

PUBLIC UTILITIES REGULATORY COMMISSION

PROPOSED TRANSITIONAL PLAN

FOR

ELECTRICITY RATE ADJUSTMENT

FOR

2001 – 2004.

JULY, 2002

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Executive Summary

In accordance with its statutory responsibilities, PURC in January 2000, **finalized and issued the Electricity Rate Setting Guidelines**. It has also developed a **Transitional Plan which would give the utility companies the necessary incentives to deliver reliable service to consumers**, and also enable PURC to **implement phased tariff adjustments over a period of time**, to reflect the **efficient economic cost** of electricity supply in Ghana.

Since its inception, the PURC has carried out **three electricity rate adjustments**, the first one in February 1998, the second in September 1998 and the third adjustment in May 2001.

The **key objectives** of PURC's transitional plan are as follows:

- i. Bring about improvement in the quality of service delivered by the utility companies
- ii. ii. Revise electricity tariffs gradually upwards towards the indicative 'economic' and efficient rates
- iii. iii. Ensure the financial sustainability of the power utilities
- iv. iv. To rationalize the tariff structure and make it cost reflective

The Commission's Transitional Plan makes critical analysis of the **three main components** of the end-user tariff namely:

- i. i. The **Bulk Generation Charge (BGC)**
- ii. ii. The **Transmission Service Charge (TSC)** and
- iii. iii. The **Distribution Service Charge (DSC)**

The Plan further defines the transitional tariff path by indicating the **frequency and magnitude of the adjustments**, towards the attainment of the target PURC efficient and economic electricity tariffs.

By definition, the BGC is the average cost recovery price of electric power purchased by the distribution utility companies from Volta River Authority (VRA). The Transmission Service Charge is the price charged by VRA for the use of the transmission network by the distribution companies. The Distribution Service Charge is the cost due ECG and NED, for the added value to power purchased, to bring electricity to its consumers.

As part of the process of finalizing the document, the Commission organized a workshop in Accra to discuss and evaluate the key elements of the Transitional Plan. This was followed by workshops in four regional capitals namely Kumasi, Tamale, Ho and Takoradi to sensitize consumers on the significance of the Transitional Plan, and to discuss with the public strategies which the Commission has put in place to ensure that consumers receive value for money.

The Commission has also recommended in the document, an **automatic formula** to be used during the Transitional Period to adjust thermal energy price, to reflect periodic world market crude oil price movement, which is considered as an exogenous factor whose cost is beyond the control of the utility management.

Currently the total distribution system loss, comprising **technical and non-technical losses**, is of the order of **24.7%**, compared to the PURC end of Transitional period target of **18%**. The distribution system is beset with rampant **unplanned outages** due to the poor state of the network. The goal is to improve services by removing all these bottlenecks and ensuring that the distribution Utilities generate **adequate revenue** to rehabilitate the distribution system sufficiently to operate at an **efficient level**.

PURC recognizes the fact that reduction of **technical losses** will require substantial level of investment. As part of improving service delivery from the power utility companies, the Commission has worked closely with the utility companies to identify the **key capital investment projects**, which need to be undertaken and **funded upfront**.

For reliability in generation and evacuation of generated power via the transmission network devoid of any technical constraints, PURC has estimated VRA's capital contribution for key projects for **2002** and **2003** to be **¢ 294.00 Billion (US \$38.00 Million)** and **¢165.00 Billion (US \$20.00 Million)** respectively.

For the distribution system, PURC has estimated ECG's upfront capital contribution for **2002** and **2003** to be **¢334 Billion (US \$ 43 Million)** and **¢406 Billion (US \$50 Million)**

Details of the **key upfront investment projects including the benefits** to Ghana's power system can be found in section 2.3 of this document.

Non-technical losses which arise from billing and metering problems, illegal connections and unmetered premises do not however require the same level of investment. This is one area that the utilities' management can effectively control, to yield substantial improvements in profitability in the short-term. The Transitional Plan has thus been carefully couched to ensure that the necessary incentives are incorporated in the tariff setting to achieve the objective of reducing both **technical and non-technical losses**.

Currently, the average revenue collection rate for both Electricity Company of Ghana and Ghana Water Company Limited is **85%**, compared with the Commission's regulatory target of **95%**.

To support the utilities to operate efficiently and deliver good service delivery comparable to internationally acceptable standards in the long-term, the Commission has carefully determined quality of service performance benchmarks that must be met by the utility companies. PURC has also established a Quality of Service Monitoring regime that enables it to interact periodically, with the utility companies and other major stakeholders, such as the various residential associations and industrial consumers in the country. These interactions provide a forum for information gathering as well resolving recurring consumer complaints.

PURC recognizes the existence of a “**revenue gap**” and therefore a “**financing gap**” arising out of the “**tariff gap**”, which must be “**plugged**” to secure and maintain the financial integrity of the utility companies during the Transitional period.

While the Commission believes that the utility companies should be given full cost recovery tariffs, it also recognizes that consumers should be assured that their interest will be protected at all times so that they receive value for money.

It should be emphasized that in determining efficient and economic tariffs, PURC would ensure that no inefficiencies are passed through the tariff to end-users. PURC would at all times set its tariffs in accordance with the following principles:

- a. a. Revenue Stability
- b. b. Economic Efficiency. PURC has introduced a Quality of Service Performance Index as a reward/penalty mechanism in the distribution tariff formula.
- c. c. Fair and Non-discriminatory
- d. d. Transparency

The total determined regulated revenue must cover at all times the underlisted cost components:

- a. a. The Cost of maintaining and servicing the fixed assets used for producing the regulated product (i.e. depreciation)
- b. b. Operating and Maintenance Expenses
- c. c. Administrative and General Expenses
- d. d. Allowance for **Reasonable and Fair Rate of Return** which will permit the utility company to:
 - • Meet its debt service obligations
 - • Attract capital and thus undertake critical investment projects to meet growth in demand and deliver reliable and quality service to consumers.

During the Transitional period, the tariff structure would be rationalized to remove the inherent inequity associated with residential consumers who live in “compound” or “multi-tenanted houses”. As part of this tariff rationalization process, PURC commissioned a study to enable it make an informed decision in to address this critical issue. It is the aim of the Commission to make the tariff structure cost-reflective and thus remove all forms of undue cross-subsidisation.

The table below compares PURC’s efficient economic tariffs with those proposed by the utility companies to cover their inefficiencies.

CUSTOMER CLASSIFICATION	CURRENT TARIFF (AS AT JUNE, 2002) (CENTS/KWh)	EFFICIENT PURC TARIFF (CENTS/KWh)	CURRENT TARIFF AS % OF ECONOMIC	TARIFF AS PROPOSED BY UTILITY (CENTS/KWh)
RESIDENTIAL:	3.99	8.01	50.00	10.05
NON-RESIDENTIAL:	7.21	10.80	67.00	14.56

INDUSTRIAL/COMMERCIAL:				
Low Voltage	6.85	10.60	64.68	11.23
Medium Voltage	5.98	6.33	94.00	10.09
High Voltage	4.54	5.11	89.00	8.94
OVERALL AVERAGE TARIFF (CENTS/KWh)	5.00	8.60	58.00	10.60

The projected **PURC end-user tariff path** for the Transitional period is also shown below.

PERIOD		BULK SUPPLY TARIFF (BST) (CENTS/KWh)	DISTRIBUTION SERVICE CHARGE (DSC) (CENTS/KWh).	END-USER TARIFF (EUT) (CENTS/KWh)	% INCREASE
MONTH	YEAR				
MAY	2001	- - - 2.59 (194)	- - - 2.61 (196)	5.20 (390)	60%
AUGUST	2002	4.50 (359)	3.30 (264)	7.80 (623)	
MARCH	2003	4.80 (412)	3.40 (285)	8.20 (697)	12%
		- - -	-		

FIGURES IN BRACKET REFER TO CEDIS/KWh.
EXCHANGE RATES:
2001: 1 US\$ = €7,500
2002: 1US \$ = €8,000
2003: 1US \$ = € 8,500

The Transitional Plan document has identified the **key obligations** of all stakeholders towards the attainment of the set objectives.

The Government obligations include the formulation of pragmatic policies in line with the power sector development plan. In that regard, the Commission would like an affirmation of the commitment from the Government to the following power sector policies:

- • Private Sector Participation in the operations of the distribution utility companies
- • Unbundling and creation of a separate Electricity Transmission Utility (ETU)

It is expected that Government would continue to give all the necessary support towards the realization of the West African Gas Pipeline Project. To ensure the financial viability of the utility companies, a payment mechanism should be put in place by the Government for prompt payment of utility bills by the Ministries, Government Departments and Agencies (MDA's).

The utility companies' obligations include carrying out internal restructuring of their institutions consistent with the Government's power sector reform policy. **The Electricity Transmission Utility (ETU)** should be transformed into an independent entity, by end of the Transitional period.

The power utilities would be expected to develop a **5-year capital investment programme** on a rolling basis for submission to the Commission.

The distribution utilities will need to further strengthen their Customer Service Centres, carry out intensive public education and awareness programmes to educate consumers on their rights and responsibilities, and must put the necessary mechanisms and in place to optimize their **revenue collection rates**, to meet PURC's benchmark of **95%**.

On its part PURC will compel the utility companies to deliver reliable and quality service to consumers, while ensuring the financial sustainability of the utility companies through economic and efficient full cost and cost reflective tariffs.

The Energy Commission is expected to expedite action to formalise the threshold definition of **50 GWh** for Bulk Customers and complete the **Strategic National Energy Plan (SNEP)** by the end of the Transitional period.

Consumer obligations have also been highlighted in the document and this include the establishment of consumer associations and/or neighbourhood associations to demand good quality service from the utility companies, learn about energy conservation as well consumer rights and responsibilities.

It is expected that all stakeholders including the **Government, Industrial Consumers, Residential & Non-residential Consumers, the Utility Companies and the Regulatory Institutions**, would meet the expected obligations so that all Ghanaians will enjoy reliable power of the right quality to keep the wheels of industry moving, as Ghana strives to become a middle-income earning country as envisioned, to become a reality in the next few years.

1.0 Introduction

The Public Utilities Regulatory Commission (PURC) in 2000, embarked on a comprehensive tariff reform process through the development of a Transitional Plan which sets out the strategies for achieving improvement in **quality of service** through a **cost-reflective** and **efficient cost-recovery** tariff setting mechanism.

In line with its principle of openness and transparency, the Commission launched the Transitional Plan in Accra in May 2001, where the key elements of the plan were subjected to thorough discussions at a workshop held in Accra with the key holders in

the power sector namely the government (as the shareholder of the utility companies), utility companies, representatives of major or bulk /industrial consumers and representatives of domestic consumers. Conclusions and recommendations were made for further discussions.

Following discussions with representatives of the government and the utilities, the Commission decided to embark on an extensive public education programme to sensitise consumers on the significance of the plan and to solicit views from consumers and other key stakeholders to finalise the Transitional Plan. Four regional workshops were held in Kumasi, Tamale, Ho and Takoradi and views expressed by participants have been thoroughly considered in the compilation of the finalisation of the Transitional Plan.

Details of Plan including the investment implications to achieve the required level of quality of supply and strategies to be adopted for future tariff adjustments have been discussed in the document. The necessary incentive mechanisms have also been built into the tariff calculation so that consumer will benefit from pass-through efficiency gains of the utility companies.

1.1 Current State of the Power Sector

It is estimated that about 40% of the population have access to grid electricity supply, with growth in demand driven largely by highly subsidized residential customers.

The weak financial status of the power utility companies caused by low tariffs and high operational inefficiencies have made it impossible for the utility companies to invest in system rehabilitation and expansion.

Lack of investment has resulted in inadequate generation reserve, transmission network constraints, overloaded transformers, distribution networks and thus unreliable power supply to consumers.

2.0 Objectives of the transitional plan

In the Ghana's Power Sector Development Policy, PURC was to **finalize the Electricity Rate Setting Guidelines** and in the **mid-term (i.e. transitional period)**, **rationalize the existing tariff structure** and also **implement appropriate adjustments in rate levels** to reflect the **efficient economic cost** of electricity supply in the country.

Since its inception, the PURC has carried out **three electricity rate adjustments**, the first one in **February 1998**, the second in **September 1998** and the third adjustment in **May 2001**.

The key objectives of PURC's transitional plan are as follows:

- a. a. Ensure delivery of good quality of service to consumers at cost-effective price.
- b. b. Ensure the financial sustainability of the power utilities

- c. c. To rationalize the tariff structure and make it more cost reflective

2.1 2.1 PURC's strategy for achieving the objectives of the Transitional Plan

- a. a. Ensure that **key investments** are undertaken **upfront** by the utility companies to provide adequate generation capacity, remove bottlenecks in the transmission system and rehabilitate the distribution lines to achieve the required reliability of service
- b. b. Set and monitor utility performance targets to enhance utility operational performance and improve upon Quality of Service delivery to consumers
- c. c. Gradual revision of electricity tariffs towards the projected economic and efficient rates for each customer class.

In developing its strategy for the achievement of the set objectives, the Commission has also taken cognizance of the underlisted objectives of the Power Sector Reforms.

- a. a. Introduction of competition in wholesale supply transactions
- b. b. Guaranteeing of 'open access' transmission system network, to facilitate competition in wholesale supply of power to bulk customers, and the distribution utilities
- c. c. Re-organisation of the existing state-owned utilities (i.e. Distribution Utilities), into strategic business units (SBU's), to effectively, commercialize their operations.
- d. d. Re-capitalization of the power utilities through public-private partnership and joint ventures.

The Commission is of the view that the transitional tariffs of the PURC should have sound analytical basis. In that regard the transitional plan has taken into account results of the following studies conducted by consultants and also the methodologies defined in the PURC Electricity Rate Setting Guidelines.

- a. a. Final Report on "Economic Pricing Methodology for the Bulk Power Sales and Transmission & Distribution Services", April, 1996 Synex Consulting Engineers, Chile.
- b. b. Final Report on "Distribution Planning & Technical Losses", November 2000 – Power Planning Associates, U.K.
- c. c. Study on "Transmission System Pricing", November 2000 – Acres Management Consultants, Canada.
- d. d. Study on "Rationalization of Tariff Structure for Multiple-Dwelling & Review of Billing Strategy for Electricity and Water Supply in Ghana", April, 2002 – CEED Solutions, Ghana.

2.2 2.2 Strategies for Quality of Supply improvement

The Commission has developed Quality of Service Reporting guidelines and formats which would be used to effectively track the level of service delivery of the utilities to consumers.

The key Quality of Service indicators to be measured are as follows:

- a. a. **Average duration of customer-hours-lost per customer class.**
This report should be submitted on disaggregated or regional basis for ease of analysis.
- b. b. **Number of customer interruptions,** as a measure of frequency of interruption

In addition, PURC will monitor the following performance indicators:

- a. a. Voltage Fluctuations
- b. b. Speed of response to faults and complaints
- c. c. Revenue Collection Rate
- d. d. Revenue Loss due to Non-Technical Losses (i.e. Billing, Metering & Illegal connection).

The Quality of Service monitoring would be enhanced through the adoption of the following mechanisms:

- a. a. Elicit feedback from consumers through periodic interactions with residential associations and other consumer classes.
- b. b. Regular meetings with utility companies to discuss feedback from consumers
- c. c. Comprehensive analysis by PURC of overall utility performance to achieve PURC quality of Service and other regulatory benchmarks, as part of the future tariff review process.

2.3 2.3 Key Upfront Investments Required for Quality of Service Delivery

PURC's Transitional Plan identified **key projects**, which would require **up-front investment** to enable Volta River Authority and the Electricity Company of Ghana, deliver reliable service, and thus meet the Commission's regulatory performance benchmarks.

2.3.1 Volta River Authority – Generation & Transmission Systems:

- a. **Project:** **Akosombo G.S. Retrofit Project**
Project Cost: ₵443 Billion (US \$57 Million)

Benefit: a. Enhance Turbine efficiency

- b. b. Improve generator capacity and ensure reliable power generation for the next 25 years.

Total Expenditure 2002: ₵ 87.20 Billion
Total Expenditure 2003: ₵ 73.00 Billion

- b. **Project: Mallam Substation**
Project Cost: ₵64.17 (US \$ 8.22 Million)

Benefit: Improve upon reliability of power supply to Accra

Total Expenditure 2002: ₵ 6.62 Billion
Total Expenditure 2003: ₵ 10.20 Billion

- c. **Project: Prestea-New Obuasi Transmission Line**
Project Cost: ₵ 56.42 Billion (US \$ 7.23 Million)

Benefits:

- • Facilitate the evacuation of power from Ghana to Togo/Benin and La Cote d'Ivoire
- • Transmission network reliability
- • Reduction of line losses

Total Expenditure 2002: ₵ 35.48 Billion

- d. **Project: System Reactive Power Compensation**
Project Cost: ₵ 12.13 Billion (US \$1.60 Million)

Benefit: a. Improve system voltage stability
b. b. Reduce Transmission Losses

Total Expenditure 2002: ₵ 870 Million
Total Expenditure 2003: ₵ 946 Million

- e. **Project: Aboadze-Volta 330 kV Transmission Line**
Project Cost: ₵ 182.90 Billion (US \$23.44 Million)

Benefit: a. Enhance Power Transfer from the Takoradi Thermal Plant

b. b. Enhance Ghana's participation in the proposed West Africa Power Pool.

c. c. Improve upon evacuation of power from the western corridor of Ghana

Total Expenditure 2002: ₵ 166 Billion
Total Expenditure 2003: ₵ 22 Billion

- f. **Project: Kumasi-Sunyani Transmission Line**
Project Cost: ₵115.23 Billion (US \$ 15 Million)

Benefit: Enhance supply reliability from Tamale to Bolgatanga and improve voltage stability to Bolgatanga.

Total Expenditure 2002: ₵ 57 Billion
Total Expenditure 2003: ₵ 61 Billion

VRA'S CAPITAL CONTRIBUTION FOR KEY PROJECTS, 2002: ₵ 294.00 Billion (US \$38.00 Million)

VRA'S CAPITAL CONTRIBUTION FOR KEY PROJECTS, 2003: ₵ 165.00 Billion (US \$20.00 Million)

2.3.2 Electricity Company of Ghana (ECG) – Distribution System

- a. **Project: To provide second 161 kV/33 kV Supply Point in Kumasi**
Project Cost: ₵ 24.23 Billion (US \$ 3.10 Million)

Benefit: Improve reliability and security of power to the city of Kumasi

Total Annual Expenditure, 2002: ₵ 0.82 Billion
Total Annual Expenditure, 2003: ₵ 3.66 Billion

- b. **Project: To provide seven new 33 kV/11 kV Primary Stations**
Project Cost: ₵ 74.54 Billion (US \$9.60 Million)

Benefits: a. Lead to improvement of installed capacity
b. b. Improve system voltages
c. c. Reduce technical losses

Total Expenditure 2002: ₵ 16.50 Billion
Total Expenditure 2003: ₵ 27.46 Billion

- c. **Project: Reinforcement of 33 kV O/H Line & Cable Network**
Project Cost: ₵ 205.75 (US \$ 26.40)

Benefit: a. Improve upon system voltage
c.c. Reduce technical losses

Total Expenditure 2002: ₵ 63.42 Billion
Total Expenditure 2003: ₵ 73.23 Billion

- d. **Project: Reinforcement of Distribution Network & Distribution Transformers**
Project Cost: ₵ 550.73 Billion (US \$71 Million)

Benefit: a. Increase system capacity
b. Reduce technical losses

Total Expenditure 2002: ₺164.72 Billion
Total Expenditure 2003: ₺ 188.60 Billion

- e. Project: Installation of 11 kV shunt capacitors at the 11 kV bus in ECG's primary substations in Accra, Kumasi, Tema & Takoradi.**
Project Cost: ₺ 12.40 (US \$1.6 Million)

Benefit: a. Improve power factor in the ECG system
b. Reduce technical losses and improve system voltages by providing reactive power.

Total Expenditure 2002: ₺12.35 Billion

- f. Project: Installation of new pre-paid energy meters**
Project Cost: ₺ 641.9 Billion (US \$82.3 Million)

Benefit: a. Reduce technical losses and improve upon ECG's cash flow.

Total Expenditure 2002: ₺ 82.36 Billion
Total Expenditure 2003: ₺ 228.85 Billion

- g. Project: Provision of new SCADA systems in the ECG sub-transmission system.**
Project Cost: ₺73 Billion (US \$9.40 Million)

Benefit: a. Automate the supervisory and control systems in these locations and thus reduce equipment downtime
b. Reduce the downtime of lines and equipment
c. Reduce the duration of customer-hours-lost

Total Expenditure 2002: ₺18.12 Billion
Total Expenditure 2003: ₺ 54.93 Billion

- h. Project: Provision of new Customer Service Centres (54 centres) in ECG's operational areas.**
Project Cost: ₺42.90 Billion (US \$5.5 Million)

Benefit: a. Enable ECG respond quickly to consumer complaints and thus restore customer confidence.

Total Expenditure 2002: ₺23.88 Billion
Total Expenditure 2003: ₺9.20 Billion

- i. Project: Provision of mobile substations and Plants in all regional capitals**
Benefit: Reduce outage hours to customers fed from substations that are undergoing major maintenance.
Project Cost: ₺ 82.2 Billion (US \$10.50 Million)

Total Expenditure 2002: ₺8.24 Billion
Total Expenditure 2003: ₺64.10 Billion

- j. **Project: Distribution Engineering & Geographic Information Systems (DEGIS).**
Project Cost: ₺152.50 Billion (US \$20 Million)

Benefit: To expedite fault tracing during power outages within the entire distribution system.

Total Expenditure 2002: ₺41.18 Billion
Total Expenditure 2003: ₺ 91.50 Billion

- i. **Project: Mallam Bulk Supply Point Upgrade**
Project Cost: ₺4.72 Billion (US \$0.6 Million)

Benefit: To improve reliability of power supply in Accra
Total Annual Expenditure, 2003: ₺2.75 Billion

ECG'S CAPITAL CONTRIBUTION FOR KEY PROJECTS, 2002: ₺334 Billion (US \$ 43 Million)

ECG'S CAPITAL CONTRIBUTION FOR KEY PROJECTS, 2003: ₺ 406 Billion (US \$50 Million)

3.0 Components of End-User Tariff

PURC's end-user tariff comprises the following three components:

- a. a. The Bulk Generation Charge (BGC)
- b. b. The Transmission Service Charge (TSC)
- c. c. The Distribution Service Charge (DSC)

The **BGC** is the average cost recovery price of electric power purchased by the distribution utility companies from the generation utility companies. The **TSC** is the price charged by the Transmission Utility Company for the use of the transmission network and the **DSC** is the cost due ECG and NED for the added value to power purchased, to bring electricity to consumers.

3.1 Bulk Generation Charge

The Bulk Generation Charge (BGC) is the average cost recovery price of electric power purchased by the utility companies from the wholesale market. Under the on-going reforms in the power sector, the BGC is to be established through the operations of a wholesale power market. The Wholesale price shall consist of a **PURC determined system marginal capacity charge** and an **energy charge** of supplying the power system. During the transitional period, the **energy charge** shall be based on the **weighted average cost of generation**.

Presently fuel used in operation thermal plants is mainly light crude oil. It is expected that natural gas, a cheaper fuel than Light Crude Oil (LCO), will in the near future

become the main fuel for thermal power plants in Ghana. It is envisaged that upon completion of the West Africa Gas Pipeline Project, under a natural gas fired thermal plant scenario, the price of electricity will be cheaper and more predictable and thus not upset tariff projections. The availability of natural gas will thus enhance competition in the supply of electric power in Ghana.

During the Transitional period, PURC all thermal power plants would be priced at full economic efficient rate to ensure full cost recovery. To manage the smooth transition to economic efficient rates, the Commission would use the Hydro price to “cushion” the impact of the transitional tariffs on consumers, especially residential customers.

The following pricing methodology shall apply during the transition period:

3.1.1 Hydroelectricity

PURC shall approve annually the purchase price(s) for the supply by VRA, of “**firm**” **capacity** and **associated energy** from the hydroelectric facilities at Akosombo and Kpong. To that end, the PURC shall take into account VRA’s annual **revenue** and **rate of return requirement**, and also the **efficient operation and maintenance costs** of those hydroelectric facilities.

3.1.2 3.1.2 Thermal Complementation for Hydro Generation potential

The cost of the thermal complementation shall be **borne by all consumers** while the hydro price would be used to “cushion” the effect of the transitional tariffs towards the attainment of full economic and efficient electricity tariff.

For effective management of the hydro lake level, VRA would be required to use **thermal complementation** to “**top-up**” the firm hydro energy generation in a particular period, to achieve the Long-Term Average hydro generation potential, to meet its domestic demand.

3.2 Thermal Generation

To promote investment in thermal power generation, the Commission has decided to allocate full economic tariff to all thermal plants to ensure full efficient cost recovery.

Prior to concluding any Power Sale and Purchase Contracts with other wholesale power suppliers, distribution utilities shall secure PURC approval for the methodology to be applied to set specific charges to recover the costs of the firm capacity and associated energy to be purchased.

The capacity charge shall be set at a level to cover the investment annuity and fixed operating and maintenance costs of developing a PURC designated peaking plant, in the National Interconnected System, (NIS).

The energy charges shall be equal to the average value of the expected cost of supplying the energy required to meet the projected load in the NIS. The basis for establishing the average energy charge shall be a one-year forward projection of all generating facilities in the NIS.

The results achieved from the one-year forward simulation shall be reviewed in June and December of each year to take into account any changes in electricity supply, demand projections and fuel costs that are made at the beginning of the year.

Table 1. below shows the indicative price (**energy and capacity**) of electricity in Ghana.

The indicative prices in table 1 below were calculated, using the following:

1. 1. Average **base LCO price of 20 US \$/bbl + 2.0 US \$/bbl** handling & premium charges.
2. 2. System peaking plant (“efficient” open cycle plant)
3. 3. System capacity price of **12.20 US \$/kW-month**, which includes a **reserve margin of 25%**.

Table 1

Variable Energy Price @ base LCO Price of 20 US \$/bbl + handling & premium charge of 2.0 US \$/bbl.	4.61*/3.03* cents/kWh
Non-Fuel Variable Price	0.23 cents/kWh
Capacity Price :	12.20** US \$/kW-month

* Energy Price calculated using actual operating characteristics of the Takoradi Thermal Power Plant. 4.61*/3.03 cents/kWh: variable energy price for open cycle and combine cycle plants respectively.

** Capacity price was based on actual capital cost and fixed O&M profiles, of TICO open cycle plants, Takoradi. Used a real discount rate of 16%

3.3 3.3 Estimated Energy Requirements (GWh/yr.) in the Domestic Market

ASSUMPTIONS:

- • Figures below are based on the threshold definition of 5MW, pending the new categorization from the Energy Commission, using the 50 GWh threshold, for bulk customers.

Table 2- Projected Energy Demand scenarios for the domestic market

CUSTOMER	2001	2002	2003	2004
-----------------	-------------	-------------	-------------	-------------

REGULATED MKT.				
ECG	4,122	4,388	4,600	4,900
NED	335	371	388	398
Sub-Total	4,457	4,759	4,988	5,298
DEMAND GROWTH (%)	-	7.70	6.30	6.20
DE-REGULATED MKT. (DOMESTIC)				
BULK CUSTOMERS	495	559	560	560
DEMAND GROWTH (%)	-	12.90	0.18	0.00
TOTAL	4,952	5,318	5,548	5,858
DOMESTIC DEMAND GROWTH (%)	-	7.40	4.30	6.00

Table 2.1 – Projected Energy Requirement (in GWh) for Valco and Exports

	2001	2002	2003	2004
Valco	2,453	2,553	2,760	2,760
Exports	570	300	300	300

3.3.1 3.3.1 “Firm” Hydro Energy Supply (GWh/yr.) and Required Thermal Complementation (GWh/yr.) to meet Domestic Demand.

Assumption: “Firm Hydro” for the domestic market (for 2001) = Expected Average Generation – Average Annual Valco Demand = 6,400 GWh/yr. – 2453 GWh/yr. = 3,947 GWh/yr.

For 2002-2004 : Long Term Average Potential - Average VALCO Demand = 6100 GWh/yr – 2,760 GWh/yr = 3,340 GWh/yr

Table 3 – Energy supply sources and their contribution

	2001	2002	2003	2004
HYDRO :	3,947	2,660	2,980	3,060
% COMPOSITION:	75.00	50.02	53.00	52.00
THERMAL COMPLEMENTATION	1,251	2,658	2,568	2,798
% COMPOSITION:	25.00	49.98	47.00	48.00
TOTAL (Hydro+Thermal)	5,197	5,318	5,548	5,858

Table 4 – Projected thermal installed capacities during transitional period.

THERMAL PLANT	INSTALLED CAPACITY (MW)	EFFECTIVE CAPACITY (MW)	“FIRM” CAPACITY (MW) @ P.F. of 0.85	“FIRM” ENERGY (GWh/yr.)
TAPCO*	330	165	280	2,453
TICO*	220/330	220	66**/280	578/2,453
WPC*	125	0	106	930

*: TAPCO: Takoradi Power Company
TICO: Takoradi International Company
WPC: Western Power Company

** : Used a Plant Factor (P.F.) of 0.30, since TICO is used mainly as a peaker.

4.0 PURC Transitional Electricity Rates - Methodologies

4.1 ‘Firm’ Hydro Energy Price for VRA Contracts

During the Transitional period, PURC will calculate the ‘economic’ hydro price in accordance with the methodology in the Electricity Rate Setting Guidelines, section 4.1.2, taking into account, VRA’s annual financial rate of return requirements, and also the efficient operation and maintenance costs of VRA’s hydroelectric facilities.

During the Transitional period, the Commission intends to use a lower Rate of Return (ROR) for the hydro to manage the gradual movement of tariffs towards attainment of full efficient and economic electricity rates.

4.2 Thermal Price for “firm” Capacity and Energy

4.2.1 Capacity (US \$/kW-month):

During the Transitional period, PURC shall use the system 'economic' capacity price for all thermal plants to ensure full recovery of invested capital.

Table 6 – System-wide 'economic' capacity price

YEAR	2001	2002	2003	2004
US\$/kW-month	12.20	12.20	12.20	12.20

PURC has determined the benchmark **capacity price**, which includes a reserve margin of 25%, based on the actual capital cost profile of the **second TICO open cycle thermal plant**, using the mathematical relationship below.

A summary of the mathematical relationship for calculating the capacity price can be found in Appendix 2.

4.2.2 Recommended Adjustment Formula For Thermal Energy Price:

The Commission recommends the following **mathematical relationship** to be used to adjust the “**base**” **Energy Price (EP) during the Transitional period**, to reflect Liquefied Crude Oil (LCO) world average market price movements. A base price of 20 US \$ per barrel was used for the analysis.

The trigger condition for application of the formula is as follows:

Fuel Price Change = (30 ± 1.5) US \$ per barrel.

The recommended automatic fuel adjustment formula is attached as Appendix 3.

Adjustment of BST, DSC and EUT to correct for **depreciation/appreciation of the cedi against the US \$**, if fuel price do not trigger use of the automatic fuel adjustment formula is also presented in **Appendix 4B**.

4.3 4.3 Other bilateral contracts between Thermal generators and distribution utilities.

The prices in the Power Sale Contracts (energy & capacity) between thermal generators and the distribution utilities will be driven by a competitive bidding process, in accordance with the PURC Electricity Rate Setting Guidelines

5.0 Transmission Service Charge

5.1 Objective

The primary objective of the transitional plan for pricing transmission services is to ensure that revenue to the Electricity Transmission Utility (ETU) would be adequate for the development and operation of an **economically adapted transmission system**.

5.2 5.2 State of the Transmission System

Currently, the transmission system is beset with technical bottlenecks, and this calls for substantial amount of investment to reinforce the system.

The Transmission System in its present state, is not the optimum or the economically adapted system that can serve as a catalyst to fully facilitate competition, in wholesale power generation.

5.3 How to achieve an economically adapted system, through transmission system pricing

The revenue requirement that would be the basis for transmission service pricing, would take into account a transmission system investment plan, that would bring it to its optimal operating level in a reasonable time period.

In determining the '**economic price**' for the Transmission Service Charge (TSC), the Commission has used the **Transmission Added Value (TAV) concept**. PURC would administer the Transmission Service Charge (TSC) using the **Postage Stamp Pricing Philosophy** and should be paid for by **all users** of the transmission system.

A **Postage Stamp Pricing** approach used in transmission system pricing means that all users of the transmission system pay a uniform charge.

TAV is defined as the **annualized replacement value** of the transmission fixed assets plus efficient O&M costs, making allowance for '**efficient**' **technical losses** (i.e. capacity & energy losses). TAV therefore is a **Standard Efficient Cost (i.e. benchmark)** concept, used in the derivation of transmission system charges

In a study on "Transmission System Pricing" conducted by Acres Management Consultants (Final Report, November 2000), the total capacity charge to the regulated market was determined as **2.90 US \$/kW/month**.

The components of "Economic" Transmission System Price can be found in Appendix 5.

5.4 5.4 Cost of Standard Ancillary Services

Other additional costs required to operate an optimized and reliable transmission network would be determined by the PURC, in consultation with the Electricity Transmission Utility (ETU).

6.0 Distribution service charge

The primary objective of the distribution system pricing plan is to ensure that at the end of the transition period, an efficient distribution network capable of delivering power to all customers in the **most cost effective way** would have been developed.

PURC will therefore set the key targets with the necessary incentive mechanisms in its tariff calculations, to ensure that the utilities reduce their technical and non-technical losses to efficient levels, and improve upon service quality to end-users.

6.1 6.1 State of the Distribution System

Currently the **total distribution system loss**, comprising both technical and non-technical losses, is of the order of **24.7%**.

The distribution system is beset **with high technical losses**, and rampant **unplanned outages** due to the poor state of the distribution network. The goal is to improve services by removing all these bottlenecks through **upfront investments in key projects** and ensuring that the distribution utilities generate **adequate revenue** to rehabilitate the distribution system to an **efficient level**.

The table below shows the trend of total distribution system losses since 2000.

END OF YEAR	TECHNICAL LOSSES (%)	NON-TECHNICAL LOSSES (%)	TOTAL SYSTEM LOSSES (%)	PURC TRANSITIONAL TARGET (%)
2000	11.00	15.00	26.00	20.00
2001	10.65	14.07	24.72	21.00
2002	N/A	N/A	N/A	21.00
2003	N/A	N/A	N/A	18.00

While PURC recognizes the fact that reduction of technical losses will require substantial level of investment, **non-technical losses** do not require the same level of investment. It is one area that the utilities' management can effectively control, to yield substantial improvements in profitability in the short-term. The components of non-technical losses are as follows:

- a. a. illegal connections
- b. b. metering problems
- c. c. billing problems
- d. d. Unmetered supplies

Of the four non-technical loss components, billing problems rank as the highest loss contributor, followed by illegal connections, metering problems and unmetered supplies.

Another key performance indicator which the Commission would monitor is the utility's average revenue collection rate, which currently stands at 85%, compared with the regulatory benchmark of 95%.

PURC will calculate the 'economic' Distribution system charge (DSC), using the **Distribution Added Value (DAV)** concept, and also tie the periodic DSC adjustment, to quality of service to end-users, using **the Quality of Service Performance (QSP) Index**.

By definition, **the DAV** is the **annualized replacement value** of the distribution fixed assets plus **efficient O&M costs**, making allowance for **'efficient' technical losses** (i.e.

capacity & energy losses). DAV is therefore a **Standard Efficient Cost (i.e. benchmark)** concept, used in the computation of distribution system charges.

The components for determination of “Economic” Distribution Service Charge is attached as Appendix 6.

7.0 PURC’s Tariff Setting Principles

The Commission’s tariff setting principles are based on the Electricity Rate Setting Guidelines and in accordance with industry practice. These principles are as follows:

- e. e. Cost Coverage
- f. f. Revenue Stability
- g. g. Economic Efficiency. PURC has introduced a Quality of Service Performance Index as a reward/penalty mechanism in the distribution tariff formula.
- h. h. Fair and Non-discriminatory
- i. i. Transparency

The total determined regulated revenue must cover at all times the underlisted cost components:

- a. a. The Cost of maintaining and servicing the fixed assets used for producing the regulated product (i.e. depreciation)
- b. b. Operating and Maintenance Expenses
- c. c. Administrative and General Expenses
- d. d. Allowance for **Reasonable and Fair Rate of Return** which will permit the utility company to:
 - • Meet its debt service obligations
 - • Attract capital and thus undertake critical investment projects to meet growth in demand and deliver reliable and quality service to consumers.

7.1 Current Tariff Levels

In determining the efficient economic tariff levels, PURC has excluded the utility companies’ inefficiencies.

A summary of the key PURC performance benchmarks used for the economic and efficient tariff calculation, vis-à-vis ECG’s performance at the end of 2000 and 2001 is presented below:

VRA.

PERFORMANCE INDICATOR	PURC TARGET	2000	2001
Transmission Losses (%)	2.80	3.00	3.08

ECG.

PERFORMANCE INDICATOR	PURC TARGET	2000	2001
Technical Losses (%)	10.00	11.00	10.65
Non-Technical Losses(%)	8.00	15.00	14.07
TOTAL DISTRIBUTION LOSSES (%)	18.00	26.00	24.72
Rev. Collection Rate (%)	95.00	82.00	85.00

As shown in the table below, the combined **utility inefficiency** has been determined to be equal to **2.00 cents/kwh (i.e. difference between 10.60 cents/kWh and 8.60 cents/kWh)**. This was therefore disallowed in the economic efficient tariff calculations and not considered as a pass-through cost to consumers.

CUSTOMER CLASSIFICATION	CURRENT TARIFF (AS AT JUNE, 2002) (CENTS/KWh)	EFFICIENT PURC TARIFF (CENTS/KWh)	CURRENT TARIFF AS % OF ECONOMIC	TARIFF AS PROPOSED BY UTILITY (CENTS/KWh)
RESIDENTIAL:	3.99	8.01	50.00	10.05
NON-RESIDENTIAL:	7.21	10.80	67.00	14.56
INDUSTRIAL/COMMERCIAL:				
Low Voltage	6.85	10.60	64.68	11.23
Medium Voltage	5.98	6.33	94.00	10.09
High Voltage	4.54	5.11	89.00	8.94
OVERALL AVERAGE TARIFF (CENTS/KWh)	5.00	8.60	58.00	10.60

7.20 Transitional Path for Future Tariff Adjustments – 2001 to 2003

Bulk Supply Tariff (BST)

PERIOD MONTH YEAR	BULK GENERATION CHARGE (BGC)	TRANSMISSION SERVICE CHARGE (TSC)	BULK SUPPLY TARIFF (BST)	PERCENTAGE INCREASE
----------------------	------------------------------	-----------------------------------	--------------------------	---------------------

		(CENTS/KWh)	CENTS/KWh).	(CENTS/KWh)	
MAY	2001	-	-	2.59 (194)	85%
		-	-		
		1.92 (144)	0.67 (50.00)		
AUGUST	2002	-	-	4.50 (359)	15%
		-	-		
		3.70 (296)	0.80 (64.00)		
MARCH	2003	-	-	4.84 (412)	
		-	-		
		3.94 (335)	0.90 (76.50)		
		-	-		
		-	-		
		-	-		

FIGURES IN BRACKET REFER TO CEDIS/KWh.

EXCHANGE RATES: 2001: 1 US\$ = € 7,500
2002: 1US \$ = €8, 000
2003: 1 US \$ = €8,500

7.30 Distribution Service Charge (DSC)

PERIOD		DISTRIBUTION SERVICE CHARGE (DSC) (CENTS/KWh)	DISTRIBUTION SERVICE CHARGE (DSC) (CEDIS/KWh).	PERCENTAGE INCREASE
MONTH	YEAR			
MAY	2001	-	-	-
		-	-	-
		2.61	196.00	
JULY	2002	-	-	35.00%
		-	-	
		3.30	264.00	
JAN.	2003	-	-	8.00%
		-	-	-
		3.35	285.00	
		-	-	
		-	-	
		-	-	
		-	-	

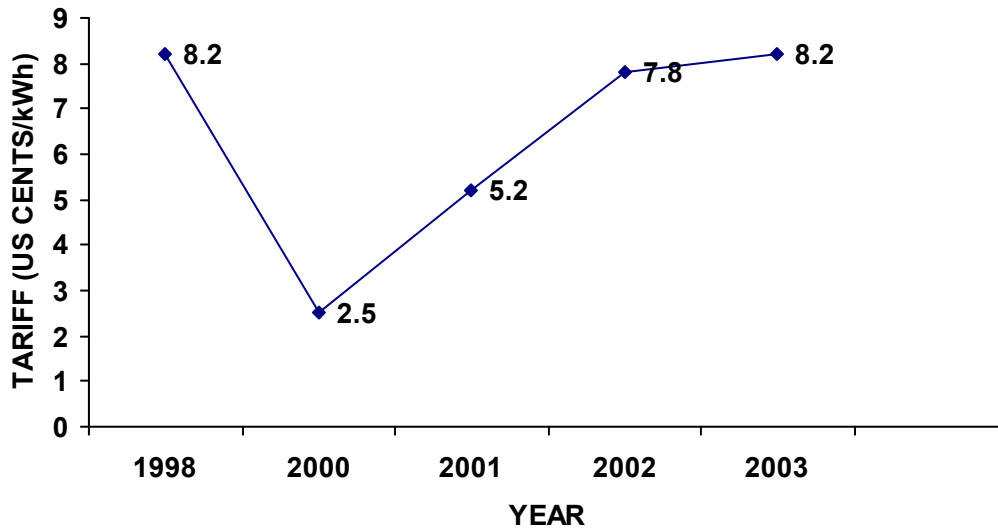
8.30 8.30 End-User Tariff Path

PERIOD	BULK SUPPLY	DISTRIBUTION SERVICE	END-USER TARIFF (EUT)	PERCENTAGE INCREASE
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MONTH	YEAR	TARIFF (BST) (CENTS/KWh)	CHARGE (DSC) (CENTS/KWh).	(CENTS/KWh)	
		-	-		
		-	-		
		-	-		
MAY	2001	2.59 (194.00)	2.61 (196.00)	5.20 (390.00)	60.00%
JULY	2002	4.50 (359.00)	3.30 (264.00)	7.80 (623.00)	12.00%
JAN.	2003	4.84 (412.00)	3.35 (285.00)	8.20 (697.00)	
		-	-		
		-	-		
		-	-		

FIGURES IN BRACKET REFER TO CEDIS/KWh.
EXCHANGE RATES:
2001: 1US \$ = ₺ 7,500
2002: 1US \$ = ₺ 8,000
2003: 1US \$ = ₺ 8,500

**TREND OF AVERAGE END-USER ELECTRICITY TARIFFS FOR
THE PERIOD 1998-2003.**



9.0 Future Tariff Adjustments – Problems Identified and Strategies to be adopted.

9.1 9.1 Special Load Tariff (SLT) – High Voltage (HV) and Medium Voltage (MV), and Non-Residential Customers

a. a. Present Tariff Situation

- • The **HV customers**, comprising large industries and the mining companies, are currently paying **89% of economic rate**
- • The **Medium Voltage class**, comprising small and medium size industries and some mining companies, are close to paying economic rate
- • **Non-Residential Customers**, made up of small commercial enterprises, are currently paying **67% of economic rate**

b. b. Strategy

- • To bring the **HV and the Non-Residential Class of customers** to the same level as the **MV**, during the next electricity tariff review.

9.2 9.2 Special Load Tariff (SLT) – Low Voltage (LV)

This is an industrial customer class comprising mostly banks and business offices, and other low energy intensive industries.

a. a. Present Tariff Situation

- • This tariff class is currently paying **65%** of PURC's indicative economic rate.

b. b. Strategy

- • The Commission's decision is to move this class to economic rate after two tariff reviews.

9.3 9.3 Residential Customers

a. a. Problems identified

- • How to **transit from current tariff level** of about **50%** of indicative economic to **the efficient and economic rate**
- • Residential customers consume about **50% of energy** sold in the **ECG controlled area**, and about **70% of energy** sold in the **NED controlled area but account for 38% of ECG's total revenue** and at least **50% of NED's total revenue**.
- • Inequity associated with the poor, living mostly in compound houses, who do not benefit from the highly subsidized "Lifeline Tariff". The "Lifeline Tariff" is a social tariff well below the cost of supply and targeted at the poor. Currently, the "lifeline tariff" constitute about 26% of the actual cost of serving a domestic consumer. It is not targeted and thus enjoyed by all residential consumers.

- • Another form of inequity associated with about 60% of the population living mainly in the rural areas with **no access to grid electricity** has been observed by the Commission. This segment of the population, apart from not benefiting from the “lifeline tariff”, spend more on purchasing consumables like kerosene, dry cell batteries for their lanterns, torchlights and radio cassettes per month.

b. b. Strategies to deal with problems identified

- • To minimize the shock of the tariff increases, PURC intends to transit residential consumers to full cost recovery rate by the **end of 2003**
- • Rationalize the tariff structure to eliminate the observed inequity associated with compound houses and the rural poor that has no access to electricity, based on the final recommendations of a consultant who undertook a tariff rationalization study for the PURC

10.0 Financial implications of the Transitional Plan

10.1 Generation System Revenue Requirements

a. Hydro

PURC will use the **regulated Hydro approach**, as per the Electricity Rate Setting Guidelines in its tariff determination.

PURC’s policy is to design a transition path which will ensure that VRA (Hydro) shall cover all prudently incurred costs and achieve a **fair and reasonable rate of return** on its average revalued net fixed assets.

b. Thermal

It is the view of the Commission that thermal power plants should be allocated the full capacity charge, to yield a **16% (Real) Rate of Return on Investment**. Thus operators of thermal power plants should not experience any revenue shortfall with respect to **capacity income**, to enable them recoup their capital investment .

On **income from energy sales**, with the introduction of the automatic fuel adjustment formula, the fuel variable cost would be adjusted as per the “trigger” conditions. Thus upon attainment of the economic efficient tariff, a thermal plant operator must cover its fuel variable cost.

10.2 Transmission System Revenue Requirements

Provided the Electricity Transmission Utility (ETU) operates within the PURC regulated costs each year, the latter should be able to meet its revenue requirements. It is expected that the ETU should be able to achieve a **reasonable rate of return** on its average revalued net fixed assets by the end of the transitional period.

10.3 Distribution System Revenue Requirements

It is expected that by the end of the transitional period, the Distribution Utility will meet its revenue requirements and thus attain a **reasonable rate of return** on average revalued net fixed assets, if it operates within the PURC regulated cost.

10.4 Revenue and Financing Gap

The Commission recognizes the existence of a “**Revenue Gap**” and therefore a “**Financing gap**” during the transitional period, created by the “**tariff gap**” between PURC’s target efficient economic tariff and current low tariff levels.

During the transitional period, the Commission would work closely with the power utility companies to identify this “**financing gap**” and work out modalities to ensure that this “gap” is “plugged” to ensure the financial sustainability of the utility companies.

11.0 Key Upfront investments to improve Quality of Service Delivery

One of the key objectives of the Transitional Plan is to ensure the delivery of reliable and quality service to consumers. The Commission has realized that this objective cannot be achieved without upfront investment in the **generation, transmission and distribution** systems to expand and improve upon the state of the existing power infrastructure.

PURC has in collaboration with the utility companies, identified the key investment projects that would enable the companies meet the Commission’s performance benchmarks. Details of the key upfront capital projects and the associated costs have been discussed in chapter 2.

12.0 Important Studies to be undertaken by PURC and the utility companies during the transition period.

- a. a. Technical and Operational Audit/Asset Replacement Value Study of the generation utilities.
- b. b. Survey to assist the Commission to correctly determine the **Quality of Service Performance (QSP) Index** for inclusion in the Distribution Service Charge (DSC) formula.
- c. c. “**Time of day**” tariff study: Its suitability and application for Ghana as a pricing option.
- d. d. A study to update the Commission on **the replacement values** of the distribution and transmission assets between **2004 and 2005**, as per the Electricity Rate Setting Guidelines.

13.0 Tariff Policy

13.1 Lifeline

A “Lifeline Tariff” is a social tariff well below the cost of supply which is targeted at the poor. Electricity rates for residential customers are currently based on an inclining block tariff structure in which a lifeline consumption (50kWh/month) is provided for all

residential customers. The rate for the lifeline is relatively small. Subsequent consumption beyond the lifeline consumption attracts higher rates.

The PURC will provide special rates for lifeline consumption for residential customers during the transitional period. Subsidies resulting from the lifeline rates shall be recovered from the higher consumption bands of residential customers, as per the tariff structure.

The objective of the PURC, in this regard, is to minimize cross-subsidies of all forms. PURC has commissioned a study to enable it make the lifeline policy more ‘**targeted**’ and thus beneficial for the target groups.

13.2 Compound Houses

The institution of the lifeline consumption and rates has resulted in some inequity for customers residing in compound houses. Under the lifeline concept, each customer is entitled to a lifeline consumption of **50kWh** at a subsidized rate. In compound house (multiple dwellings), for example of 4 households, where each household is required to enjoy the lifeline the total lifeline consumption is expected to be 200kWh.

Unfortunately because the customers share a common meter they together enjoy only 50kWh of their total consumption at the subsidized rate. The rest of their consumption is billed at a higher rate hence the inequity or unfairness.

The problem encountered is that while the consumption for multiple dwellings that use a common meter may not necessarily be high, the bill is disproportionately high for each household in the compound house.

The PURC will institute measures to resolve the problem of inequity and unfairness in compound houses. A consultant has been engaged to undertake a study of the level of the problem and make recommendations to the PURC.

The recommendations have been used to assist PURC to clearly define the parameters/characteristics for establishing and incorporating a “targeted” form of lifeline tariff in its end-user tariff schedule.

13.3 Tariff Structure

In general, the PURC will constantly review and revise the existing tariff structure when necessary in consultation with all stakeholders.

In doing this, the Commission will also take cognizance of the fact that there are consumers on pre-payment meters, who must receive fair and equitable bills, based on the tariff structure. It is therefore the aim of the Commission to reduce the **current five-**

tier residential tariff band structure to a **two-band structure and make the lifeline more targeted.**

The Commission intends to reduce the impact of the transitional tariffs on residential consumers by allocating the hydro price to this class of consumers.

It also the intention of the Commission to come out with a **flat rate for pre-payment meters**, by the end of the transitional period. This rate would be at a discount from those charged to credit meter users.

14.0 Obligations of stakeholders

The Commission recognizes the fact that all stakeholders need to discharge their responsibilities for the successful attainment of the transitional plan objectives. This will further assist the PURC to fulfill its mandate of ensuring that a vibrant power sector emerges to serve as a catalyst for Ghana's industrial development.

14.1 The Government

- a. a. The government, through the Ministry of Mines & Energy, should continue to formulate pragmatic policies in line with the power sector development plan. In that regard, the Commission would like an affirmation of the commitment from the Government to the following power sector policies:
 - • Private Sector Participation in the operations of the distribution utility companies
 - • Unbundling and creation of a separate Electricity Transmission Utility (ETU)
- b. To ensure that the set objectives of the transitional plan are realized, it is imperative that the government does all within its power, to make the West Africa Gas Pipeline Project, a reality. It is important that the gas price be acquired at a **reasonable cost**, to promote competition in generation and to ensure more stable and predictable electricity prices.
- c. c. Government should clearly define its strategy towards divesting itself from the State-Owned utilities
- d. d. The Government should ensure that a mechanism is put in place to enable all Ministries, Government Departments and Agencies (i.e. MDA's) pay their electricity bills on schedule, to enable the utility companies meet their revenue requirements.

14.2 Utility Companies

- a. a. Utilities are expected to carry out internal restructuring of their institutions, to be consistent with the power sector reforms. **The Electricity Transmission Utility (ETU) should be operationally and managerially separated from**
- b. b. VRA Generation and must be an **autonomous entity by end of the Transitional period.**

Separation of the ETU, will serve as a catalyst to promote competition in wholesale power supply and further serve as an impetus, for the creation of the **West Africa Power Pool**.

- c. c. PURC's policy is to encourage competition in the area of thermal complementation
- d. d. Development of a **5-year (i.e. 2001-2005)** detailed technical and investment programme for submission to the Commission by the Distribution Utilities (i.e. ECG & NED), with the view to reducing **technical and non-technical losses** to efficient levels.
- e. e. If a utility is of the view that a non-core activity is a necessary undertaking, relevant to the performance of the core business, then the utility concerned, should submit a **detailed justification** to the Commission, during tariff reviews.
- f. f. Submission of quarterly reports by the utilities to the Commission, should be done **within 4 weeks** of the end of the quarter, and not more than **3 months**, for annual reports.

The distribution utilities will need to further strengthen their Customer Service Centres, data collection & management systems, to be able to fulfil PURC's reporting requirements, under the new dispensation.

- g. g. There should be the need for the utilities to operate within the framework of the Codes of Practice and Standards, developed by the Energy Commission and PURC.
- h. h. The utilities must endeavour to carry out intensive public education and awareness programmes to educate consumers on their rights and responsibilities.
- i. i. The utilities must put the necessary mechanisms and programmes in place to optimize their **revenue collection rates**, particularly from the government Ministries, Departments & Agencies (MDA's). Details of such a plan/programme must be submitted to PURC.

This will be one of the key PURC **performance indicators** during the transition period, which will be tied to the periodic Distribution Service Charge adjustment.

13.3 PURC

PURC is committed to ensuring that all the set objectives outlined in the Plan are realized. In that regard, the Commission will during the transitional period, discharge the following obligations and thus establish a transparent regulatory regime, which will be an example to the developing world and a model, comparable to the best in the developed world.

- a. a. To establish a regulatory environment which will facilitate the achievement of the **financial sustainability** of the power utilities, through **full cost-recovery** rates.
- b. b. To ensure that a **non-discriminatory and open-access transmission system** is established, to promote competition in wholesale power generation.
- c. c. Establish the **necessary incentive mechanisms**, which will encourage the distribution utilities to adopt cost reduction and efficient practices, and improve upon **quality of service** to the benefit of consumers.
- d. d. Ensure that **only** efficient and **prudently** incurred costs are passed-through the electricity tariffs, to end-users.

13.4 Energy Commission

- a. a. To facilitate competition in power generation by allowing more players in the de-regulated segment of the market, it is expected that Energy Commission (EC) will review the threshold definition of **50 GWh** for Bulk Customers.
- b. EC should clearly define the parameters for ensuring that the class of customers, which currently purchase electricity directly from VRA, but do not qualify as “Bulk” Customers as per EC’s definition, are put into the “regulated” segment of the market.
- c. The threshold definition for a ‘Bulk Customer’ should be done with respect to **Capacity and Energy**, taking cognizance of the technical design of the distribution system.
- e. e. The Energy Commission, should endeavour to complete the **Strategic National Energy Plan (SNEP)** by the end of the Transitional period.
- f. f. EC should carry out a detailed **financial analysis of the investment implications** of the Performance Standards set out in the “Electricity Distribution Code of Practice, Procedures & Standards of Performance”, to enable PURC assess the tariff implications of the distribution utilities’ investment programmes.

13.5 Consumers

- a. a. Form consumer associations/neighbourhood associations to demand good quality service from the utility companies
- b. b. Learn about rights and responsibilities of consumers such as:
 - • Serving of adequate notice to consumers prior to disconnection
 - • Complaints procedure

- • Paying bills promptly
 - • Better understanding of Customer Service charter
- c. Use Energy wisely

APPENDICES

APPENDIX 1.

PURC BENCHMARKS FOR DETERMINATION OF SYSTEM EFFICIENT & ECONOMIC TARIFF.

<u>BGC- Bulk Generation Charges</u>	<u>ECONOMIC</u>	<u>2001</u> (LCO)	<u>2002</u> (LCO)	<u>2003</u> (LCO)	<u>2004</u> (LCO)
CAPACITY CHARGE (US\$/kW/month)					
VRA-HYDRO	0	0	0	0	0
THERMAL	12.2	12.2	12.2	12.2	12.2
ENERGY CHARGES (USmils/kWh)					
Hydroelectricity (PURC Determined) - Max.	1.50				
Thermal Energy (BASE: @\$22/bbl)					
LCO Price (BASE: 22 US\$/bbl)	30	30	30	30	30
alpha (LCO)		0.89	0.89	0.89	0.89
alpha (NG)		0.89	0.89	0.89	0.89
beta (LCO)		0.11	0.11	0.11	0.11
beta(NG)		0.11	0.11	0.11	0.11

<u>TSC-Transmission Service Charges</u>	<u>ECONOMIC</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
<u>TAV (US\$/kW/mnth)</u>					
Network Component (US\$/kW/mnth)	1.98	1.61%	1.98%	1.98%	1.98%
BSP Component (US\$/kW/mnth)	0.92	0.92%	0.92%	0.92%	0.92%
<u>TRANSMISSION LOSS FACTORS</u>					
BSP (% of Capacity)	0.8%	0.8%	0.8%	0.8%	0.8%
Network (% of Capacity)	1.4%	1.4%	1.4%	1.4%	1.4%
BSP (% of Energy)	0.9%	0.9%	0.9%	0.9%	0.9%
Network (% of Energy)	1.9%	1.9%	1.9%	1.9%	1.9%

	<u>ECONOMIC</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>
DSC - Distribution Service Charges					
DAV (US\$/kW/mnth)					
Sub-Trans Component (US\$/kW/mnth)	1.03	0.27%	1.03%	1.03%	1.03%
MT Component (US\$/kW/mnth)	1.50	1.90%	1.50%	1.50%	1.50%
LT Component (US\$/kW/mnth)	6.11	7.20%	6.11%	6.11%	6.11%
DISTRIBUTION LOSS FACTORS					
Sub-Trans (% of Capacity)	2.4%	2.40%	2.40%	2.40%	2.40%
MT (% of Capacity)	3.12%	4.00%	3.50%	3.22%	3.12%
LT (% of Capacity)	8.04%	19.00%	18.00%	16.00%	14.00%
Sub-Trans (% of Energy)	2.00%	1.13%	2.00%	2.00%	2.00%
MT (% of Energy)	3.22%	4.00%	3.22%	3.22%	3.22%
LT (% of Energy)	12.68%	16.00%	15.50%	14.60%	12.68%

APPENDIX 2

Mathematical relationship for capacity price:

Annual Capacity price in US \$/kW -yr. = (Investment Annuity + Fixed Cost) × (1+ Reserve Margin)

Where: The reserve margin = 25%.

APPENDIX 3.

Automatic Fuel Adjustment Formula:

The **Adjusted Energy Price** can be computed as follows:

$$P_{(ADJUST).} = P_o \left\{ \alpha \frac{FP}{FP_o} + \beta \frac{CPI}{CPI_o} \right\} \text{----- (1)}$$

Where:

P = Adjusted Energy Price,

P_o = Base Thermal Variable Energy Price:

for an oil fired Simple Cycle plant = 4.61 cents/kWh

for an oil fired Combined Cycle plant = 3.03 cents/kWh

Levelized Energy Price for a natural gas fired thermal plant is 2.9 cents/kWh

FP = Fuel Price (For liquid fuels, the reference fuel is Bonny Crude Oil)

FP_o = Base fuel price (**20 US \$/bbl + a premium of 2.0 US \$/bbl**) = **22 US \$/bbl**

CPI = % change in the Consumer Price Index of USA

CPI_o = % change in the Base Consumer Price Index of USA = **2.00 %**

α = Annual fuel coefficient

β = Annual CPI coefficient

The Annual Fuel and CPI coefficients are defined in the table below:

Table of Fuel Coefficients for computing P

COEFFICIENTS	CRUDE OIL	NATURAL GAS
FUEL COEFFICIENT (α)	0.89	0.89
CPI COEFFICIENT (β)	0.11	0.11

Upon attainment of PURC's economic efficient tariff, the fuel adjustment formula would be triggered in accordance with the following mathematical relationship:

$$\text{Fuel Price Change} = (30 \pm 1.5) \text{ US \$/bbl}$$

APPENDIX 4A.

i. Calculation of Adjusted Weighted Average Cost of Generation BGC_{ADJUST} :

The **Adjusted Bulk Generation Charge, BGC_{ADJUST}** , is computed as follows:

$$BGC_{ADJUST} \text{ (Cents/kWh)} = [(X_1H_C + X_2P_2 + X_3P_3) + nK]$$

where :

X_1 = Percentage of Hydro contribution in the Generation Mix

X_2 = Percentage of simple cycle thermal energy in the Generation Mix

X_3 = Percentage of combine cycle thermal energy in the Generation Mix

H_C = Hydro Cost (**cents/kWh**) determined by PURC

P_2 = Adjusted Variable Energy Price (**cents/kWh**) of a simple cycle plant (calculated from the **Adjusted Energy Price**, from equation 1)

P_3 = Adjusted Variable Energy Price (**cents/kWh**) of a combine cycle plant (calculated from the **Adjusted Energy Price**, from equation 1)

K = System Capacity Price (**12.20 US \\$/kW-month = 1.67 cents/kWh**)

n = Effective percentage **thermal capacity** contribution to system demand.

ii. Conversion of BGC_{ADJUST} , in cents/kWh, to cedis/kWh:

Since the Bulk Generation Charge (Adjusted) is computed in **cents/kWh**, PURC will use **Bank of Ghana's exchange rate projections** to effect the conversion from **cents/kWh** to **cedis/kWh** using the following relationship:

$$BGC_{(ADJUST)} \text{ (Cedis/kWh)} = \frac{BGC_{(ADJUST)} \text{ (Cents/kWh)} \times EXCH_t}{100}$$

where:

BGC_{ADJUST.} (Cents/kWh) = Adjusted Bulk Generation Charge
EXCH_{t.} = Average Cedi-to-US \$ exchange rate (as projected by the Bank of Ghana for next period).

iii. Determination of Bulk Supply Tariff

Calculate the Bulk Supply Tariff using the formula:

$$\mathbf{BST = BGC_{ADJUST.} + TSC}$$

where:

BST = Bulk Supply Tariff (cedis/kWh)
 TSC = Transmission Service Charge (cedis/kWh)

For TSC, the PURC Benchmark = 0.9 Cents/kWh

Convert TSC (cents/kWh) to cedis/kWh using the following relationship:

$$\mathbf{TSC = \frac{TSC \text{ (Cents/kWh)} \times EXCH_{t.}}{100}}$$

APPENDIX 4B. – Correction of Distribution Service Charge (DSC) for depreciation/appreciation of cedi against the US Dollar:

Apply the formula:

$$\mathbf{DSC_t = DSC_{t-1} \times \frac{EXCH_t}{EXCH_{t-1}}}$$

Where:

- DSC_t = Distribution service Charge (in cedis/kWh) for next period
- DSC_{t-1} = Distribution service Charge (in cedis/kWh) for previous period
- EXCH_t = Average Exchange Rate (cedis-to-dollars), for next period (as projected by the Bank of Ghana)
- EXCH_{t-1} = Average Exchange Rate (cedis-to-dollars), used by PURC for previous period

APPENDIX 5.

End-User Tariff Determination:

Calculate the End-User Tariff using the formula:

$$\mathbf{EUT \text{ (cedis/kWh)} = BST \text{ (cedis/kWh)} + DSC \text{ (cedis/kWh)}}$$

Where:

EUT = End-User Tariff

Trigger Condition for Automatic Adjustment for Tariff: On Quarterly Basis

APPENDIX 6.

Components of "Economic" Transmission System Price

<u>TAV:</u>	
Toll (\$/kW/month)	1.98
Transformation cost (\$/kW/month)	<u>0.92</u>
TOTAL CAPACITY CHARGE (\$/kW/month):	2.90
<u>Loss Factors:</u>	
Power Transformation (% of capacity):	0.80%
Power Transmission (% of capacity):	<u>1.37%</u>
TOTAL CAPACITY LOSS (% of capacity):	2.17%
Energy Transformation (% of energy):	0.90%
Energy Transmission (% of energy):	<u>1.90%</u>
TOTAL ENERGY LOSS (% of energy):	2.80%

APPENDIX 7.

Benchmarks for Determination of the 'Economic' Distribution Service Charge

DSC COMPONENTS	
-	
<u>DAV* (US \$/kW/month):</u>	
HV component	1.03
MT component	1.50
LT component	6.11
-	
<u>DISTRIBUTION LOSS FACTORS**:</u>	
Sub-transmission:	
% of capacity	2.40
% of energy	2.00
MT:	
% of capacity	3.12
% of energy	3.22

LT :	
% of capacity	18.04
% of energy	12.60

* USED THE RESULTS OF THE ASSET INVENTORY/REVALUATION EXERCISE BY PRICEWATERHOUSECOOPERS TO CALCULATE THE DAV

** BASED ON FIGURES FROM FINAL REPORT ON "DISTRIBUTION PLANNING & TECHNICAL LOSSES", BY POWER PLANNING ASSOCIATES, NOVEMBER, 2000.