Insurance expense | 394 | 431 | (37) | -9% |
| Bad debt expense | 134 | 85 | 49 | 58% |
| Miscellaneous | 411 | 433 | (22) | -5% |
| Non payroll expenses | 3,344 | 3,428 | (84) | -2% |
| **TOTAL** | 6,789 | 6,645 | 144 | 2% |

[4] The OUR determined O&M cost above ($6,645M) represents the sum of the Maintenance and SG&A costs (being $2,758M and $3,886M respectively) included in Table 6.2 of the OUR's June 2004 Rate Case Determination. The detailed categories shown in Table 2.3 are based on JPS' rate submission (Table 6.5) as appropriately adjusted for the OUR's approved O&M costs.

## 2.2 Z-factor impact on JPS (Cont'd)

### 2.2.5 Operating & Maintenance (O&M) Costs for 2004 (Cont'd)

Based on internal reviews and analysis, JPS is confident that regular maintenance costs have not been inadvertently (or deliberately) captured under the hurricane restoration costs (i.e. included in the Z-factor claim). This view is corroborated by the fact that:

(i) the full year's O&M costs were marginally (2%) higher than the approved revenue requirement; and

(ii) the expense categories most applicable to regular T&D maintenance, such as Third party services, General Supplies and Materials & Equipment, were collectively $42M higher than the revenue requirement.

Additionally, by looking at O&M costs incurred prior to the hurricane, rather than using the full year experience only, we can again see in Table 2.4[5] below that the O&M costs were 2% higher than the prorated revenue requirement as well.

**Table 2.4**

**Total Operating & Maintenance Costs**

| August 2004 | Actual O&M Costs | OUR Determined O&M costs | Difference | |
|---|---|---|---|---|
| | (J$ Millions) | (J$ Millions) | (J$ Millions) | % |
| Payroll & related expenses | 2,276 | 2,145 | 131 | 6% |
| Third Party Services | 742 | 733 | 9 | 1% |
| General Supplies | 68 | 78 | (10) | -13% |
| Materials & Equipment | 291 | 302 | (11) | -4% |
| Office Expenses | 202 | 236 | (34) | -14% |
| Transportation Expenses | 316 | 304 | 12 | 4% |
| Insurance expense | 261 | 287 | (27) | -9% |
| Bad debt expense | 120 | 57 | 64 | 112% |
| Miscellaneous | 255 | 289 | (33) | -12% |
| Non payroll expenses | 2,255 | 2,285 | (31) | -1% |
| **TOTAL** | 4,531 | 4,430 | 101 | 2% |

Additional data is provided on O&M costs in Appendix IV to demonstrate that there is no need to make any seasonality adjustment to the August numbers shown above.

[5] The full year revenue requirement from Table 2.3 was adjusted to eight months using 8/12ths and compared to the actual O&M costs incurred up to August 2004 in Table 2.4.

## 2.3 Proposed recovery of the Z-Factor claim

JPS proposes that the Z-factor claim should be recovered in a manner similar to the current treatment for IPP costs (as per page 14 of the OUR's Determination Notice). This methodology would require that:

- The Z-factor claim is embedded in the non-fuel energy charge only.
- The actual kWh energy rate will be derived based on the OUR-approved total Z-factor cost divided by the forecast sales for the relevant period (being 3,146,000 for the twelve month period June 1, 2005 to May 31, 2006).
- The amount to be recovered will be based on a Base Exchange Rate of US$1 = J$62.
- A computation would be done on a monthly basis to compare actual billed kWh sales against 1/12th of the forecast sales. The difference between the actual sales and the expected sales (multiplied by the approved embedded Z-factor energy rate) would be recovered or refunded in the following month through the fuel rate (i.e. implementing a Z-factor surcharge or refund into the monthly fuel rate calculation).
- Reconciliation would be done at the end of the twelve-month period to show that JPS has adequately recovered its costs through the embedded rate and refunded or recovered the difference, if any, through the fuel rate.

The following matters are considered crucial to the above mentioned recovery process:

- JPS wishes to ensure recovery of the agreed Z-factor claim and wishes to avoid the potential for any over or under recovery.
- JPS does not believe that this financial claim should be subject to sales risk, especially considering the complication which could ensue should there be another hurricane or other catastrophe which results in actual energy sales being lower than the forecast, during the recovery period.
- Considering that the opportunity cost of capital is embedded in the Z-factor claim, and given the importance of the predictability of future recovery, JPS considers it critical that this claim be recovered as close as possible to the forecast period. It is for this reason that a monthly measure is desired.
- JPS believes that this methodology would be relatively simple and effective to implement, since the IPP surcharge concept is very similar. This would facilitate easier tracking of the actual recovery and facilitate easier reconciliation or proof that JPS recovered the correct amount over the agreed period.

## 2.4 Application of Z-factor to proposed rates

JPS proposes that the Z-factor adjustment should be recovered through energy sales only and not applied to all billing determinants. We believe that this is both appropriate and equitable, especially given that the demand charge would present an undesirable mode of recovery, considering the nature of the demand charge. The commercial customers facing the demand charge did not see a reduction in this billing determinant during the hurricane period, so it would be inappropriate to now increase their demand charge as a result of the hurricane in the application of the Z-factor to rates.

The total impact of the hurricane includes the incremental hurricane restoration costs, the under-recovered embedded costs in the non-fuel revenue requirement and the opportunity cost of capital. The embedded energy rate would be derived by dividing the total hurricane cost of J$1,466M by the forecast sales of 3,146,000 kWh, producing a Z-factor adjustment of 46.59¢ per kWh, as shown below:

$$ER = \frac{J\$1{,}465.6M}{3{,}146{,}000} = 46.59¢ \text{ per kWh}$$

Where:

ER = embedded Z-factor rate denoted in Jamaican cents.

J$1,465.6M = total impact of Hurricane Ivan.

3,146,000 = total forecast kWh sales for the period June 2005-May 2006.

JPS expects to recover the total Z-factor cost evenly over the twelve-month period. However, depending on the actual billed sales, JPS may over or under recover the Z-factor cost for any given month, or in total over the recovery period. This potential over- or under recovery could be avoided by applying the following monthly adjustment mechanism:

$$\text{Over/(Under) Recovery } = \left(\text{BS1} - \frac{3{,}146{,}000}{12}\right) X \ \frac{46.59¢}{62} \text{ X BFX1}$$

Where:

BS1 = the actual billed sales in a given month (denoted in kWh).

3,146,000 = total forecast kWh sales for the period June 2005-May 2006.

62 = the base foreign exchange rate during the recovery period.

BFX1 = the actual billing foreign exchange rate in a given month

JPS proposes that this over/(under) recovery be adjusted for in the monthly fuel and IPP surcharge, that is, any over/(under) recovered amount is subtracted/added to the fuel and IPP cost in the following month when computing the fuel and IPP rate. This would ensure that JPS remains revenue neutral with respect to the recovery of the Z-factor cost, avoids any potential over/under recovery and recovers the cost over the agreed time line having regard for the time value of money.

# Section 3: Ensuring Quality of Service: The Q-Factor

## 3.1 Introduction

As mentioned in Section 1.4, JPS is required to provide the benchmark data that will form the basis for measuring improvements or deterioration in the quality of service provided to customers for the remainder of the tariff period (i.e. 2005 to 2009).

The OUR's consultants, PPA/Frontier Economics (PPA/FE), in their Electricity Tariff Study 2002, put forth two main ways that quality standards could be translated into an index that could be included within the electricity price cap—the "Relative Q" option and the "Absolute Q" option:

- *"Relative Q" option*—under this option, Q could be set based on the proportionate difference between pre-defined actual measures of quality and a target level of quality. PPA/FE suggested aspects of quality that include frequency of interruptions, duration of planned interruptions and duration of unplanned interruptions. Standards would be set for each and JPS' deviation from that standard would be calculated and a Q derived from the deviation and weighted importance. PPA/Frontier noted that the Office of the Regulator General in Victoria, Australia uses this form of index.
- "*Absolute Q" option*—under this option a starting absolute quality index is fixed. Quality indices could be weighted for perceived differences in value to customers. If JPS performs better than the fixed index then the calculated Q would be added to PCI, if JPS performs worse than the fixed index then the calculated Q would be subtracted from PCI. PPA/FE noted that the Office of Gas and Electricity Markets (OFGEM) in the UK use this form of index.

PPA/FE noted that both approaches require the OUR to assess customer willingness to pay for different levels of supply quality in order to set a value of Q. Predicting the value that customers put on the quality of supply is difficult, especially when dealing with several classes of customers and high-users and low-users within the same class.

JPS recommends that the development of the Q-factor meet the following criteria:

- The Q-factor should provide the proper financial incentive to provide a level of service quality based on the customers' perception of that service quality.
- The measurement and calculation of the Q-factor should be straightforward and transparent without undue cost of compliance.
- It should provide fair treatment for factors affecting performance that is outside of JPS' control, such as those due to disruptions by the independent power generators; natural disasters; and other *force majeure* events, as defined in the Terms and Conditions of the Licence.
- It should be symmetrical in application, as stipulated in the Licence, with appropriate caps or limits of effect on rates.

JPS' proposed choice of indicators and methodology for assessing performance is outlined in Section 3.2.

## 3.2 Proposed performance indicators and methodology

JPS proposes that a method generally in agreement with the "Absolute Q" option described by PPA/FA be utilized for the remainder of the price cap period. Specifically, JPS proposes that measurements approximating SAIDI, SAIFI and CAIDI for ***Sustained Interruptions***, as defined in the Institute of Electrical and Electronics Engineers Standard (IEEE Std. 1366, 2001), become the quality measures used to determine JPS' level of service quality. By this definition, a Sustained Interruption is any interruption not classified as a momentary event, i.e., any interruption longer than five minutes.

The IEEE Standards definitions for the SAIDI, SAIFI and CAIDI quality of service indices are as follows:

- SAIFI—this index is designed to give information about the average frequency of sustained interruptions per customer over a predefined area and is expressed in interruptions per customer, calculated as follows:

$$\frac{\text{Total number of customer interruptions}}{\text{Total number of customer served}}$$

- SAIDI—this index is designed to provide information about the average time that customers are interrupted, is expressed in minutes per period, calculated as follows:

$$\frac{(\Sigma\text{Customer interruption durations})}{\text{Total number of customer served}}$$

- CAIDI—this index is designed to provide information about the average interruption duration per customer, is expressed in minutes per interruption, calculated as follows:

$$\frac{(\Sigma\text{ Customer interruption durations})}{\text{Total number of customer interruptions}} \quad \text{OR} \quad \frac{\text{SAIDI}}{\text{SAIFI}}$$

The value of Q will be based upon actual values of SAIDI, SAIFI and CAIDI for each year of the PBRM as compared to the benchmark. JPS proposes that the benchmarks are set such that, in each year between 2005-2009, JPS will be incentivised to continuously improve its performance on SAIDI, SAIFI and CAIDI relative to 2004/5.

Specifically:

$$\text{SAIDI benchmark in year } 2005/6 + t = \text{SAIDI}_{2004/5}\ (1 - 0.02t)$$
$$\text{SAIFI benchmark in year } 2005/6 + t = \text{SAIFI}_{2004/5}\ (1 - 0.02t)$$
$$\text{CAIDI benchmark in year } 2005/6 + t = \text{CAIDI}_{2004/5}\ (1 - 0.02t)$$

In other words, SAIDI, SAIFI and CAIDI should be continuously improving by 2%, relative to the 2004/5 performance level, in each year from 2005 to 2009, not withstanding force majeure events. The targets are shown in Table 3.1.

## 3.2 Proposed performance indicators and methodology (Cont'd)

**Table 3.1**

**JPS Proposed Targets for the Q-factor 2005 – 2009**

| Year | Target SAIDI | Target SAIFI | Target CAIDI |
|---|---|---|---|
| 2005/6 | $SAIDI_{2004/5}$ | $SAIFI_{2004/5}$ | $CAIDI_{2004/5}$ |
| 2006/7 | $SAIDI_{2004/5}*(1 - 0.02)$ | $SAIFI_{2004/5}*(1 - 0.02)$ | $CAIDI_{2004/5}*(1 - 0.02)$ |
| 2007/8 | $SAIDI_{2004/5}*(1 - 0.04)$ | $SAIFI_{2004/5}*(1 - 0.04)$ | $CAIDI_{2004/5}*(1 - 0.04)$ |
| 2008/9 | $SAIDI_{2004/5}*(1 - 0.06)$ | $SAIFI_{2004/5}*(1 - 0.06)$ | $CAIDI_{2004/5}*(1 - 0.06)$ |

In each of the four years following 2005, if the:

- SAIDI, SAIFI and CAIDI calculations show marked improvement relative to the target, Q will be a positive adjustment in the annual PBRM filing.
- SAIDI, SAIFI and CAIDI calculations show little or no improvement relative to the target, Q will be zero (a dead band) in the annual PBRM filing.
- SAIDI, SAIFI and CAIDI calculations show deterioration relative to the target, Q will be a negative adjustment in the annual PBRM filing.

## 3.3 2004/5 performance on SAIDI, SAIFI and CAIDI

**Preamble to the results**

When JPS filed its tariff submission in March 2004, the system to capture information on forced outages at the sub-feeder level was not yet in place. The OUR decided that the Q-factor should remain at zero until the data on forced outages at both the feeder and sub-feeder levels could be collected and analysed. Baseline data was to be made available by June 2005 in order to determine the basis of application for 2005–2009.

JPS implemented its system in June 2004 and data capture at the feeder and sub-feeder level began in July 2004 for the computation of SAIDI, SAIFI and CAIDI on forced outages at the sub-feeder level.

The data collection period, however, was shortened by two months due to the *Force Majeure* event caused by hurricane Ivan for the months of September and October 2004. Accordingly, the data presented relates to seven months only.

The results presented in Table 3.2 demonstrate JPS' performance in the 2004/5 baseline year. JPS does not believe that prorating a year's data from seven months of data would give an accurate profile of our typical performance as the forced outage rate varies seasonally. A prorating of our twelve-month performance from ten months of captured data would more accurately demonstrate our typical performance and hence, JPS proposes to submit one year's data in June 2005 that would capture the ten-months performance and a prorated amount that would cover the two-month interruption due to hurricane Ivan. We propose that this data to be submitted in June 2005 be used to determine the Q targets for the June 2005 – May 2006 period, rather than the data presented below in Table 3.2. The data in Table 3.2 provides an indicative illustration of our performance, based on seven months of data collection.

## 3.3 2004/5 performance on SAIDI, SAIFI and CAIDI (Cont'd)

Table 3.2 shows JPS' performance on SAIDI, SAIFI and CAIDI for the tariff period under review (July 2004 – March 2005). The results shown below are for sustained interruptions (i.e. interruptions longer than five minutes) and exclude *force majeure* events (i.e. it excludes September and October due to Hurricane Ivan).

**Table 3.2**

**JPS 2004 performance on SAIDI, SAIFI and CAIDI**

| | | | |
|---|---|---|---|
| Period | 2004/5 | | |
| Number of customers at end of 2003 | 522,151 | | |
| **Feeder Level Outages** | **SAIDI** | **SAIFI** | **CAIDI** |
| Forced Outages | 575.25 | 22.12 | 26.00 |
| Planned Outages | 106.66 | 0.20 | 537.90 |
| **Sub-Feeder Level Outages** | **SAIDI** | **SAIFI** | **CAIDI** |
| Forced + Planned Outages | 586.52 | 2.33 | 251.75 |
| **Seven-month 2004 Performance** | **1,268.43** | **24.65** | **51.46** |

## 3.4 Q-Factor Method of Calculation

JPS proposes that quality of service performance be classified into three categories, with the following point system (see Table 3.3):

- Above Average Performance—would be worth 2 Quality Points on either SAIFI, SAIDI or CAIDI;
- Dead Band Performance—would be worth 1 Quality Point on either SAIFI, SAIDI or CAIDI; and
- Below Average Performance—would be worth 0 Quality Points on SAIFI, SAIDI or CAIDI.

JPS proposes for each of the indices above, that, beating the target by 1.0% or more should be considered as Above Average Performance; beating the target by less than 1.0% should be considered as Meeting Expectation (Dead Band Performance); and performance that is below the target would be considered as Below Average Performance.

Customer interruptions that are a result of events or circumstances defined as *force majeure* events in the Licence would be excluded from the SAIDI, SAIFI and CAIDI calculations for the relevant period.

## 3.4 Q-Factor Method of Calculation (Cont'd)

JPS further proposes that if the sum of Quality Points for:

- SAIFI, SAIDI and CAIDI is 6, then Q = +0.5%
- SAIFI, SAIDI and CAIDI is 5, then Q = +0.5%
- SAIFI, SAIDI and CAIDI is 3, then Q = +0.0%
- SAIFI, SAIDI and CAIDI is 2, then Q = -0.5%
- SAIFI, SAIDI and CAIDI is 0, then Q = -0.5%

**Table 3.3:**

| **Proposed categories and points for SAIFI, SAIDI and CAIDI** | | |
|---|---|---|
| **Band** | **Performance relative to target** | **Quality points** |
| Above average | Beating the target by 1.0% | 2 |
| Dead band | Beating the target by between 0% to 1.0% | 1 |
| Below average | Worsening of performance | 0 |

## 3.5 Data Collection Methodology, Security and Storage

JPS has now put in place systems that collect the data required for the computation of SAIDI, SAIFI and CAIDI for both planned and forced outages at both the feeder and sub-feeder level. All the data required is electronically captured and computation is done on a dedicated server.

Calculation of these indices require data on:

- Outage start and end times;
- System total number of customers; and
- Number of customers affected by the outage.

The data required for calculating approximate SAIDI, SAIFI and CAIDI values will build upon JPS' existing data acquisition capabilities together with JPS' best approximation of the number of customers on each feeder, as described in more detail below.

JPS electronic data capture mechanisms are at various stages of development and no one system presently exists which could capture all the information required for an exact calculation of SAIDI, SAIFI and CAIDI indices. SCADA status and analogue information are available on the majority of transmission and generation equipment with status information available for just over 80% of feeder level circuits on the distribution system. At the local distribution level, some data is also electronically captured using the Sentry Trouble Call System. Customer reported data is also manually captured and stored electronically using the Call Centre Management System (CCMS).

### 3.5.1 Data on outage start and end times

Outages can occur at the feeder or sub-feeder level, and can either be planned outages or forced outages. The sources and availability of data required for SAIDI, SAIFI and CAIDI vary depending on the type of outages.

### 3.5.1 Data on outage start and end times (Cont'd)

### A. Feeder level outages

JPS collects and stores data on all its planned and forced interruptions down to the feeder recloser level in a Microsoft Access-based outage-logging database (developed in-house) located at its System Control Centre. The data collected is stored under unique event codes and includes information related to the equipment affected, the start and end times of the outage, classification of the outage cause, approximate number of customers interrupted, protection devices that operated, etc.

- At the feeder recloser level, data will be captured on any forced outage (Generation, T&D). There are four possible sources of outage time data at the feeder level:
- *SCADA system*—where feeder status monitoring via SCADA exists, time of outages will be logged by the System Control Engineer at the System Control Centre utilizing SCADA timestamps. Where available, SCADA will serve as the primary source of outage information at the feeder level.
- *DCI sentry outage monitors*—at present, not all feeder reclosers are monitored via SCADA. For feeder reclosers without feeder status monitoring via SCADA, outage start and end times will be logged by the System Control Engineer utilizing timestamp information captured from the DCI Sentry outage monitors. There are a total of 13 substations (19% of total substations and customers) across the island that currently do not have SCADA monitoring or control, all of which have DCI Sentry monitors installed feeding information to the outage detection system.
- *Outage log database*—For planned outage duration at the feeder recloser level, the planned start and end times will be captured and recorded in the outage log database from outage requests submitted by field personnel requesting outages. The System Control Engineer will also record the actual planned start and end times of each outage, needed for calculation of the reliability indices on the day of the actual outage in the same database.
- *Central call centre logs*—in the event of a failure of the SCADA monitoring and/or the DCI sentry outage detection monitors, the central call centre logs will be used to provide outage start. This will be determined by the first customer call received, which confirms a feeder outage start time. The outage end time will be determined by the recloser or switch closing time as reported to the System Control Engineer or the Dispatch Technician by the field personnel and also recorded in the call centre log.

### B. Sub-feeder level outages

- Planned outages—for planned outages at the sub-feeder level, data would be available primarily from the Outage Log Database at the System Control Centre. Where the DCI sentry system is available, it would also be used as a source of data.

### 3.5.1 Data on outage start and end times (Cont'd)

### B. Sub-feeder level outages (Cont'd)

- Forced outages—where available, the DCI sentry system will be used to provide information on start and end times of forced outages at the sub-feeder level. The DCI sentry system, however, does not monitor all sub-feeder outages. Therefore, where the DCI system is not available, the central call centre logs will be used to provide outage start times. The outage end time will be determined by the recloser or switch closing time as reported to the system control engineer or dispatch technician by the field personnel and also recorded in the call centre log.

### 3.5.2 System total number of customers

Data regarding the company's total active customer count is captured in the CIS billing records. The customer count completed at the end of December 2003 stood at 522,151 and represents the base for the 2004/5 computations (see Table 3.2). Going forward JPS proposes to use the customer count at the end of March of each year for our annual submission, thereby moving our annual performance reporting from a calendar year basis to a March-to-March basis.

### 3.5.3 Number of customers affected by the outage

### A. Feeder level outages

JPS' total customer base is disaggregated among the twelve parishes with the Kingston/St. Andrew Parish being further split into North (KSAN) and South (KSAS) sectors. Within the distribution operations division, an engineer is assigned O&M responsibility for each feeder. The responsible engineer therefore tends to have an excellent working knowledge of individual and total customers supplied via the feeder.

To determine the customer count per feeder, a census was carried out in the following manner. The engineer used the billing address from the CIS database and mapped this information to the feeder route getting a total count of customers per feeder. In instances where feeders go across parish boundaries, the engineer was required to disaggregate the count and conduct a physical count of those customers.

The managers with responsibility for each of the three operating regions, into which the distribution organization is split, have also performed a similar exercise. JPS has compared both sets of data against data gathered during a physical count of customers serviced by several feeders performed a few years earlier. Where data sets showed good comparison among them as well as comparing favourably with the parish count, the data was accepted. In instances of less than favourable comparison, a more exhaustive examination was done and, after various iterations, the count was matched to the billing register count on a parish-by-parish basis.

Where outages (planned and forced) are concerned at the feeder level, it is therefore proposed that the estimated number of customers on each feeder be determined from this derived customer count listing. This list will be updated at the end of every tariff year to be used in the next years' calculations. See Appendix V for the current customer count list for the year ending 2003.

### 3.5.3 Number of customers affected by the outage (Cont'd)

**B. Sub-feeder level outages**

JPS does not currently have customer count data at the sub-feeder level. Therefore, it is proposed that, for sub-feeder section outages, the number of customers affected will be estimated utilizing the feeder peak loading and the average utilization (MW) per customer for that feeder.

Feeder peak loadings are determined locally at the substation level from the maximum loading as recorded at the recloser per month (substation loading report). For some feeders, 24-hour substation feeder level measurements exist via electronic substation meters downloaded monthly. For these cases, this loading information will be utilized as the primary source. Utilizing this load reading, and the total number of customers per feeder from the customer count list, an *average utilization* per customer can be computed as follows (See Appendix VI for the current listing of MW/customer for each feeder).

$$\text{Average customer utilization (MW/customer)} = \frac{\text{Feeder peak loading per month}}{\text{Number of customers on the feeder}}$$

For each planned outage on a feeder section, it is normal that during the submission of outage requests the requesting engineer indicates the number of customers to be affected and/or the load to be interrupted. The load to be interrupted is normally a clip-on reading (amperes) at the switch point done on a similar day to the day of the outage and recorded on the outage request form sent to the System Control Centre. Where the number of customers is not provided and the load to be interrupted is provided, the number of customers on the section can be estimated from the average customer utilization (kW/Customer) for that feeder circuit. Specifically, the estimated kW loadings to be interrupted as determined above will be used along with the average customer utilization for that feeder to determine the number of customers to be interrupted, i.e.:

$$\text{Number of customers to be interrupted} = \frac{\text{Estimated load (kW) interrupted}}{\text{Average Customer Utilization (kW/Customer) for that feeder}}$$

Where neither is provided, the discounted rating of the isolating fuse (amperes) to be opened will be used as a proxy to estimate the load on the line section. The fuse rating is discounted to approximate the typical peak load on the section. This is done based on estimating the load behind the fuse at the sub-feeder level in order to calculate the number of customers affected whenever such fuses operate and interrupt the customer's supply. The fuse that connects a branch is sized (amperes) based on the connected kVA capacity on that branch, i.e. the total capacity of all the transformers on the branch. The transformers are typically loaded between 45 and 50 percent of their capacity; this is referred to as the *transformer utilization*. Therefore, in order to determine a factor that can be applied to discount the fuse connecting the branch that represents the load on the segment, the transformer utilization is taken into consideration.

The load on branch = transformer utilization x fuse factor x branch kVA,

Where: (i) the branch kVA = fuse size (amperes) x phase voltage; and

(ii) the fuse factor $= \frac{\text{feeder connected KVA}}{\text{Total main branch fuse KVA}}$

### 3.5.3 Number of customers affected by the outage (Cont'd)

**B. Sub-feeder level outages (Cont'd)**

This methodology of determining transformer utilization is normally used to conduct distribution feeders' load-flow simulation studies. The above method was also tested with a sample of distribution feeders and the calculated customer count was reconciled to within five to ten percent of the actual customer count for those feeders. For the submission, JPS has used a discount factor of 50 percent to determine the load and the number of customers interrupted for outages at the sub-feeder level.

For each forced outage on the sub-feeder section, the field personnel attending to the restoration will report the size of the fuse (amperes) that operated to interrupt the load and the time of closing to the System Control Engineer or the Dispatch Technician who would enter the information into the Outage Log System. The System Control Engineer then computes an estimate of the number of affected customers based on the methodology that is used in the planned sub-feeder level outage computation mentioned above.

**C. Load Transfers**

Where there are load transfers, the customer count on any feeder or sub-feeder will differ from the normal count. At the present time, the Outage Log Database at the System Control Centre is manually updated whenever a feeder circuit is fully transferred. The load demand and the number of customers are updated for the feeder to which the load has been transferred. In this way, the number of customers interrupted can be consistently calculated.

A strategy will have to be developed for partial load transfers, which will either be a physical count of customers on the transferred section or a calculation using the load on the section and the Average customer utilization. JPS proposes that the customer count be estimated in the same way as planned outages at the sub-feeder level (i.e. by using the estimated load (kW) transferred and the average kW per customer on that feeder).

$$\text{Number of customers to be transferred} = \frac{\text{Estimated load (kW)}}{\text{Transferred KW per Customer for that feeder}}$$

### 3.5.4 Data Security

One concern regarding the calculation of any performance measure utilising complex computer systems is data security. JPS believes that adequate measures have been put in place to ensure adequate protection and security of the relevant data. Specifically, the main database system to be utilized to store critical information (outage log database) related to outages operates in a secure environment where a log is kept of all user access and data entry/change. This database is maintained independently by the IS department who are also responsible for ensuring regular back up of the data. Once data is entered, changes can only be made via authorized access. Additionally, the customer count and the feeder loading information are only accessible by the system administrator and the user is only required to enter times, dates, causes for outages etc. Should discrepancies arise in the database, it is possible that validation or crosschecking can be obtained via the other independent data capture mechanisms aforementioned (SCADA, substation metering, call centre logging system, or the DCI sentry system) and also from written logs kept by the operating personnel.