Study on Electricity Pricing For a typical Distribution System With a Case Study

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and behalf, it contains no materials previously published or written by another person nor material, which to substantial extent, has been accepted for the award of my other academic qualification of a university or other institute of higher learning except where acknowledgement is made in the text.

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NOMENCLATURE

CEB	Ceylon Electricity Board
LECO	Lanka Electricity Company Ltd.
WPS	Western Province South
TOD	Time of the day
AIC	Average Incremental Cost
LRMC	Long run Marginal Cost
SRMC	Short Run Marginal cost
LDC	Load Duration Curve
PPP's	Private Power producers
GDP	Gross Domestic Product
BOO	Built Own Operate
Ktoe	Kilo tone oil equivalent
UG	Under ground
GSS	Grid Substations
DSM	Demand Side Management
LV	Low Voltage
HT	High Tension
Small I & C	Small Industrial and Commercial
IPP's	Independent power producers

ABSTRACT

The scope of the study was to develop a cost reflective, economically efficient tariff structure for a typical distribution system with a case study on Western Province South (WPS) of the Ceylon Electricity Board (CEB). The WPS is one of the CEB's provinces in administrating the electricity distribution system. Different tariff structures were developed under two approaches. They are; one based on average incremental cost and the other based on average historical cost.

In order to develop above tariff structures future load forecasts were made using the past trends and the planning period for the tariff study was taken as from 2002 to 2009.The energy, peak power and loses for the above period were established. Future costs including investments, system augmentation and rehabilitation costs, operation and maintenance costs were established for the planning period. Using above data, tariff structures were developed using AIC principals under four scenarios to see the effect of different parameters. Average historical cost based tariff was developed using 2001 data and it establishes a slightly lower tariff than the AIC based tariffs. Also, prices are differentiated only on voltage levels in the historical cost based tariff due to the non-availability of adequate data. Sensitivities of these tariffs were checked for the purchase price and for the discount rate. All these tariff structures were compared and most appropriate tariff was selected which differentiate prices on voltage levels, time of usage, and contribution to the peak.

As the average generation costs of CEB has been continuously increased since 2000 due to the emergency and hired thermal power, a more realistic price at the grid sub level was established based on the thermal and hydro costs, and the generation mix. It was found that this price is Rs. 5.73 per kWh at grid substation level. With this purchase price; the proposed tariff was revalued to establish the final tariff structure. This final tariff generates an average selling price of Rs. 7.35. This final tariff is then compared with the present tariff and found it charges higher price for Domestic, LECO and Street light consumers and charge a lower price for Industrial and Commercial consumers. It was further studied the possibility of maintaining the same tariff as present for the Domestic consumers. In this case it was found, a subsidy of Rs 1.13 billion has to be paid annually to the utility.

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