

Performance
Monitoring and

July

2011

Background

The RIC published its document “**Performance Monitoring And Reporting Framework**” (PMR) in May 2005, for the purposes of monitoring the services of the electricity sector. Service performance in this context refers to the delivery of an electricity supply to meet customers’ load requirements within targeted quality limits and within targeted levels of reliability. In the Regulation of Electricity Transmission and Distribution 2006 – 2011: Final Determination (The Determination), the RIC indicated that it would monitor the performance of the Trinidad and Tobago Electricity Commission (T&TEC) using key performance indicators. The Determination further outlined Specific Directives to be followed by the service provider during the regulatory period.

Purpose of This Report

The purpose of this report is to review the approach adopted by the RIC in using key performance indicators to monitor the performance of the service provider, and to determine whether any changes are required to the RIC’s approach.

Responding to this Document

All persons wishing to comment on this document are invited to submit their responses by mail, fax or e-mail to:

Executive Director
Regulated Industries Commission
Furness House – 1st & 3rd Floors
Cor. Wrightson Road and Independence Square
Port-of-Spain, Trinidad
Postal Address: P.O. Box 1001, Port-of-Spain, Trinidad
Tel. : 1(868) 625-5384; 627-7820; 627-0821; 627-0503
Fax : 1(868) 624-2027
Email : ricoffice@ric.org.tt or comments@ric.org.tt
Website : www.ric.org.tt

Responses will normally be published on the RIC's website unless there are good reasons why they should remain confidential. Any requests for confidentiality must be indicated.

A copy of this document will be made available on the RIC's website at www.ric.org.tt.

Introduction

The duty of the Commission under the RIC Act, Chapter 54:73, Section 6, is to prescribe standards for services, to monitor the service providers, and conduct checks to determine their compliance with the standards, as well as to carry out studies of efficiency and economy of operation and of performance by service providers and publish the results thereof. Also, in Section 56, the Act empowers the Commission to collect and compile any information which may be of assistance in the exercise of its functions. Against this background, the RIC published the PMR to establish a performance monitoring and reporting framework for the electricity sector. It was indicated in the PMR that performance monitoring and reporting can be a significant performance driver and a useful tool for:

- Informing customers and other interest groups about the level of service they are receiving;
- Providing information and data for developing regulatory standards where required and for on-going assessment of compliance with such standards;
- Informing the decision-making processes of regulators; and
- Identifying baseline performance of service providers as well as comparing relative performance with other utilities.

The performance indicators are grouped in the following categories:

- Baseline explanatory data
- Quality of supply
- Network reliability and efficiency
- Customer responsiveness and service

- Financial performance
- Affordability

The performance indicators used during the first regulatory period for the electricity transmission and distribution sector are listed in the **Appendix** of this paper.

Monitoring T&TEC's Performance

During the first regulatory control period, the RIC provided templates that T&TEC used to supply the data needed to calculate the performance indicators. The RIC collected data from T&TEC at regular intervals and produced annual Performance Monitoring Reports. The RIC indicated that it would publish these reports on its website where the media, public and other interested parties would have access. It was expected that the reports would highlight T&TEC's performance for the respective period, bringing it under the scrutiny of the various stakeholders, and thereby motivating performance improvements and efficiency gains in T&TEC's operations. Analyses were done on T&TEC's performance with respect to the quality of service standards and specific directives outlined in the Determination and two reports were produced for the periods 2006 to 2008 report and 2008/2009. These two reports produced thus far have provided much detailed and in-depth analyses of T&TEC's performance.

Issues Encountered

From inception, there have been problems with obtaining all the data specified by the PMR. In the initial stages of implementation, T&TEC indicated that some of the data requested were more pertinent for the electricity generators. In some cases, data were not available in the format indicated in the PMR, because the basis on which T&TEC collected the data differed from what was specified. Some data were also unavailable because of technical issues with T&TEC's data collection system, such as breakdowns and computer virus infection. There were also issues with

the integrity of data submitted by T&TEC. Some data were inaccurate, while others were unreliable because of the basis on which it was determined. Additionally, data were not consistently supplied by T&TEC in a timely manner.

Conclusions & Proposals

The RIC intends to continue monitoring the performance of T&TEC using the relevant performance indicators. However, the RIC will initiate a number of measures to improve its monitoring and reporting activities. Among these are:

- Reviewing the templates used to collect data from T&TEC, and making adjustments where necessary, to ensure greater relevance in the data reported by the service provider. Since T&TEC is fully responsible for the operation of the Cove Estate Power Station, as well as electricity generating units in Scarborough, Tobago, the RIC intends to include the appropriate operational indicators (shown in item 6 of the appendix) in its monitoring of the service provider;
- The requiring of the service provider to employ an independent audit of its data collection and dissemination system to verify that the data and computations used to derive the values of the indicators are both valid and reliable. The RIC will also ensure that the independent auditor's report is made public;
- The employment of all its enforcement powers contained in the RIC Act, to obtain timely and reliable information from the service provider, including:
 - Caution letters;
 - Publication of Non-compliance Orders in the media; and
 - Any other action necessary to achieve compliance;
- Reporting on an abbreviated list of major indicators at six months intervals to give a snapshot of the performance and financial health of the service provider. In order to create a broad picture, indicators were chosen to cover **financial health**, **electrical efficiency**, **reliability**, **operational efficiency** and **customer responsiveness**. The rationale behind the list of indicators chosen is to depict the overall health and performance of the service provider using

no more than six indicators that may be of interest to customers and easily understood by them (see **Table** below); and

- The inclusion of the above “traffic signal” indicators in the electricity bills of customers.

Table – List of Major Indicators

INDICATOR	What it Measures
Total System Losses (Transmission & Distribution)	The amount of electrical energy that is lost in the system
Current Ratio	Financial Health – Liquidity
% Net Profit	Financial Health – Profitability
SAIFI (System Average Interruption Frequency Index)	Reliability
Customers per Employee Ratio	Operational Efficiency of the company
Written Complaints Response Rate	Customer Responsiveness

The RIC will continue to produce the detailed report, and make it available on the RIC’s website. The in-depth analysis of the report provides a rigorous level of scrutiny of the service provider’s operation that is both prudent and beneficial to the RIC’s role as the regulator. In addition to the in-depth report, a more reader-friendly version of the report will be prepared for the purposes of engendering public and media discussions. This report will also be published using various other media, including newspapers, the internet (allowing readers to post their comments), and social networking technologies such as Facebook and Twitter.

The RIC invites comments on the abbreviated list of indicators chosen, method of publication proposed and any other comments.

APPENDIX

PERFORMANCE INDICATORS FOR THE ELECTRICITY SECTOR

<u>Item</u>	<u>Category</u>	<u>Indicator</u>	<u>Definition</u>	<u>Units</u>	<u>Reporting Period</u>
1.0	Aggregate Data				
1.1		Number of electricity customers by class and area	T&TEC's customer data		Yearly
1.2		kWh sales by area	T&TEC's customer data		Semi Annually
1.3		kWh purchased	The basic unit of electric demand, equal to 1,000 watt-hours.	kWh	Monthly
1.4		Total System Losses	$1 - \left(\frac{[\text{Energy Units Billed}]}{[\text{Energy Units Purchased}]} \times \frac{[\text{Collection in \$}]}{[\text{Billing in \$}]} \right)$	MWh	Semi Annually
1.5		Number of connections and disconnections			Yearly
1.6		Peak demand	The maximum load during a specified period of time	MW	Semi Annually
1.7		Electricity coverage (i.e. Access to electricity)	$\frac{[\text{No. of customers (T \& TEC stats)}]}{[\text{No. of households in T \& T}]} \times 100$	%	Quarterly & Yearly
2.0	Financial				
2.1		Maintenance cost per MWh Sold	$\frac{[\text{Total annual maintenance costs (excluding capital cost)}]}{[\text{MWh sold}]}$	\$/MWh	Yearly
2.2		Cost of fuel per kWh	$\frac{[\text{Total costs of fuel}]}{[\text{kWh generated}]}$	\$/kWh	Quarterly & Yearly
2.3		Cost of fuel (sales)		\$	Quarterly & Yearly
2.4		Revenue per kWh	$\frac{[\text{Total revenue from sales}]}{[\text{Total no. of kWh sold}]}$	\$/kWh	Yearly

Item	Category	Indicator	Definition	Units	Reporting Period
2.5		Internal manpower costs	Annual internal manpower costs / annual running costs x 100.	%	Yearly
2.6		Energy costs ratio	Annual energy costs / annual running costs x 100.	%	Yearly
2.7		Depreciation costs ratio	Annual depreciation costs / annual capital costs x 100.	%	Yearly
2.8		Net interest costs ratio	(Interest expenses costs – interest income) / annual capital costs x 100.	%	Yearly
2.9		Sales revenues	(Sales revenues / annual revenues) x 100	%	Yearly
2.10		Total cost coverage ratio	Annual revenues / annual costs.		Yearly
2.11		Delay in accounts receivable	Year-end account receivable / annual sales revenues x 12.	months equivalent	Yearly
2.12		Investment ratio	Annual investments subject to depreciation / annual depreciation x 100.	%	Yearly
2.13		Debt service coverage ratio	Profit before interest and tax / (Interest + capital repayments) x 100	%	Yearly
2.14		Operating ratio	$\frac{\text{Operating costs (including depreciation and interest)}}{\text{Operating revenue}}$		Yearly
2.15		Working ratio	$\frac{\text{Operating costs (excluding depreciation and interest)}}{\text{Operating revenue}}$		Yearly
2.16		Return on net fixed assets	Net operating income / net fix assets x 100.	%	Yearly
2.17		Return on equity	Profit after interest and tax / shareholders' equity x 100.	%	Yearly
2.18		Operating cost per customer	$\frac{\text{[Total operating costs]}}{\text{[Total no. of customers]}}$	\$/cust.	Yearly

<u>Item</u>	<u>Category</u>	<u>Indicator</u>	<u>Definition</u>	<u>Units</u>	<u>Reporting Period</u>
2.19		Operating revenue per kWh	$\frac{[\text{Total operating revenue}]}{[\text{Total no. of KWh sold}]}$	\$/kWh	Yearly
2.20		Current ratio	$\frac{[\text{Current assets}]}{[\text{Current liabilities}]}$		Yearly
2.21		Quick Ratio	$\frac{[\text{Current assets - stock}]}{[\text{Current liabilities}]}$		Yearly
2.22		Return on capital employed	$\frac{[\text{Profit before interest and tax}]}{[\text{Capital employed}]} \times 100$	%	Yearly
2.23		Gearing	$\frac{[\text{Interest bearing debt}]}{[\text{Interest bearing debt + equity}]}$		Yearly
2.24		Creditors Payments	$\frac{[\text{Creditors}]}{[\text{Credit purchases}]} \times 12$	Monthly equivalent	Yearly
2.25		Total revenue	Operating revenue and other revenue for the period	\$	Yearly
2.26		Total expenditure	Operating expenses plus other expenses (Operating Expenses includes Generation, Transmission and Distribution, Administration and General, and Depreciation)	\$	Yearly
2.27		Operating profit	Revenue from the organization's regular activities, less costs, and expenses and before income deduction	\$	Yearly
2.28		Asset turnover	$\frac{[\text{Sales}]}{[\text{Capital employed}]}$		Yearly
2.29		Interest Cover	$\frac{[\text{Profit before interest and tax}]}{[\text{Interest}]}$		Yearly
2.30		Long term debt	Debt liabilities due in excess of one year	\$	Yearly

<u>Item</u>	<u>Category</u>	<u>Indicator</u>	<u>Definition</u>	<u>Units</u>	<u>Reporting Period</u>
3.0	Network Reliability				
3.1		System average interruption frequency index (SAIFI) (Average number of sustained interruptions per customer)	Total number of reported customer interruptions greater than 1 minute duration / total number of customers served	Interruptions per year	Yearly
3.2		System average interruption duration index (SAIDI) (Average minutes off supply per customer)	Sum of each outage duration in minutes times the number of customers / total number of customers served	Minutes	Yearly
3.3		Customer average interruption duration index (CAIDI) (Average interruption duration)	$\frac{[SAIDI]}{[SAIFI]}$	Minutes	Yearly
3.4		Number of faults per 10km of distribution lines		No.	Yearly
3.5		Number of faults per 20km of transmission lines		No.	Yearly
3.6		Number of transmission and distribution circuit trip outs by voltage level		No.	Yearly
3.7		Interruptions restored within 3 hours and 5 hours		No.	Yearly
3.8		Supply interruptions per 100 connected customers		No.	Yearly
3.9		Number of complaints on voltage levels per 100 connected customers		No.	Yearly
3.10		Number of faults assigned to modifications at substations		No.	Yearly

<u>Item</u>	<u>Category</u>	<u>Indicator</u>	<u>Definition</u>	<u>Units</u>	<u>Reporting Period</u>
3.11		Disaggregation of causes for interruptions of supply: 1. Maintenance 2. New construction 3. User connection 4. Faults		No.	Yearly
3.12		Average response time to interruptions		Minutes	Yearly
4.0	Affordability and other Economic Data				
4.1		Sales per employee (kWh)	$\frac{[\text{Total kWh sales}]}{[\text{Number of employees}]}$	KWh/emp.	Yearly
4.2		Sales per employee (\$)	$\frac{[\text{Total revenue form sales}]}{[\text{Number of employees}]}$	\$/emp.	Yearly
4.3		Customers per employee	$\frac{[\text{Total no of customers}]}{[\text{Total number of employees}]}$	Cust./Emp.	Yearly
4.4		Low/High voltage complaints by area		No.	Quarterly and Yearly
4.5		Consumption per capita (kWh)	$\frac{[\text{Total kWh sales}]}{[\text{Total population}]}$	kWh/person	Yearly
4.6		Tariff for electricity services by category			Yearly
4.7		Restrictions for non payment of bills		No.	Yearly
4.8		Average consumption by class		kWh	Yearly
4.9		Average electricity bill by class		kWh	Yearly
4.10		Percentage of Customers with installment plans		%	Yearly

<u>Item</u>	<u>Category</u>	<u>Indicator</u>	<u>Definition</u>	<u>Units</u>	<u>Reporting Period</u>
5.0	Customer Responsiveness and Service				
5.1		Calls to emergency phone Line (% answered in 30 sec.)		%	Quarterly and Yearly
5.2		Written complaints not responded to within 5 working days		No.	Quarterly and Yearly
5.3		Complaints received (per 100 customers)		No.	Quarterly and Yearly
5.4		Complaints by major type	Reporting on the major areas of complaint	No.	Quarterly and Yearly
5.5		Complaints resolved by type		No.	Quarterly and Yearly
6.0	Operational Indicators				
6.1		Operator effectiveness Training requirements (Per generation unit)	$\frac{[\text{MWh lost due to operator caused outage}]}{[\text{MWh generated}]} \times 100$	%	Quarterly and Yearly
6.2		Performance of generation unit when most needed (Per generation unit)	$\frac{[\text{Output (MW) at each monthly peak}]}{[\text{Name plate rating}]}$	No.	Quarterly and Yearly
6.3		Spinning Reserves Availability Indicates how well the system responds to load increases	$\frac{[\text{Spinning reserves at each monthly peak}]}{[\text{System peak load}]} \times 100$	%	Quarterly and Yearly
6.4		Generator Performance under Peak Load	$\frac{[\text{The generator unit output (MW) at each monthly system load peak}]}{[\text{The unit's name plate rating}]}$		Quarterly and Yearly
6.5		Capacity Factor	$\frac{[\text{Annual electricity produced (MWh)}]}{[\text{Installed capacity (MW)} \times 8760 \text{ (period in hours)}]} \times 100$	%	Yearly

Item	Category	Indicator	Definition	Units	Reporting Period
6.6		<p>Load Factor</p> <p>When the capacity factor is approximately the same as the load factor, this is an indication that installed capacity matches demand.</p>	$\frac{[\text{Annual electricity produced (MWh)}]}{[\text{Maximum load (MW)} \times 8760 \text{ (period in hours)}]} \times 100$	%	Yearly
6.7		<p>Monthly System Peak Load Demand</p> <p>Indicates if monthly system peak loads are being met</p>	$\frac{[\text{Available capacity (MW) at each monthly peak}]}{[\text{System peak load}]} \times 100$	%	Quarterly and Yearly
6.8		<p>Generation Unavailability</p> <p>This indicates the generation capacity short fall due to forced or planned outages</p>	$\frac{[\text{Unavailable capacity (MW) at each monthly peak}]}{[\text{System peak load}]} \times 100$	%	Quarterly and Yearly
6.9		<p>Forced outage rate at monthly peak (per generator)</p>	$\frac{[\text{unit rating (MW)} \times \text{outage hours (hrs)}]}{[\text{installed capacity (MW)} \times \text{period (hrs)}]}$		Quarterly and Yearly
6.10		<p>Availability Factor</p> <p>Measures the availability of each unit after partial or full outages (both planned and forced) have been allocated</p> <p>Indicates whether sufficient capacity is available in the total system</p>	$\frac{[\text{Total hours of operation of plant during the period}]}{[\text{Total length of period (hours)}]} \times 100$ <ul style="list-style-type: none"> o Ratio of available to installed capacity 	%	Quarterly and Yearly
6.11		<p>Output Factor (per unit)</p> <p>Measures the extent to which each unit capability is used</p>	$\frac{[\text{MWh generated in period}]}{[\text{Site rating on unit (MW)} \times \text{hours in period connected to system}]} \times 100$	%	Quarterly and Yearly

Item	Category	Indicator	Definition	Units	Reporting Period
6.12		Realization of monthly system loads	$\frac{[\text{Available capacity (MW)}]}{[\text{System peak load at each monthly peak}]} \times 100$	%	Quarterly and Yearly
6.13		Inadequate generation capacity due to a forced or planned outages	$\frac{[\text{Unavailable capacity (MW)}]}{[\text{System peak load at each monthly peak}]} \times 100$	%	Quarterly and Yearly
6.14		Average Heat Rate (per unit) Measures the amount of energy needed to produce one kWh of electrical output. The smaller the heat rate the greater the efficiency	$\frac{[\text{Total Energy content of fuel burned}]}{[\text{Net kWh generated by unit}]}$	kJ/kWh	Quarterly & yearly