



2022-2025 ELECTRICITY AND WATER MAJOR TARIFF REVIEW DECISION

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PREAMBLE

The purpose of this Tariff Decision Paper is to fulfill the statutory mandate of the Public Utilities Regulatory Commission (PURC) as set out in the Public Utilities Regulatory Commission Act, 1997 (Act 538) relating to approval of tariffs for utility services – natural gas, electricity and water. Additionally, it is to enhance transparency in the utility tariff setting process in Ghana in line with international best practice. This Decision Paper provides the rationale underpinning the 2022-2025 natural gas, electricity and water tariffs. It is issued for the benefit of the Utility Companies, Investors, Government of Ghana, Consumers and the Public.

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The Commission warrants the accuracy of information contained in this paper as at the date of the tariff decision. The decision remains in force until duly revoked by the Commission.

Executive Summary

The Public Utilities Regulatory Commission (PURC) on August 15, 2022 announced its decision on tariffs which are applicable to Ghana's natural gas, electricity and water managed and operated by the Natural Gas Transmission Company (Ghana National Gas Company Limited), Generation Companies (Volta River Authority (VRA), Independent Power Producers (IPPs)), the Transmission Utility (Ghana Grid Company Limited) and the Distribution Companies (Electricity Company of Ghana Limited (ECG), Northern Electricity Distribution Company Limited (NEDCo), Enclave Power Company Limited (EPC)) and Ghana Water Company Limited (GWCL) for the 2022-2025 Tariff Control Period. These tariffs set out rates chargeable for the supply of natural gas, electricity and water by regulated public utilities to consumers in Ghana. The Commission's tariff determination and approval was executed within the mandate of the Public Utilities Regulatory Commission Act, 1997 (Act 538) with regards to rate setting, particularly, Sections 3(b), 18 and 19.

As a regulatory requirement, the approved rates were arrived at after careful examination of tariff filings made by Utility Companies noted above. The tariffs/rates examination process was conducted taking into consideration PURC's Rate Setting Guidelines, several utility operational considerations as well as exogenous factors including macro-economic and socio-economic factors which have direct bearing on natural gas, electricity and water production, supply and consumption. The approval process also took into consideration submissions made by major stakeholders.

GNPC per the Public Utilities Regulatory Commission Act 1997, (Act 538) is not a public utility regulated by the Public Utilities Regulatory Commission, but by virtue of Section 17 of the Public Utilities Regulatory Commission Act 1997, (Act 538), the Commission has an indirect regulatory role in terms of the cost of the product or commodity the corporation deals in. Thus, by virtue of GNPC's role as owner of domestic gas, which commodity and associated costs are critical in determination of volume of electricity generated and tariffs, made submissions in respect of adjustment in gas commodity prices and volumes for Sankofa, TEN and Jubilee gas fields. This according to GNPC is to recover investments made in the three gas fields. In view of above, the Corporation proposed an adjustment in its existing Weighted Average Gas Commodity Charge of USD 5.0140/MMBtu to USD 6.5206/MMBtu in 2022.

GNGC, as the utility mandated with responsibility for transportation of natural gas in the country, provided a number of reasons in support of the Company's proposed tariffs. These include recovery of fixed operational expenses required to ensure uninterrupted operation of GNGC's facilities and the delivery of gas, recovery of cost of investments, return on assets which facilitates repayment of the cost of capital and equity return to shareholders. In that regard, the Company proposed an upward review in Total Tariff for Gas Gathering, Processing and Transmission from USD1.064/MMBtu in 2021 to USD2.0780/MMBtu in 2022.

VRA put forward a number of reasons as underpinning the company's tariff submissions. These include recovery of cost of power supply to the Distribution Companies, net cost of inadvertent power imports, cost of ancillary services to the National Interconnected Transmission System (NITS) and additional costs borne by VRA to ensure grid stability and uninterrupted power supply in the nation. In addition, the Authority noted it had undertaken a number of thermal power plant initiatives and projects aimed at enhancing reliability and affordability while ensuring sustainability. The Authority therefore proposed a 37.06% increase in its existing Composite Bulk Generation Tariff of GHP28.2273/kWh to GHP38.6879/kWh in 2022.

With regards to electricity transmission, GRIDCo indicated that there has been an increase in cost of maintenance as a result of over 6,400 circuit km of the company's transmission lines located in densely forested vegetation coupled with high incidence of corrosion on coastal transmission backbone and increased transformer capacity at most substations. In addition,

the company noted their inability to undertake medium to long term investments in the NITS due to high cost of financing and depreciation of the Ghana Cedi. GRIDCo further noted that the company has embarked on and intends to undertake a number of transmission line and substation projects aimed at improving reliability of the NITS to enhance customer satisfaction. To this end, the company proposed an increase of 63.94% in its existing Transmission Service Charge-1 of GHp 5.4398/kWh to GHp 8.9131/kWh in 2022.

The three Electricity Distribution Companies namely Electricity Company of Ghana (ECG), Northern Electricity Distribution Company (NEDCo) and Enclave Power Company (EPC) put forward a number of reasons as underpinning their tariff proposals.

ECG noted that instability of macroeconomic and market driven variables such as exchange and inflation rates have increased cost of both imported and local materials required by the company to serve its customers. In terms of investments, ECG stated that the company has undertaken regular investments to improve service delivery. The company also put forward a number of critical projects to be undertaken over the Tariff Control Period including technical and commercial/revenue enhancement works and strategies aimed at ensuring reliable and quality supply of power to customers as well as improve cash flows. In light of above, ECG proposed a 148% increase in existing Distribution Service Charge-1 of GHp 16.1094/kWh GHp 39.9513/kWh for 2022.

NEDCo, on the other hand indicated that a number of reasons in support of the Company's request for upward review of its Distribution Service Charge. These include the sparse nature of habitation in many of rural communities within its operational territory which continues to worsen with each square kilometer increase of distribution network. The company also noted the impact of increasing depreciation of Ghana Cedi and high inflation on its operations. NEDCo further indicated that a number of technical and commercial/revenue enhancement projects have been completed and plan to undertake. The company noted that failure to undertake these projects will result in load shedding, increase in technical losses, poor voltage profile, and poor supply reliability. The company therefore proposed a 232.06% upward review in its existing in DSC-1 to GHp 53.4937/kWh for 2022.

In support of the company's proposal, EPC indicated that the need to undertake massive capital investments to support growing demand from its customers specifically from its greenfield site in Dawa. According to EPC, previous investments have been funded with loans at full commercial interest rates and more commercial borrowing would be required for the new infrastructure. With regards to improving system reliability and quality of service to customers, EPC indicated that a number of initiatives have been undertaken to cover system reliability enhancement, system automation, loss control, capacity building and customer responsiveness. In that regard, the company proposed an upward adjustment of 153.35% in its DSC-1 to GHp 40.8130/kWh for 2022.

In respect of Water Production, Transmission, Distribution and Supply, GWCL noted the company's inability to raise enough revenue to finance much needed capital investment projects to increase urban water demand and coverage country-wide by 2025. Also, the company noted it is unable to undertake urgent repairs of assets, extensions as well as replacement of over-aged and obsolete equipment/pipelines resulting in the company not being able to meet its regulatory service delivery targets hence persistent customer complaints. In addition, the company is saddled with severe debt overhang as a result of non-payment of on-lend loans. GWCL also noted the impact of exchange rate fluctuation on the real value of its tariff over time. Additionally, GWCL indicated that a number of revenue enhancing projects in the area of production, transmission and distribution improvement works have either been completed or ongoing. The company proposed an increase from its existing Weighted Average Water Tariff of GHS6.7/m³ to GHS28.20/m³.

The Commission upon analyses and consideration of factors mentioned above, approved USD 5.9060/MMBtu as the Weighted Average Cost of Gas (WACOG) and Heavy Fuel Oil (HFO) price of USD 570/Metric Tonne which prices were used in computation of Fuel Recovery Charges for power plants nominated to operate on Natural Gas and HFO for the 2022-2025 Tariff Control Period. A pass-through Composite Generation Charge of GHp63.1997/kWh for both VRA and Independent Power Producers (IPPs) was approved as cost of generating electricity for the regulated electricity market.

With regards to Electricity Transmission and Distribution, the Commission approved Annual Revenue Requirement (ARR) of GHS 1,138.39Million, GHS 2,303.27Million, GHS 530.71Million and GHS 78.30Million for GRIDCo, ECG, NEDCo and EPC respectively. This resulted in an average Transmission Service Charge Attributable to Network Operations of GHp7.9090/kWh, Distribution Service Charge Attributable to Network Operations of GHp17.0429/kWh for the Distribution Utilities.

In the determination of the total revenue requirement for the regulated electricity supply value chain, that is, Generation-Transmission-Distribution, the Commission also provided 2% of the Distribution Utilities' ARR to cover non-collectible revenue. The overall effect of the Commission's decision with respect to approved rates for regulated electricity market is an average increase of 27.15% across board for all category of customers.

With regards to water, GWCL through the Company's filings requested a total revenue requirement of GHS 3,362.55Million to cover costs of water production and purchases, transmission as well as distribution of water to consumers. The Commission approved total revenue requirement amounting to GHS 2,038.21 Million for the 2022-2025 Tariff Control Period. To recover fully this revenue requirement, the Commission approved an 21.55% increase across board in water rates for all categories of customers.

The Commission wishes to urge Utility Service Providers, Consumers and other key Stakeholders to honour their obligations in terms of quality of service delivery vis-à-vis prompt payment electricity and water bills.

Abbreviations and Acronyms

Act	Public Utilities Regulatory Commission Act, 1997 (Act 538)
ARR	Annual Revenue Requirement
EC	Energy Commission
ECG	Electricity Company of Ghana
EMOP	Electricity Market Oversight Panel
EPC	Enclave Power Company
ESI	Electricity Supply Industry
GDP	Gross Domestic Product
GHS	Ghana Cedis
GNGC	Ghana National Gas Company
GNPC	Ghana National Petroleum Corporation
GoG	Government of Ghana
GRIDCo	Ghana Grid Company
GW	Gigawatt
GWCL	Ghana Water Company Limited
GWh	Gigawatt-hour
IPP	Independent Power Producer
KTPP	Kpone Thermal Power Plant
kW	Kilowatt
kWh	Kilowatt-hour
MDAs	Ministries, Departments and Agencies
MoE	Ministry of Energy
NITS	National Interconnected Transmission System
NEDCo	Northern Electricity Distribution Company
O&M	Operation and Maintenance
PURC	Public Utilities Regulatory Commission
RAB	Regulatory Asset Base
RoR	Rate of Return
TARR	Total Annual Revenue Requirement
TI	Tariff Income
USD	United States of America Dollar
VALCO	Volta Aluminum Company
VRA	Volta River Authority
WACOG	Weighted Average Cost of Gas

1.0 INTRODUCTION

The Public Utilities Regulatory Commission (PURC) is mandated by Sections 3(a) and (b) of the Public Utilities Regulatory Commission Act, 1997 (Act 538) to perform the following functions:

- (i) to provide guidelines on rates chargeable for provision of utility services
- (ii) to examine and approve rates chargeable for provision of utility services

In accordance with Section 19 of the Act, the PURC on August 15, 2022, published new utility tariffs, setting out rates chargeable for the supply of natural gas, electricity and water by Regulated Utilities to consumers in Ghana. These rates are contained in Appendix 3. The new rates approved by the Commission came into effect on September 01, 2022 and will remain in force until reviewed by the Commission. The Commission will undertake rate revisions under its Rate Setting Guidelines for Quarterly Review of Natural Gas, Electricity and Water Tariffs to ensure that targeted revenue requirements for the Regulated Utilities are achieved at any particular point in time.

It is worth noting that the tariff decision is the culmination of a major tariff review process which enabled the Commission to solicit relevant information/data from regulated utility companies, consumers and other stakeholders. The process included:

- Filings by the regulated utility companies, namely: Volta River Authority (VRA), Ghana National Gas Company Limited (GNGC), Ghana Grid Company (GRIDCo), Electricity Company of Ghana (ECG), Northern Electricity Distribution Company (NEDCo), Enclave Power Company (EPC) and Ghana Water Company Limited (GWCL).
- Submissions and written papers by other key stakeholders including Ghana National Petroleum Corporation (GNPC) and the general public.
- Public consultations which provided the platform for the utility companies to make representations to the general public.

To restate, the new rates approved by the Commission are effective September 01, 2022 and remain in force until reviewed by the Commission. To this end and as noted earlier, the Commission will undertake periodic rate revisions to ensure that targeted revenue requirements for the Regulated Utilities are achieved.

2.0 PURC TARIFF DECISION AND PRINCIPLES

2.1 Tariff Decision

The Commission's tariff decisions are based on prudent and efficient costs which are key to the financial viability of the regulated public utilities. The decisions are also intended to foster economic growth by sending signals to the market. In addition, it is the position of the Commission that the enhancement of operations of the country's natural gas, electric and water utilities is a priority. In that context, the relevance of the regulatory environment must be assessed from that perspective. In arriving at prudent and efficient costs of the utility companies, the Commission took into account performance of the utility companies since the last two Major Tariff Reviews in 2018 and 2019.

2.2 PURC Tariff Principles

In addition to the prudent and efficient costs criteria outlined in 2.1 above, the Commission took into consideration the legal requirement of the PURC Act which legal requirements are listed in Table 2-1. These legal requirements are also executed by the Commission through its Rate Setting Guidelines and approval of rates.

Table 2-1 Summary of Relevant Sections in Act 538 on Determination of Tariffs

Relevant Section of Act 538	Objective
16 (3) (a)	Consumer interest
16(3) (b); 3(c)	Investor / Utility interest
16(3)(c)	Assuring reasonable cost of production of the service
16(3)(d)	Assurance of the financial viability of the public utility
20(1)	Uniformity of prices throughout the country
20(1)(a)	Population distribution
20(1)(b)	Best use of natural resources
20(1)(c)	Economic development of the country
20(2)	Different rates for different consumer classes

The Commission's interpretation of these provisions is summarised below:

- **Consumer Interest:** Ensuring value for money in terms of price, quality and reliability; maintaining an optimum balance between affordability and availability of service; fair apportionment of total cost of supply to various classes of consumers; provision of a minimum level of service (lifeline supply) at an affordable price to a specified category of residential customers; ensuring long term availability of service.
- **Investor/ Utility Interest:** Ensuring the utility or investor's ability to recover operational expenses and earn a reasonable return.
- **Reasonable Cost of Production:** Examination of the cost of production of a service by a public utility or others so as to exclude unreasonable or inefficient costs from the revenue requirement of the utility company.
- **Financial Viability:** Ensuring that the utility companies maintain positive cash flows at all times to achieve reasonable financial indices.
- **Uniformity of Prices and Population Distribution:** Allowance for a tariff structure which incorporates uniform rates for all customers within a particular consumer category regardless of geographic location.

- **Economic Development of the Country:** Providing for “Special Rates” for priority consumers whose activities may enhance or significantly affect economic development.

3.0 REGULATORY AND POLICY CONSIDERATIONS UNDERLYING 2022-2025 MULTI-YEAR MAJOR TARIFF REVIEW DECISION

3.1 Regulatory Considerations

Two key regulatory considerations underpin the Commission's 2022-2025 Multi-Year Major Tariff Review. These are regulatory philosophy and regulatory control period.

3.1.1 Regulatory Philosophy

The regulatory philosophy underpinning the determination of tariffs for the 2022-2025 Tariff Control Period is three-fold:

1. Allowance of efficient and prudent cost of supply for utility services to end-users
2. Recovery of reasonable and efficient costs including return on assets
3. Provision of economic signals to investors while recognising the needs of low-income consumers.

Guided by this philosophy, PURC's hybrid tariff methodology combines cost-plus revenue requirement principles and performance-based incentive mechanisms to encourage regulated utilities to work towards achieving the Commission's regulatory performance benchmarks. This methodology will enable Regulated Utilities realise approved revenue requirements hence improve quality of service delivery to consumers.

3.1.2 Regulatory Control Period

Three Regulatory Control Period Policy Issues were considered as a guide to determination and approval of current tariff decisions. These are 5-Year Multi-Year Tariff Control Period, 3-Year Multi-Year Tariff Control Period and 1-Year Tariff Control Period. After several deliberations and taking into account current macroeconomic conditions both from a national and global perspective, the Commission opted for a 3-Year Tariff Control Period with the expectation that improvement in macroeconomic conditions noted above would provide the Commission the opportunity to align such expectations with the appropriate Tariff Control Period.

Notwithstanding the adoption of the 3-Year Tariff Framework by the Commission, it is worth noting that the analyses which formed the basis of the final tariff decisions captured in the report were conducted in line with requirements of the Commission's Rate Setting Guidelines and data which was submitted by Utility Service Providers covering a Five-year Multi-Year Tariff Control Period.

3.2 Policy Considerations

As has been the case in previous decisions, in terms of policy, a number of key policies underlie PURC's 2022-2025 Multi-Year Major Tariff Review. These are harmonisation of Natural Gas Pricing for Electricity Generation, Operating Expenses, Capital Works in Progress, Short-Term Capital Investment Expenditure, System Losses, Depreciation, Regulated Asset Base, Return on Regulated Asset Base and Restructuring of the Rate Structure.

3.2.1 Harmonisation of Natural Gas Pricing for Electricity Generation

In order to streamline the pricing of natural gas in Ghana, which gas is being supply from different gas sources vis-à-vis prices, the Commission continued its practice of harmonization of natural gas prices into a single price – Weighted Average Cost of Gas. The objective is to provide a single price platform for monitoring plant efficiency and also prevent passage of inefficient fuel costs in power generation to end users.

3.2.2 Operating Expenses

The policy relating to operating expenses is to ensure prudence and efficiency in determination of costs relating to operational activities of Utility Service Providers, which costs are then used

in the Commission's tariff decision. To that end, actual costs reported in the utilities most recent financials were considered. Those costs which were identified and analysed to be unjustified were disallowed. The resulting costs were then adjusted using projected inflation, which results were used to validate the costs proposed by the Utilities.

3.2.2 Capital Works In Progress

The Commission per its policy excludes capital works in progress from its rate base.

3.2.3 Short-Term Capital Investment Expenditure

To address critical investment needs of the regulated utilities, which investments are required to resolve bottlenecks impeding quality of service delivery in the short-term, the Commission introduced the policy of short-term capital investments in the 2022-2025 Multi-Year major Tariff Review. Under this policy, the Commission approved a number of short-term investments. These include meters, reliability improvement projects, technical loss reduction projects, voltage Improvement projects, commercial loss and revenue improvement projects. To this end, the Commission, will as part of our regulatory oversight responsibilities, periodically monitor both the execution and impact of these projects on the value chain and provide support where necessary.

3.2.4 System Losses

As part of the Commission's efforts at loss reduction over the 2022-2025 Tariff Control Period, the Commission approved annual loss reduction targets for Electricity Distribution Companies and Water Company. These loss reduction targets set by the Commission for the regulated utilities are linked to approved short-term capital investments over the period. It is thus the expectation of the Commission that these investments will be carried out to realise the targets set which should in turn lead to improvement in performance hence quality of service delivery to consumers.

3.2.5 Depreciation

Per the Commission's Rate Setting Guidelines, depreciation expense shall be calculated on Net Revalued Fixed Assets which are used and useful in providing utility services. Thus, the Commission allowed depreciation in line with the Rate Setting Guidelines and where necessary made the necessary adjustments to reflect grant supported investments, works in progress as well as effect of the exchange rate variations. Specifically, depreciation was not provided for assets funded by grants and assets funded by Government.

3.2.6 Regulated Asset Base

The policy of the Commission with regards to regulated asset base as captured in the Rate Setting Guidelines is that the value of regulatory asset base at any particular tariff period shall be determined using the replacement value approach. In other words, it involves the use of inflation-adjusted historical cost of regulated assets less accumulated depreciation for the period under consideration plus net working capital. In line of the above, the Commission used the net replacement value of the regulated asset base of the utilities over the 2022-2025 Tariff Control Period.

3.2.7 Return on Regulated Asset Base

The policy on return on regulated asset base as contained in the Rate Setting Guidelines is that the allowable rate of return shall be set equal to the estimated Weighted Average Cost of Capital (WACC). In that regard, the Commission determined the WACC, by calculating the cost of debt and equity and the proportions of debt and equity per PURC's capital structure benchmark.

3.2.8 Restructuring of Rate Structure

As a key policy direction and objective of the Commission going forward, both in the short-term and long-term, the structure of rates payable by consumers is to be realigned to reflect the economic cost of serving each customer hence cost of service. It is worth stating that the Commission has commenced implementation of this policy effective the 2022-2025 Tariff Control Period.

4.0 FILINGS IN RESPECT OF MAJOR TARIFF REVIEW

The requirements for filing of tariffs by public utilities are stated in sections 21 and 22 of the Act. Each public utility is required to file its tariff proposals with the Commission showing rates to be charged by public utilities in accordance with the PURC tariff filing forms. In furtherance of this, the Commission notified the Regulated Utilities and other stakeholders of the commencement of the tariff filing process and requested them to file tariff proposals for the period 2022-2027 Tariff Control Period.

4.1 Tariff Procedure

The following procedure per volume one (1) of the Commission's Rate Setting Guidelines was adopted.

i. Request for Papers

The Commission commenced the tariff review process in March 2022 by inviting submissions on natural gas, electricity and water tariffs from interested persons.

ii. Utility Proposals

The following Regulated Utilities filed tariff proposals with the Commission requesting adjustment of rates chargeable for their services:

1. Ghana National Gas Company Limited
2. Volta River Authority
3. Ghana Grid Company Limited
4. Electricity Company of Ghana Limited
5. Enclave Power company Limited
6. Northern Electricity Distribution Company
7. Ghana Water Company Limited

iii. Submissions by Other Stakeholders

In response to the PURC's request, the following Stakeholders also made submissions to the Commission.

1. Ghana National Petroleum Corporation
2. Ministry of Finance
3. Ministry of Energy
4. Trades Union Congress (TUC) of Ghana
5. National Security

iv. Preliminary Review

In accordance with PURC's Rate Setting Guidelines, the Commission undertook a preliminary review of the proposals. The objective of the preliminary was to ensure compliance with tariff filing and data requirements.

v. Filing of Supplementary Utility Data

Due to insufficient or inadequate data, some utility companies were required to submit revised and additional data to the Commission to complete their tariff proposals. The date for submissions of these additional data ended March 30, 2022.

vi. Tariff Hearings

As required under Section 18 (4) of the Act, the Commission held a series of Technical Committee hearings with each regulated utility company for the period April 12-14 & 19, 2022. The Commission further directed all regulated utility companies to publish summaries of their proposals to enable interested parties examine the bases of their requests. This was followed by Stakeholder consultations held regionally commencing May 04, 2022.

vii. Examination of Tariff Proposals

As provided in Section 16 of the Act, the Commission is obliged to take account of consumer interest, investor interest, the cost of production of the service, and assurance of the financial integrity of the public utility in its Rate Setting Guidelines. These considerations formed the basis of tariff examination and approval by the Commission. All representations made by regulated utility companies and other stakeholders were taken into account by the Commission in arriving at a decision.

4.2 Summary of Tariff Submissions by Regulated Utility Companies

As noted earlier, Regulated Utilities made submissions to the Commission for consideration and approval of their service provision levels and associated costs as well as revenue requirements. A summary of these are presented in the following sections.

4.2.1 Volta River Authority (VRA)

VRA's tariff proposal submission included proposed power purchase tariffs for Electricity Distribution Companies (DisCos namely ECG, NEDCo and EPC), prices for reactive power compensation, forecast electrical energy supply for regulated electricity market, rationale underpinning tariff submission and key policy issues for tariff consideration.

4.2.1.1 Proposed Power Purchase Tariffs for DisCos

VRA proposed power purchase tariffs and electrical energy allocation for DisCos – ECG, NEDCo and EPC as part of the Authority's tariff proposal for the 2022-2027 Tariff Control Period. Data in respect of above is presented in Table 4-1.

Table 4-1 Summary of Proposed Power Purchase Tariffs and Electrical Energy Allocation by DisCos

Item Description	Tariff (Ghp/kWh)	VRA Electrical Energy Allocation By DisCos (GWh)			Total
		ECG	NEDCo	EPC	
Power Plant:					
Akosombo	19.5774	2,937.2	531.0	68.1	3,536.3
Kpong	35.5889	525.8	95.0	12.2	633.0
TAPCo	60.2050	1,062.4	940.5	0.0	2,002.9
TT1PP	69.2243		347.5	0.0	347.5
KTPP	70.0544		0.0	158.7	158.7
AMERI	68.0410	354.0	0.0	0.0	354.0
Navrongo Solar	98.1053		3.0		3.0
Lawra Solar	67.6800		10.0		10.0
Total VRA Generation		4,879.4	1,927.0	239.0	7,045.4
Weighted Bulk Generation Charge (Ghp/kWh)		33.6643	49.5207	53.9037	38.6879

Source: 2022-2027 VRA Tariff Proposal

4.2.1.2 Reactive Power Compensation

VRA also proposed compensation for reactive power generation by the Authority. The Authority noted that reactive power generation was necessary to ensure transmission network system stability and security which the Authority has over the years provided. A summary of the proposed reactive power charges is presented in Table 4-2.

Table 4-2 Summary of Proposed Reactive Power Charges by Power Plant

Power Plant	Measure	2022	2023	2024	2025	2026	2027
Akosombo	GHS/kVar/Month	426.18	466.69	499.72	565.98	556.21	610.65
Kpong	GHS/kVar/Month	475.54	509.84	552.52	590.28	592.13	620.2

Source: 2022-2027 VRA Tariff Proposal

4.2.1.3 VRA Forecast Electrical Energy Supply

VRA presented forecast electrical energy supply by power plant for the regulated electricity market as shown in Table 4-3.

Table 4-3 Summary of VRA Forecast Electrical Energy Supply by Power Plant for Regulated Electricity Market 2022-2027

Item Description	Measure	2022	2023	2024	2025	2026	2027
Forecasted Supply:							
Akosombo GS	GWh	3525	3308	3145	2874	2874	2874
Kpong GS	GWh	645	605	575	526	526	526
TAPCo	GWh	2003	1999	1999	1999	1999	1999
TT1PS	GWh	348	348	487	521	860	1229
KTPS	GWh	139	146	150	158	158	158
AMERI	GWh	354	1062	1563	1713	737	787
VRA Renewable Plants:							
Navrongo Solar Plant	GWh	3	3	3	3	3	3
Lawra/Saleo Solar Plant	GWh	12	12	12	12	12	12
Kaleo 2 Solar Plant	GWh	0	24	24	24	24	24
Bongo Solar Plant	GWh	0	0	0	63	95	95
Kpong Floating Solar Plant	GWh	0	0	0	0	16	16
VRA Wind Power Projects	GWh	0	0	56	124	151	151
Pwalugu Hydro Project	GWh	0	0	0	60	110	110
Total VRA Renewable Generation	GWh	15	39	95	286	411	411
Total Forecasted VRA Supply for Regulated Electricity Market	GWh	7,029	7,507	8,014	8,077	7,565	7,984

Source: 2022-2027 VRA's Tariff Proposal

The authority indicated that the rationale underpinning request for tariff adjustments include cost of power supply, cedi depreciation, cost of liquid fuels, cost of provision of ancillary services to the NITS and need to undertake generation efficiency and expansion projects to increase power supply and reliability.

4.2.2 Ghana Grid Company Limited (GRIDCo)

GRIDCo as part of its proposal submitted both an Electricity Supply Plan and a revenue requirement request for 2022-2027 Regulatory Control Period. Details of the Electricity Supply Plan for 2022 is presented in Table 4-4 whilst details of revenue requirement are presented in Table 4-5.

4.2.2.1 2022 Electricity Supply Plan

The 2022 electricity supply plan indicating electrical energy supply by generation plant is presented in Table 4-4.

Table 4-4 Summary of GRIDCo's 2022 Proposed Electricity Supply Plan

Power Plant	Projected Energy Consumption
Akosombo GS	5,513.3
Kpong GS	986.9
TAPCO	2,002.9
TICO	2,298.6
TT1PP	347.5
KTPP	375.4
TT2PP	111.7
AMERI Power Plant	572.4
VRA Solar(Navrongo)	3.0
VRA Solar(Kaleo)	21.9
VRA Solar(Lawra)	9.9
Imports From Cote d'Ivoire	-
Total VRA Available Generation	12,243.5
Bui GS	894.0
Bui Solar Farm	94.8
SAPP	2,068.7
CENIT	744.6
Karpowership	3,347.3
AKSA	249.4
CENPOWER	2,466.8
Twin City/ Amandi	1,414.7
Early Power	-
BXC Solar	27.0
Meinergy	27.0
Safisana	0.7
Total Supply (GWh)	23,578.6

Source: GRIDCo's Electricity Supply Plan, 2022

Details of GRIDCo's proposed Electricity Supply Plan for 2022 as presented in Table 4-4 indicate that GRIDCo would transmit a total energy volume of 23,578.6 GWh to both regulated and de-regulated electricity markets.

4.2.2.2 Technical, Economic and Financial Assumptions

From a technical, economic and financial perspective, GRIDCo submitted the following assumptions as presented in Table 4-5.

Table 4-5 Summary of GRIDCo's Proposed Technical, Economic & Financial Assumptions 2022-2027

Item	Measure	Cost By Regulatory Year						
		2021	2022	2023	2024	2025	2026	2027
Electricity Available for Dispatch	GWh	20,682	23,579	25,983	27,764	29,325	31,350	33,215
Total Electricity Sales	GWh	19,695	22,520	24,889	26,590	28,065	29,921	31,716
Transmission Loss	%	5.01	4.49	4.21	4.23	4.3	4.56	4.73
Operation & Maintenance Costs	MGHS	75.56	112.31	140.94	163.25	187.17	225.35	251.95
Administrative & General Costs	MGHS	68.03	79.48	84.83	92.45	100.53	109.91	117.33
Human Resource Costs	MGHS	234.67	256.33	280.61	320.30	366.16	390.87	450.77
Depreciation	MGHS	155.95	200.45	213.31	227.18	244.91	250.82	259.91
Return on Regulated Asset Base	MGHS	815.63	1,033.74	1,164.58	1,436.42	1,470.92	1,525.34	1,587.49
Cost of Working Capital	MGHS	235.35	306.01	331.70	425.54	454.54	483.67	480.52
Corporate Tax	MGHS	0	20.03	34.25	12.31	13.23	103.87	61.61
Total Revenue Requirement	MGHS	1,585.19	2,008.35	2,250.22	2,677.45	2,837.46	3,089.83	3,209.58
RoRNFA	%	16	20	21	25	25	25	25
Regulatory Fixed Asset Base	MGHS	5,089	5,169	5,546	5,746	5,884	6,101	6,350

Source: GRIDCo's Tariff Proposal, 2022-2027

In terms of revenue requirement, GRIDCo proposed a total revenue requirement ranging from GHS 1,585.19 Million in 2022 to GHS 3,209.58 Million in 2027. This request according to GRIDCo is in respect of transmission services the company would provide for the Tariff Control Period.

The Company noted that its request for upward review of operational costs by PURC are underpinned by impact of Cedi depreciation on their operations, increasing cost of maintenance and financing, need to upgrade transmission network capacity, replacement of aged and obsolete assets to meet growth in demand as well as improve quality and reliability of supply.

4.2.3 Electricity Company of Ghana Limited (ECG)

ECG's tariff proposal covered adjustment in the Company's distribution service charge, rationale for level of tariff being proposed, key policy issues for tariff consideration as well as underlying technical, economic and financial assumptions.

4.2.3.1 Technical, Economic and Financial Assumptions

As part of its tariff proposal, ECG presented a number of key technical, economic and financial assumptions underlying their tariff proposal for 2022-2026. These assumptions are presented in Table 4-6 and Table 4-7.

Table 4-6 Summary of ECG's Technical, Economic and Financial Assumptions

Item	Measure	Cost By Regulatory Year				
		2022	2023	2024	2025	2026
Power Purchases @ Bulk Supply Point	GWh	14,418	15,499	16,661	17,910	19,253
Power Sales	GWh	10,986	11,942	13,021	14,149	15,402
System Losses	%	23.80	22.95	21.85	21.00	20.00
Operation & Maintenance Expenses	MGHS	347.64	411.76	476.06	578.40	681.73
Administrative & General Expenses	MGHS	343.14	363.49	387.61	415.18	440.71
Human Resource Expenses	MGHS	976.29	1,122.74	1,122.74	1,235.01	1,235.01
Customer Service Expenses	MGHS	290.08	343.59	397.24	482.64	568.86
Depreciation	MGHS	1,196.85	1,560.13	1,894.82	2,264.02	2,979.85
Interest on Working Capital	MGHS	8.04	9.34	10.37	12.33	14.00
Interest on Foreign & Local Loans	MGHS	519.47	730.87	938.20	1,096.78	1,252.56
Return on RAB	MGHS	342.72	346.28	372.23	395.92	397.38
Corporate Tax	MGHS	41.02	72.00	127.97	162.23	176.17
Provision for Uncollectibles (2%)	MGHS	323.69	360.32	412.25	437.15	486.47
Total Revenue Requirement	MGHS	4,388.9	5,320.5	6,139.5	7,079.7	8,232.7

Source: ECG's Tariff Proposal, 2022-2026

As shown in Table 4-6, ECG proposed total revenue requirement ranging from GHS 4,388.9 Million in 2022 to GHS 8,232.7 Million over the 5-year period.

4.2.3.2 ECG System Demand, Electrical Energy Supply and Procurement Cost Data

ECG's projected system peak demand over five (5) years as well as electrical energy supply from VRA power plants and bilaterally contracted power plants are presented in Table 4-7.

Table 4-7 Summary of ECG System Demand and Supply Data 2022-2026

Item Description	Measure	2022	2023	2024	2025	2026
Peak Demand	MW	2269	2382	2466	2506	2617
Supply Sources:						
Embedded Generation- Renewables						
(Solar & Biomass):						
BXC	GWh	29.90	29.90	29.90	29.90	29.90
Meinergy	GWh	23.53	23.53	23.53	23.53	23.53
Safisana	GWh	0.38	0.38	0.38	0.38	0.38
Total Renewables	GWh	53.81	53.81	53.81	53.81	53.81
Hydro Generation:						
Akosombo (VRA)	GWh	2,824	2,824	2,824	2,824	2,824
Kpong (VRA)	GWh	516	516	516	516	516
Bui	GWh	1,030	1,030	1,030	1,030	1,030
Total Hydro	GWh	4,371	4,371	4,371	4,371	4,371
Thermal Generation:						
VRA:						
TapCo (VRA) - NG	GWh	135	135	135	135	135
Ameri (VRA) - NG	GWh	983	983	983	983	983
IPPs:						
Amandi (NG)	GWh	1,752	1,752	1,752	1,752	1,752
Cenpower (NG)	GWh	2,847	2,847	2,847	2,847	2,847
Karpowership (NG)	GWh	1,714	2,841	3,863.16	3,863	3,863
Cenit (NG)	GWh	-	-	-	-	-
Sunon Asogli Power 1 (NG)	GWh	1,077	1,077	1,077	1,077	1,077
Sunon Asogli Power 2 (NG)	GWh	2,100	2,100	2,100	2,100	2,100
Early Power (NG)	GWh	-	-	190	1,493	2,893
AKSA Energy (HFO)	GWh	-	-	-	-	-
Total Thermal (VRA+IPPs)	GWh	10,607	11,734	12,946	14,249	15,649
Grand Total	GWh	15,032	16,159	17,371	18,674	20,074

Source: ECG's Tariff Proposal, 2022-2026

ECG projected its system peak demand to increase from 2,269MW in 2022 to 2,617MW in 2026. Electrical energy supply from VRA and IPPs including embedded generation is projected to increase from 15,032 GWh in 2022 to 20,074GWh in 2026.

With regards to the fixed and energy costs of power procurement costs by power plant, ECG submitted tariffs by power plant which is presented in Table 4-8.

Table 4-8 Summary of ECG Proposed Power Procurement Costs By Power Plant 2022-2026

Power Generator	Measure	2022	2023	2024	2025
VRA:					
Akosombo					
Capacity Tariff	USCents/kWh	1.8700	1.8700	1.8700	1.8700
Energy Tariff	USCents/kWh	0.1500	0.1500	0.1500	0.1500
Kpong					
Capacity Tariff	USCents/kWh	3.9900	3.9900	3.9900	3.9900
Energy Tariff	USCents/kWh	0.1500	0.1500	0.1500	0.1500
TAPCo					
Capacity Tariff	USCents/kWh	2.0100	2.0100	2.0100	2.0100
Energy Tariff	USCents/kWh	5.6900	5.6900	5.6900	5.6900
AMERI					
Capacity Tariff	USCents/kWh	5.5100	5.5100	5.5100	5.5100
Energy Tariff	USCents/kWh	6.6900	6.6900	6.6900	6.6900
IPP TARIFFS					
Bui					
Capacity Tariff	USCents/kWh	10.2108	10.2108	10.2108	10.2108
Energy Tariff	USCents/kWh	0.0300	0.0300	0.0300	0.0300
Karpowership					
Capacity Tariff	USCents/kWh	6.5539	6.5944	6.6357	6.6777
Energy Tariff	USCents/kWh	6.1226	6.1393	6.1563	6.1735
Sunon Asogli Power 1 (NG)					
Capacity Tariff	USCents/kWh	5.2275	5.2275	5.2275	5.2275
Energy Tariff	USCents/kWh	5.5936	5.5936	5.5936	5.5936
Sunon Asogli Power 2 (NG)					
Capacity Tariff	USCents/kWh	5.5876	5.5876	5.5876	5.5876
Energy Tariff	USCents/kWh	6.1056	6.1056	6.1056	6.1056
AKSA (HFO)					
Capacity Tariff	USCents/kWh	4.6026	4.6178	4.6333	4.6490
Energy Tariff	USCents/kWh	9.6402	9.6799	9.7202	9.7612
AKSA (NG)					
Capacity Tariff	USCents/kWh	4.6026	4.6178	4.6333	4.6490
Energy Tariff	USCents/kWh	7.3241	7.3638	7.4041	7.4451
Cenpower (NG)					
Capacity Tariff	USCents/kWh	6.7449	6.7715	6.7987	6.8263
Energy Tariff	USCents/kWh	5.2316	5.2345	5.2374	5.2404
Cenit (NG)					
Capacity Tariff	USCents/kWh	2.7800	2.7800	2.7800	2.7800
Energy Tariff	USCents/kWh	6.9052	6.9052	6.9052	6.9052
Amandi (NG)					
Capacity Tariff	USCents/kWh	6.3498	6.4364	6.4809	6.5261
Energy Tariff	USCents/kWh	5.4815	5.8321	5.8468	5.8618
Early Power (LPG)					
Capacity Tariff	USCents/kWh	4.6065	4.6160	4.6256	4.6353
Energy Tariff	USCents/kWh	0.0000	0.0000	0.0000	0.0000
Early Power (NG)					
Capacity Tariff	USCents/kWh	4.6065	4.6160	4.6256	4.6353
Energy Tariff	USCents/kWh	6.5400	6.8125	6.8426	6.8733
BXC					
Capacity Tariff	USCents/kWh	0.0000	0.0000	0.0000	0.0000
Energy Tariff	USCents/kWh	20.1372	20.1372	20.1372	20.1372
Meinergy					
Capacity Tariff	USCents/kWh	0.0000	0.0000	0.0000	0.0000
Energy Tariff	USCents/kWh	18.2464	18.2464	18.2464	18.2464
Safisana					
Capacity Tariff	USCents/kWh	0.0000	0.0000	0.0000	0.0000
Energy Tariff	USCents/kWh	17.5100	17.5100	17.5100	17.5100

Source: ECG's Tariff Proposal, 2022-2026

With regards to the rationale underpinning ECG's request for upward review of its tariffs, the company indicated that a change in macroeconomic and market driven variables such as exchange and inflation rates have increased cost of both imported and local distribution materials required by ECG to serve its customers as well as exchange rate losses been faced by the company through payment of cost of electrical energy supply by IPPs. In addition, ECG indicated the need to undertake some critical investments to improve service quality and reduce system losses.

4.2.4 Northern Electricity Distribution Company (NEDCo)

NEDCo's proposal submission dwelt on rationale underpinning the company's tariff proposal and underlying economic, technical and financial assumptions which resulted in the company's projected revenue requirements for the regulatory period. A summary of NEDCo's technical, economic and financial assumptions are presented in Table 4-8.

4.2.4.1 Technical, Economic and Financial Assumptions

NEDCo identified a number of key technical, economic and financial assumptions as underlying the company's proposed tariffs which are presented in Table 4-9.

Table 4-9 Summary of NEDCo's Technical, Economic and Financial Projections

Item	Measure	Cost By Regulatory Year				
		2022	2023	2024	2025	2026
Power Purchase	GWh	1,891	2,031	2,182	2,343	2,516
Power Sales	GWh	1,172	1,220	1,261	1,309	1,440
Operation & Maintenance Expenses	MGHS	108.85	116.76	124.26	131.84	142.89
Administrative & General Expenses	MGHS	58.53	63.20	67.56	71.71	76.01
Human Resource Expenses	MGHS	248.34	284.31	326.96	359.66	395.62
Depreciation	MGHS	145.61	275.61	133.50	127.91	127.24
Return on Average Net Fixed Assets	MGHS	65.66	75.67	83.24	78.37	73.49
Total Revenue Requirement	MGHS	626.99	815.56	735.52	769.49	815.26
Average Net Fixed Assets	MGHS	820.80	945.92	1,040.49	979.57	918.67
Return on ANFA	%	8	8	8	8	8

Source: NEDCo's Tariff Proposal, 2022-2026

A summary of the data presented in Table 4-8 shows that, NEDCo projected energy sales totaling 1,172 GWh in 2022 which increases to 1,440 GWh in 2026.

Revenue wise, NEDCo requested total revenue requirement amounting to GHS 626.99 Million in 2022. This request, according to the Company, is expected to increase to GHS 815.26 in 2026.

The Company cited increasing depreciation of Ghana Cedi against the US Dollar, high inflation rates, increased costs of vital materials and equipment relevant to provision of service, the need to expand, upgrade and replace aged and obsolete distribution network which are relevant to meeting growth in demand, reducing system losses as well as improving quality and reliability of supply.

4.2.5 Enclave Power Company Limited (EPC)

Similar to NEDCo's tariff proposal, EPC's proposal covers adjustment in the Company's distribution service charge, rationale for level of tariff being proposed and underlying technical, economic and financial assumptions as presented in the following section.

4.2.5.1 Technical, Economic and Financial Assumptions

EPC noted key technical, economic and financial assumptions as underlying the company's tariff proposals which are presented in Table 4-10.

Table 4-10 Summary of EPC Projected Technical, Economic and Financial Assumptions

Item	Measure	Cost By Regulatory Year				
		2022	2023	2024	2025	2026
Power Sales	GWh	308.30	385.38	400.41	500.51	520.03
Distribution Losses	MGHS	2.62	3.11	4.12	4.96	6.09
Operation & Maintenance Expenses	MGHS	3.76	4.08	4.42	4.77	5.16
Administrative & General Expenses	MGHS	29.81	36.95	45.83	56.88	70.73
Human Resource Expenses	MGHS	8.68	11.50	16.09	20.05	21.66
Depreciation	MGHS	16.03	17.05	18.10	22.39	25.67
Interest on Local Loans	MGHS	2.97	3.50	6.16	8.44	6.23
Return on Equity	MGHS	35.88	42.34	49.97	58.96	73.66
Interest on Working Capital	MGHS	3.54	3.72	3.27	2.78	2.45
VRA Contested Debt	MGHS	25.20	27.00	7.51	-	-
Total Revenue Requirement	MGHS	128.49	149.25	155.45	179.23	211.65

Source: EPC's Tariff Proposal, 2022-2026

EPC projected energy sales of 308.42GWh in 2022. This is projected to increase to 520.03 GWh in 2026 to serve customers within the regulated market but located in Free Zone areas. Details of data presented in Table 4-9 indicate that EPC requests recovery of revenue requirement amounting to GHS 128.49Million in 2022. This request the Company noted is expected to increase to GHS 211.65Million in 2026.

With regards to the rationale underpinning EPC's tariff proposal, the company cited the need for additional capital investments in network infrastructure to meet growing demand from customers and meet its technical and commercial performance targets.

4.2.6 Ghana Water Company Limited (GWCL)

GWCL's tariff proposal highlights key issues and the need for upward review in the Company's average end-user water tariff by PURC. The company submitted a summary of their proposed tariff both by cost item and customer category, rationale for level of tariff being proposed, underlying economic, technical as well as financial assumptions as presented in the following sections.

4.2.6.1 Proposed Water Tariff by Customer Category

As part of the company's tariff proposal, GWCL proposed renaming and re-grouping of its existing tariff structure. The company proposed renaming of domestic category as 'residential' while maintaining the current lifeline tariff block of 0-5m³. In addition, GWCL requested classification of shops, churches and mosques as 'Non-Residential' from the Commercial category and further proposed the merging of Special Commercial and Sachet Water Producers to form the 'Commercial category'.

Table 4-11 Summary of Proposed Water Tariff by Customer Category for 2022-2027

Categories	Existing Tariff	Proposed Tariff	Expected Sales	Expected Revenue	Customers
	GHp	GHp	m3	GHS	No.
Residential					
0-5	329.2121	1149.7211	5,496,246	63,191,501	168,610
5 and above	560.2083	2483.9544	103,539,309	2,571,869,254	434,453
Bulk Supply		1149.7211	1,070,032	12,302,379	10
Non Residential	923.0390	3492.7398	1,532,436	53,524,002	16,907
Commercial	923.0390	4122.3598	22,303,164	919,416,652	48,940
Industrial	1111.8338	5013.9975	8,443,568	423,360,299	300
Public Distribution/Gov't Depts	718.6628	3186.5391	19,391,283	617,910,822	5,842
Public Standpipe	369.4489	1638.1304	4,918,822	80,576,716	9,596
Port & Harbour		60.0000	364,957	218,974	30
Total			167,059,817	4,742,370,599	684,688

Source: GWCL's Tariff Proposal, 2022-2027

GWCL proposed upward adjustment in water tariffs (GHP/m³) by customer category as presented in Table 4-11.

4.2.6.2 Technical, Economic and Financial Assumptions

From a technical, economic and financial perspective, GWCL submitted underpinning assumptions shown in Table 4-12 with regards to its proposed revenue requirements and tariffs.

Table 4-12 Summary of GWCL's Proposed Economic, Technical and Financial Projections for 2022-2027

Item	Measure	Cost By Regulatory Year					
		2022	2023	2024	2025	2026	2027
Total Production	m ³	325,500,000	332,200,000	338,900,000	438,700,000	673,300,000	673,300,000
Total Sales	m ³	167,059,816	174,155,108	181,020,980	238,614,327	372,822,054	379,479,590
Non-Revenue Water	%	49%	48%	47%	46%	45%	44%
Recurrent Expenditure							
Personnel Cost	GHS	328,068,246	410,085,307	512,606,634	640,758,292	800,947,865	1,001,184,831
Chemicals	GHS	70,518,718	78,980,964	90,828,108	118,984,822	185,616,322	207,890,281
Electricity Consumption	GHS	271,202,159	303,746,418	275,212,669	277,541,386	340,018,895	298,076,062
VAT/NHIS	GHS	57,527,731	64,431,058	74,095,717	82,987,203	92,945,668	104,099,148
Fuel	GHS	26,194,615	29,337,969	32,858,525	36,801,548	41,217,734	46,163,862
Materials	GHS	29,412,817	32,942,355	37,883,708	42,429,753	47,521,324	53,223,883
Reagents	GHS	1,103,392	1,235,799	1,421,169	1,591,709	1,782,714	1,996,640
Hiring of Equipment	GHS	1,292,001	1,447,041	1,664,098	1,863,789	2,087,444	2,337,937
Overheads	GHS	143,904,666	161,173,226	185,349,210	207,591,115	232,502,049	260,402,294
Bad Debts	GHS						
R&M	GHS	206,124,897	230,859,884	265,488,867	297,347,531	333,029,234	372,992,743
Financial Cost	GHS	3,745,346	4,194,787	4,824,005	5,402,886	6,051,232	6,777,380
Exchange Loss	GHS	1,441,624,837	1,513,706,078	1,589,391,382	1,668,860,951	1,752,303,999	1,839,919,199
Levies	GHS	19,915,760	22,305,651	25,651,499	28,729,679	32,177,240	36,038,509
Crop and Land Compensation	GHS	1,594,297	1,785,613	2,053,454	2,299,869	2,575,853	2,884,956
Pipeline Right of Way & Vegetation Man:	GHS	1,375,073	466,543	2,324,070	14,063,060	6,465,642	6,788,925
Contract Service	GHS	3,056,031	6,821,498	17,493,450	161,244,630	108,232,186	113,643,795
Capital Maintenance	GHS	308,486,513	591,843,136	679,194,304	784,360,892	911,214,426	913,192,744
New Service Connections & Replacemen	GHS	160,000,000	200,000,000	240,000,000	280,000,000	320,000,000	360,000,000
Cash Operating Expenses	GHS	3,075,147,097	3,655,363,327	4,038,340,869	4,652,859,116	5,216,689,827	5,627,613,187
Capital Recovery Cost							
Return on Assets (Cost of Equity)	GHS						
Interest on Loans (Cost of Debt)	GHS	100,912,599	90,574,108	80,235,617	69,897,126	59,558,635	49,220,144
Depreciation	GHS	841,537,857	841,537,857	841,537,857	841,537,857	841,537,857	841,537,857
Loan Repayment (Principal)	GHS	489,656,297	479,317,738	468,979,178	458,640,619	448,302,059	446,957,153
Sub-Total	GHS	1,432,106,753	1,411,429,702	1,390,752,652	1,370,075,602	1,349,398,551	1,337,715,154
GWCL Grand Total	GHS	4,507,253,850	5,066,793,029	5,429,093,521	6,022,934,718	6,566,088,378	6,965,328,341
Desalination							
Capacity Charge	GHS	144,906,300	152,151,615	159,759,196	167,747,156	176,134,513	184,941,369
Water Charge	GHS	13,254,192	13,916,902	14,612,747	15,343,384	16,110,553	16,916,081
Electricity Cost	GHS	45,067,981	47,321,380	49,687,449	52,171,821	54,780,412	57,519,433
Desalination Total Cost	GHS	203,228,473	213,389,896	224,059,391	235,262,361	247,025,479	259,376,883
Total Estimated Revenue Requirement	GHS	4,710,482,323	5,280,182,925	5,653,152,912	6,258,197,079	6,813,113,857	7,224,705,224

Source: GWCL's Tariff Proposal, 2022-2027

With regards to water production, GWCL projected total production volume of 325.5Mm³ for 2022 which is projected to increase to 673.3Mm³. Total sales volume to consumers is expected to increase from 167.1Mm³ in 2022 to 379.5Mm³.

To enable GWCL recover fully cost of operations, the Company proposed total revenue requirement ranging from GHS 4,710.48 Million in 2022 to GHS 7,224.71 Million in 2026 as presented in Table 4-12.

According to GWCL, reasons underlying the company's request for increase in tariff are mainly due to Ghana Cedi/US Dollar exchange rate depreciation, paradigm shift in economic policies of Government particularly with regards to repayment of on-lend loans, the need for adequate funds to undertake critical investments to expand service coverage, improve on quality of supply and reduce non-revenue water losses.

5.0 TARIFF SETTING METHODOLOGY

5.1 Introduction

The PURC's Building Blocks Tariff Methodology emphasizes determination of the following:

1. Service Levels
2. Revenue Requirements
3. Translation of Revenue Requirement so determined, into Rates Payable by Consumers

5.2 Determination of Service Levels

As a key component in the Commission's tariff decision as noted, transmission system loss, distribution system loss, revenue collection ratios as service levels were determined as obligatory standards for the regulated utilities to deliver over the tariff period. These outcomes, reflect regulatory benchmarks and legislative obligations which Regulated Utilities must meet in accordance with licensing and other regulatory benchmarks.

5.3 Determination of Revenue Requirements

The determination of Revenue Requirements by the Commission for the Regulated Utility Service Providers was to be carried out in line with Rate Setting Guidelines approved by the Commission. Based on requirements of Commission's Rate Setting Guidelines for determination of Revenue Requirements, all Regulated Public Utilities (GNGC, VRA, GRIDCo, ECG, NEDCo and EPC) submitted technical, economic and financial data, which data was used by the Commission in its expense approval decisions in respect of operation and maintenance expenses, administrative and general expenses, human resource expenses, financing costs both return on and of capital sufficient to enable regulated utilities deliver outcomes efficiently.

5.4 2022-2025 Multi-Year Major Tariff Review Methodology

As noted in Section 5.3, the Commission's Tariff Methodologies in respect of determination of the cost components of the revenue requirement, which cost components are operation and maintenance expenses, administrative and general expenses, human resource expenses, financing costs both return on and of capital are embedded in its approved Rate Setting Guidelines for Natural, Electricity and Water. However, the Commission in applying its Rate Setting Guidelines for the 2022-2025 Multi-Year Major Tariff Review for Natural Gas, Electricity and Water, took into account, the debilitating impact of global and domestic economic conditions on operations of the Utility Service Providers as well as service consumers, which resulted in a realignment of methodologies for determination of some cost components of the revenue requirement.

5.4.1 Natural Gas Revenue Requirement

The determination of Natural Gas revenue requirement by the Commission for the 2022-2025 Tariff Control Period involved an analysis of Gas Commodity volume and price by source as pass-through cost, regulated costs of Gas Gathering, Gas Processing where necessary as well as Gas Transportation. In that regard, the Weighted Average Cost of Gas comprising Weighted Average Gas Commodity Charge, Weighted Average Gas Gathering Charge, Weighted Average Gas Processing Charge, Weighted Average Gas Transmission Service Charge and Weighted Average Gas Services Charge was determined and approved by the Commission.

5.4.1.1 Weighted Average Gas Commodity Charge

The Weighted Average Gas Commodity Charge (WAGCC) was determined by the Commission as a pass-through cost based on both Natural Gas volume and price by gas supply source as supplied by the Ghana National Petroleum Corporation (GNPC) and Ghana National Gas Company (GNGC) using the formula contained in Section 6.1.1 of the Rate Setting Guidelines

for Natural Gas Gathering, Processing, Transmission and Weighted Average Cost of Gas and captured in Appendix-4 (A.1) of this Decision Paper.

5.4.1.2 Weighted Average Gas Gathering Charge

In determining the Weighted Average Gas Gathering Charge (WAGGC), the Commission first determined Gas Gathering Charge which is required to recover cost of investments, operation and maintenance and other related costs of the Gas Gathering infrastructure and then Weighted Average Gas Gathering Charge using the formulae indicated in Appendix-4 (A.2).

5.4.1.3 Weighted Average Gas Processing Charge

Similar to determination of Gas Gathering Charge, the Gas Processing Charge (GPC) was determined by the Commission as a first step to determination of the Weighted Average Gas Processing Charge. In line with Section 6.1.3 of Rate Setting Guidelines for Natural Gas Gathering, Processing, Transmission and Weighted Average Cost of Gas, Gas Processing Charge (GPC) which is for recovery of cost of investments made in GNGC's Natural Gas Processing Plant as well as operation and maintenance and related expense of the Gas Processing Plant and Weighted Average Gas Gathering Charge was determined using the formulae indicated in Appendix-4 (A.3).

5.4.1.4 Weighted Average Gas Transmission Service Charge

Gas Transmission Service Charge (GTSC) was determined by the Commission as a first step to determination of the Weighted Average Gas Transmission Service Charge. The determination of the Gas Transmission Service Charge (GTSC) which is in line with Section 5.3 of Rate Setting Guidelines for Natural Gas Gathering, Processing, Transmission and Weighted Average Cost of Gas was to aid the Commission in determination of the Weighted Average Gas Transmission Service Charge, which tariff is to recover GNGC's investment in the Natural Gas Transmission Infrastructure as well as the required operation and maintenance and related expense of operating the Gas Transmission Infrastructure vis-à-vis projected gas transmission volume for the 2022-2025 Tariff Control Period. The Gas Transmission Service Charge and Weighted Average Gas Transmission Charge were determined using the formula indicated in Appendix-4 (A-4).

5.4.1.4 Weighted Average Gas Service Charge

Gas Service Charges are negotiated Gas Management Costs between GNPC and Gas Services Management Companies to cover Gas aggregation, nomination and management services, which costs have been submitted by GNPC to PURC. In that regard, the Gas Service Charges were treated by the Commission as a pass-through cost and incorporated in determination of the Weighted Average Cost of Gas per the formula indicated in Appendix-4 (A-5).

5.4.1.5 Weighted Average Cost of Gas (WACOG)

Having approved Gas Gathering, Processing and Transmission Tariffs for GNGC based on the stated formulae, the Commission harmonised both price and volume of various gas supply sources into a Weighted Average Cost of Gas (WACOG) using the formula captured in Appendix-4 (A-6).

5.4.2 Electricity Generation Revenue Requirement

Electricity Generation Revenue Requirement was determined taking into consideration projected volume of energy to be supplied within the Tariff Control Period as indicated in the Electricity Supply Plan and the Composite Bulk Generation Charge in line with the methodology outlined in PURC Rate Setting Guidelines for Procurement and Supply of Electrical Generation Capacity and Energy in the Regulated Electricity Market.

5.4.2.1 Determination of Composite Bulk Generation Charge

In line with Section 3.1 of the Rate Setting Guidelines for Procurement and Supply of Electrical Generation Capacity and Energy in the Regulated Electricity Market, the Composite Bulk Generation Charge was computed using the formula indicated in Appendix-4 (B).

5.4.3 Electricity Transmission Revenue Requirement (Added Value)

The Commission determined the revenue requirement for the Transmission Utility (GRIDCo) in line with Section 3.1 of the Rate Setting Guidelines for Electricity Transmission and System Operations. In that regard, tariff proposal submitted by GRIDCo to the Commission in respect of GRIDCo's investment in the Electricity Transmission Infrastructure as well as the required operation and maintenance and related expense of operating the Electricity Transmission Infrastructure vis-à-vis projected electricity transmission volume for the 2022-2025 Multi-Year Major Tariff Review were utilised to determine Electricity Transmission Annual Revenue Requirement by applying the formula captured in Appendix-4 (C). Having determined the revenue requirement in respect of electricity transmission, the Commission then computed the Electricity Transmission Service Charge (TSC-1) using the formula indicated in Appendix-4 (C.1).

The Commission will like to state that, the approved prudent and efficient costs associated with provision of transmission services to end-users of electricity must be recovered through rates payable by consumers.

The rate determined above reflects the cost of providing transmission grid services and is referred to as Transmission Service Charge-1 (TSC-1) payable by all end-use customers to the transmission utility. This excludes transmission losses which is also referred to as Transmission Service Charge-2 (TSC-2) and payable to the relevant generator. The cost of transmission losses is therefore not to be retained by the Transmission Utility.

5.4.4 Electricity Distribution Utilities Revenue Requirement

The Annual Revenue Requirement (ARR) for Distribution Utilities were determined in line with Section 1.1 of the Commission's Rate Setting Guidelines for Electricity Distribution and Supply. In that regard, tariff proposals submitted by the three DisCos to the Commission in respect of investment in the Electricity Distribution Infrastructure as well as the required operation and maintenance and related expense of operating the Electricity Distribution Infrastructure vis-à-vis projected electricity sales volume for the 2022-2025 Tariff Control Period were utilised to determine Electricity Distribution Annual Revenue Requirement using the formula captured in Appendix-4 (D). The Commission having determined the revenue requirement in respect of Electricity Distribution, computed the Electricity Distribution Service Charge (DSC-1) using the formula indicated in Appendix-4 (D.1).

The Commission notes that, the approved prudent and efficient costs associated with provision of distribution services to end-users of electricity must be recovered through rates payable by consumers.

The rate determined above reflects the cost of providing distribution grid services and is referred to as Distribution Service Charge-1 (DSC-1) payable by all end-use customers to the Distribution Utility. This excludes distribution losses which is also referred to as Distribution Service Charge-2 (DSC-2) and payable to the relevant generator hence not to be retained by the Distribution Utility unless the Distribution pays for the full cost or value of electricity procured from the generator.

5.4.4.2 Total Annual Revenue Requirement for Regulated Electricity Supply Industry Value Chain

PURC determined the Total Revenue Requirement for the Electricity Supply Value Chain in line with Section 2.12.1 of the Rate Setting Guidelines for Electricity Distribution and Supply taking into consideration the Projected Power Purchase Cost, comprising Generation and Transmission Costs, in addition to Distribution and Supply Cost as captured in Appendix-4 (E).

5.4.4.3 Allocation of Total Revenue Requirement for Electricity Supply Value Chain

The Total Revenue Requirement determined in Section 5.3.3 shall be allocated fully to Rate Payers or End-use Customers on the basis of customer class rates. The translation process involves allocation of costs to various customer categories on the basis of their cost of service, while taking into consideration socio-economic factors as they impact identified consumer groups.

5.4.5 Water Production, Transmission, Distribution and Supply Revenue Requirement

The Commission in determining efficient and prudent Water Tariffs for GWCL based on its proposed volume, costs and revenue requirement over the Tariff Control Period, employed the three Annual Revenue Requirement methodologies for Water Production, Transmission, Distribution and Supply as per the Rate Setting Guidelines for Water Production, Transmission, Distribution and Supply.

In that regard, tariff proposals submitted by GWCL to the Commission in respect of investment in the Water Production, Transmission, Distribution and Supply Infrastructure as well as the required operation and maintenance and related expense of operating the Water Production, Transmission, Distribution and Supply Infrastructure vis-à-vis projected water sales volume for the 2022-2025 Tariff Control Period were utilised to determine Water Production, Transmission, Distribution and Supply Annual Revenue Requirement using the formula captured in Appendix-4. The Commission having determined the revenue requirement in respect of Water Production, Transmission, Distribution and Supply Operations computed the Average Water End-User Tariff using the formula indicated in Appendix-4 (F).

It is worth noting that, the approved prudent and efficient costs associated with provision of water production, transmission, distribution and supply services to end-users of water using above formula must be recovered through rates payable by consumers.

6.0 ANALYSES OF COSTS AND TARIFF DECISION IN RESPECT OF DETERMINATION WEIGHTED AVERAGE COST OF GAS

This section presents outcome of analyses of projected natural gas volumes and natural gas tariffs by gas supply sources. The section also highlights various components of the Weighted Average Cost of Gas as well as related tariff decision.

6.1 PURC Approved Projected Gas Volumes and Tariffs by Gas Source

The Commission's approved projected gas supply volumes and tariffs by gas source as well GNPC's service charges are indicated in Table 6-1.

Table 6-1 Summary of PURC Approved Projected Gas Volumes, Tariffs by Gas Source

Gas Supply Volumes/Tariffs	Measure	Gas Volumes and Tariffs By Gas Supply Source and Activity	
		Proposed	Approved
Gas Volume:			
Jubilee	MMScf/D	116	116
TEN	MMScf/D	9	9
Sankofa	MMScf/D	200	210
N-Gas	MMScf/D	30	44
Commodity Charge:			
Jubilee	USD/MMBtu	2.2647	0.0000
TEN	USD/MMBtu	0.6198	0.6198
Sankofa	USD/MMBtu	8.7200	6.6272
N-Gas	USD/MMBtu	7.5803	7.5803
Reverse Flow Transmission - WAGP (Tdi-Tema):			
Contracted Comingled Reverse Flow Volume*	MMScf/D	60	60
Contracted Reverse Flow Transmission Charge	USD/MMBtu	2.4248	2.4248
GNPC Services Cost:			
GNPC Financing Service Cost	USD/MMBtu	0.0855	0.0500
Gas Management Cost	USD/MMBtu	0.0843	0.0843
Total Service Charge	USD/MMBtu	0.1698	0.1343

*The Commingled Reverse Gas Volume of 60 MMScf/D is a component of gas volume from the three gas fields: Jubilee, TEN and Sankofa

Source: PURC Tariff Analyses, 2022-2025

As indicated in Table 6-1, the Commission's decisions with regards to projected gas volumes and tariffs were based on the following.

1. In terms of projected gas volumes, the Commission maintained the proposed volumes from Jubilee and TEN. However, the Commission adjusted upwards proposed volumes for Sankofa and N-Gas. This was to match demand and supply since the Commission did not consider Tema LNG as part of gas supply sources for 2022.
2. With respect to Jubilee Commodity Charge, GNPC proposed to price Jubilee ex-post Jubilee foundation volume of 200 Bscf at USD2.2647/MMBtu. However, PURC in consultation with GNPC decided to maintain and approve the existing position of zero price for Jubilee since negotiations between GNPC, GoG and Tullow Oil PLC had not been concluded. The Commission will be notified of the new Commodity Charge for Jubilee when negotiations are concluded.
3. With regards to Sankofa's Commodity Charge, GNPC factored in GoG/ Ministry of Finance restoration of the 24% GoG/GNPC share in Sankofa's price hence USD8.72/MMBtu was proposed. However, the Commission considered the fact that since no directive was received from GoG/ Ministry of Finance with regards to restoration of the 24% GoG/GNPC share in Sankofa's price, the Commission excluded 24% GoG/GNPC share in Sankofa's price leading to a reduction in the Sankofa price from USD8.72 /MMBtu to USD6.6272 /MMBtu. This decision by the Commission was agreed to by GNPC.

4. For GNPC's Services Cost, the Commission maintained the existing GNPC Financing Service Cost of USD0.0500/MMBtu. This is due to the non-inclusion of Tema LNG as part of the gas supply sources, for which GNPC will not incur financing costs for Tema LNG.

6.2 Determination of GNGC's Natural Gas Gathering, Processing and Transmission Service Charges

For purposes of determining financially sustainable Charges for GNGC's Gathering, Processing and Transmission segments of Gas Supply Value vis-a-vis projected gas volumes, revenue requirements and tariffs submissions made by GNGC, the Commission subjected GNGC's proposals to review and analyses which led to approval of Gas Gathering, Processing and Transmission Tariffs for GNGC as indicated in Table 6-2.

Table 6-2 Summary Results of PURC Approved Vs Proposed GNGC Tariffs by Value Chain

Item Description	Measure	Gas Tariffs By Gas Value Chain	
		Proposed	Approved
GNGC Tariffs By Activity:			
Gathering Charge	USD/MMBtu	0.3729	0.1054
Processing Charge	USD/MMBtu	0.8669	0.3356
Transmission Service Charge	USD/MMBtu	0.8380	0.7271
Total	USD/MMBtu	2.0778	1.1680

Source: PURC Tariff Analyses, 2022-2025

Presented in Table 6-2 are PURC Approved Natural Gas Gathering, Processing and Transmission Service Charges for GNGC. It must be noted that GNGC's Proposed Tariffs were based on non-inclusion of CBD Loan Assets and offsetting of Natural Gas Liquids (NGLs) revenue amounting to USD 35.84 Million from their total revenue requirement. Further review and analysis of NGLs revenues by the Commission resulted in an amount of USD56.74 Million, which amount was offsetted against GNGC's Total Revenue Requirement hence PURC Approved Gas Gathering, Processing and Transmission Service Charge as indicated in Table 6-2.

6.3 Weighted Average Cost of Gas

The Commission determined the Weighted Average Cost of Gas which was used to determine the Fuel Recovery Charge component of the Total Applicable Generation Tariff for each of the Power Generation Plants supplying electricity to the regulated electricity market. Details of the Weighted Average Gas Commodity Charge (WAGCC), Weighted Average Gas Gathering Charge (WAGGC), Weighted Average Gas Processing Charge (WAGPC), Weighted Average Gas Transmission Service Charge (WAGTSC) including Statutory Levies and Weighted Average Gas Service Charge (WAGSC) are presented in Table 6-3.

Table 6-3 Summary of PURC Approved Weighted Average Gas Charges

Tariff Type	New Tariff: Effective September 01, 2022	
	GHS/MMBtu	
Weighted Average Gas Commodity Charge (WAGCC)	33.4478	
Weighted Average Gas Gathering Charge (WAGC)	0.2748	
Weighted Average Gas Processing Charge (WAGPC)	0.8753	
Weighted Average Gas Transmission Service Charge (WAGTSC-1)*	6.1813	
Weighted Average Gas Transmission Service Charge (WAGTSC-2)	2.8249	
Weighted Average Gas Service Charge (WAGSC)	0.7883	
Weighted Average Cost of Gas (WACOG)	44.3924	

* This includes Regulatory Levy

Source: PURC's Tariff Analyses, 2022-2025

It must be noted that the Ghana Cedi-US Dollar used in converting the Dollar value of the Weighted Average Gas Charges was GHS7.5165/USD 1.0000.

7.0 ANALYSES OF COSTS AND TARIFF DECISION IN RESPECT OF ELECTRICITY GENERATION

This section presents outcome of analyses of the costs and tariffs as well as tariff decision in respect of electricity generation.

7.1 Composite Bulk Generation Revenue Determination

The Generation Revenue Requirement for 2022-2025 Tariff Control Period was determined based on GRIDCo's electricity supply plan and also tariffs for each of the power plants contained in the supply plan. The Electricity Supply Plan for 2022 was prepared by the Power Planning Technical Committee made up of Energy Commission, PURC, VRA, GRIDCo, ECG, NEDCo, GNGC and GNPC as a consensus document. The supply plan matches supply and demand of electrical energy for both regulated and de-regulated electricity markets for a given period.

In order to match electrical energy demand by ECG, NEDCo and Enclave Power Company (EPC) with available electrical energy supply by VRA and contracted IPPs, various demand and supply projections captured in the 2022 Electricity Supply Plan was used. These projections including hydro allocation by Electricity Market Oversight Panel (EMOP) to the Regulated Electricity Market were reviewed and realigned to establish a perfect balance for purposes of determining as accurate as possible the Composite Bulk Generation Charge for ECG, NEDCo and EPC. The Commission also took into consideration capacity and energy projections captured in their various Power Purchase Agreements and Electricity Supply Plan as presented in Table 7-1.

Table 7-1 Summary of 2022-2025 Projected Electrical Energy Generation by Power Plant

Power Plant	Projected Electrical Energy By Power Plant (GWh)			
	2022	2023	2024	2025
VRA Generation:				
Akosombo	3,565	3,455	3,291	3,291
Kpong	652	632	602	602
TAPCo	2,275	2,182	2,327	2,347
TT1PP	348	348	487	521
KTPP	139	146	150	158
AMERI	439	1,143	1,295	1,626
Navrongo Solar Plant	3	3	3	3
Lawra/Kaleo Solar Plant	12	12	12	12
Total VRA Generation	7,434	7,922	8,167	8,560
IPP Generation:				
Sunon Asogli 1	703	1,077	1,077	1,077
Sunon Asogli 2	1,365	2,100	2,100	2,100
Karpowership	3,347	3,227	3,627	3,627
AKSA	249	-	-	-
CENIT	745	887	887	887
CENPOWER	2,467	2,381	2,740	2,740
Early Power Phase 1	-	-	190	1,132
AMANDI (TWIN CITY)	1,415	1,354	1,354	1,354
Bui Power	894	1,030	1,030	1,030
BPA Solar Farm	95			
BXC Solar	27	30	30	30
Meienergy Solar	27	24	24	24
Safisana Biogas	1	0	0	0
Total IPPs	11,335	12,108	13,058	14,000
Total VRA+IPPs	18,769	20,030	21,225	22,560

Source: PURC Tariff Analysis, 2022-2025

Based on above, the Commission determined a Composite Bulk Generation Charge (CBGC) hence total generation revenue requirement, details of which are presented in Table 7-2.

Table 7-2 Summary of 2022-2025 Average Electrical Energy Generation by Power Plant and Tariffs

Power Plant	Projected Electrical Energy (GWh)	Tariff (Ghp/kWh)
VRA Plants		
VRA-Hydro:		
Akosombo	3,528	15.1893
Kpong	646	31.1394
Sub-Total VRA Hydro	4,174	
VRA-Thermal:		
TAPCo	2,234	56.8384
TT1PP	426	63.1740
KTPP	148	63.0292
AMERI	1,206	60.8206
Sub-Total VRA Thermal	4,013	
VRA-Renewable:		
Solar (Navrongo)	3	93.8944
Solar (Kaleo/Lawra)	12	67.6485
Sub-Total VRA Renewable	15	
Total VRA Electrical Energy/ VRA Composite Bulk Generation Tariff	8,202	37.9560
ECG IPPs:		
Sunon Asogli Phase I	984	80.1335
Sunon Asogli Phase II	1,916	78.1830
Karpowership	3,457	76.9651
AKSA	62	127.3665
Cenit	851	71.4094
Cenpower	2,450	86.4478
Early Power	330	85.8319
Amandi (Twin City)	1,369	77.6405
Bui Power Authority	996	76.9689
BPA Solar Farm	24	76.9689
BXC Solar	29	151.3612
Meienergy Solar	24	136.2215
Safisana Plant	0.5	131.5387
Sub-Total IPPs	12,494	
Total Electrical Energy/ VRA+ECG IPPs Composite Bulk Generation Charge	20,696	63.1997

Source: PURC's Tariff Analyses, 2022-2025

A breakdown of PURC Approved Composite Bulk Generation Charge into Composite Bulk Generation Fixed Charge and Composite Bulk Generation Energy Charge for the 2022-2025 Tariff Control Period is presented in Table 7-3.

Table 7-3 Breakdown of 2022-2025 Approved Average Composite Bulk Generation Charge

Tariff Type	Measure	Approved Tariff
Composite Bulk Generation Charge:		
Composite Bulk Generation Fixed Charge	Ghp/kWh	30.4166
Composite Bulk Generation Energy Charge	Ghp/kWh	32.7831
Total	Ghp/kWh	63.1997

Source: PURC's Tariff Analyses, 2022-2025

A breakdown of PURC Approved Tariffs by Power Plant into Capacity Charge and Energy Charge for the 2022-2025 Tariff Control Period is presented in Table 7-4.

Table 7-4 Summary of 2022-2025 Approved Average Capacity and Energy Tariffs by Power Plant

Power Plant	PURC Approved Tariffs By Power Plant Effective September 01, 2022		
	Capacity Charge (Ghp/kWh)	Energy Charge (Ghp/kWh)	Total Applicable Tariff (Ghp/kWh)
VRA Plants			
VRA-Hydro:			
Akosombo	14.0613	1.1280	15.1893
Kpong	30.0113	1.1280	31.1394
Sub-Total VRA Hydro			
VRA-Thermal:			
TAPCo	15.1082	41.7302	56.8384
AMERI	11.8486	48.9720	60.8206
TT1PP	13.5079	49.6661	63.1740
KTPP	14.8125	48.2167	63.0292
Sub-Total VRA Thermal			
VRA-Renewable:			
Solar (Navrongo)	12.4918	81.4026	93.8944
Solar (Lawra/Kaleo)	9.0000	58.6485	67.6485
Sub-Total VRA Renewable			
IPPs:			
Sunon Asogli Phase I	39.2925	40.8410	80.1335
Sunon Asogli Phase II	33.3627	44.8203	78.1830
Karpowership	30.5696	46.3955	76.9651
AKSA	33.8242	93.5422	127.3665
CENIT	20.8959	50.5136	71.4094
Cenpower	48.8302	37.6176	86.4478
Early Power	29.8348	55.9971	85.8319
Amandi (Twin City)	41.0198	36.6207	77.6405
Bui Power	76.5931	0.3758	76.9689
BPA Solar Farm	76.5931	0.3758	76.9689
BXC Solar	151.3612	0.0000	151.3612
Meienergy Solar	136.2215	0.0000	136.2215
Safisana Plant	131.5387	0.0000	131.5387
Sub-Total IPPs			
Total Electrical Energy/ VRA+IPPs			63.1997
Composite Bulk Generation Charge			30.4166
Composite Bulk Generation Fixed Charge			32.7831

Source: PURC's Tariff Analyses, 2022-2025

In terms of revenue, PURC Approved Generation Revenue broken down into Capacity and Energy Revenue per power plant for the 2022-2025 Tariff Control Period are presented in Table 7-5, Table 7-6 and Table 7-7.

Table 7-5 Summary of 2022-2025 Approved Annual Average Generation Revenue by Power Plant

Power Plant	PURC Approved Annual Generation Revenue for 2022-2025 Tariff Control Period			
	Capacity Revenue (MUSD)	Capacity Revenue (MGHS)	Energy Revenue (MUSD)	Energy Revenue (MGHS)
VRA Plants				
VRA-Hydro:				
Akosombo	66.00	496.11	5.29	39.80
Kpong	25.77	193.73	0.97	7.28
Sub-Total VRA Hydro	91.78	689.84	6.26	47.08
VRA-Thermal:				
TAPCo	44.89	337.45	124.00	932.07
AMERI	6.72	50.48	27.76	208.62
TT+PP	2.66	20.03	9.80	73.63
KTPP	23.76	178.59	77.34	581.32
Sub-Total VRA Thermal	78.03	586.54	238.89	1,795.65
VRA-Renewable:				
Solar (Navrongo)	0.05	0.37	0.32	2.44
Solar (Lawra/Kaleo)	0.14	1.08	0.94	7.04
Sub-Total VRA Renewable	0.19	1.45	1.26	9.48
Total VRA	170.00	1,277.84	246.42	1,852.21
IPPs:				
Sunon Asogli Phase I	51.42	386.48	53.44	401.71
Sunon Asogli Phase II	85.06	639.34	114.27	858.91
Karpowership	140.59	1,056.73	213.37	1,603.80
AKSA	2.81	21.09	7.76	58.32
CENIT	23.66	177.83	57.19	429.89
Cenpower	159.17	1,196.38	122.62	921.67
Early Power	13.12	98.59	24.62	185.04
Amandi (Twin City)	74.72	561.62	66.70	501.39
Bui Power	101.49	762.87	0.50	3.74
BPA Solar Farm	2.42	18.15	0.01	0.09
BXC Solar	5.88	44.16	-	-
Meienergy Solar	4.42	33.23	-	-
Safisana Plant	0.08	0.61	-	-
Total IPPs	664.81	4,997.08	660.49	4,964.56
Total VRA+IPPs	834.82	6,274.91	906.91	6,816.77

* The above revenue values have been arrived at using Projected Ghana Cedi/US Dollar Exchange Rate of 7.5165

Source: PURC's Tariff Analyses, 2022-2025

It must be stated that the projected annual average excess capacity cost for IPPs under Take-or-Pay contracts including Sunon Asogli I & II for the 2022-2025 Tariff Control Period amounted to GHS 709.12 Million.

Table 7-6 Summary of 2022-2025 Approved Electricity Generation Capacity Revenue by Power Plant

Power Plant	Capacity Revenue (MUSD)				Capacity Revenue (MGHS)			
	2022	2023	2024	2025	2022	2023	2024	2025
VRA Generation:								
Akosombo	66.69	64.64	61.56	61.56	501.27	485.85	462.71	462.71
Kpong	26.04	25.24	24.04	24.04	195.75	189.72	180.69	180.69
TAPCo	45.73	43.86	46.77	47.17	343.77	329.69	351.53	354.59
TT1PP	6.25	6.25	8.75	9.36	47.01	47.01	65.78	70.38
KTPP	2.74	2.88	2.96	3.11	20.59	21.63	22.22	23.40
AMERI	8.01	20.86	23.64	13.49	60.24	156.82	177.67	101.41
Navrongo Solar Plant	0.39	0.38	0.37	0.36	2.94	2.83	2.76	2.73
Lawra/Kaleo Solar Plant	1.08	1.08	1.08	1.08	8.12	8.12	8.12	8.12
Total VRA Generation	156.95	165.19	169.16	160.19	1,179.68	1,241.67	1,271.49	1,204.03
IPP Generation:								
Sunon Asogli 1	36.77	56.30	56.30	56.30	276.37	423.18	423.18	423.18
Sunon Asogli 2	60.60	93.21	93.21	93.21	455.52	700.62	700.62	700.62
Karpowership	136.13	131.23	147.50	147.50	1,023.26	986.37	1,108.65	1,108.65
AKSA	9.10	-	-	-	68.38	-	-	-
CENIT	20.70	24.65	24.65	24.65	155.59	185.24	185.24	185.24
CENPOWER	160.25	154.65	178.01	178.01	1,204.54	1,162.45	1,338.01	1,338.01
Early Power Phase 1	-	-	7.54	44.92	-	-	56.69	337.67
AMANDI (TWIN CITY)	77.20	73.89	73.89	73.89	580.31	555.39	555.39	555.39
Bui Power	91.10	104.96	104.96	104.96	684.74	788.91	788.91	788.91
BPA Solar Farm	9.66	-	-	-	72.61	-	-	-
BXC Solar	5.44	6.02	6.02	6.02	40.87	45.26	45.26	45.26
Meienergy Solar	4.89	4.26	4.26	4.26	36.78	32.05	32.05	32.05
Safisana Biogas	0.12	0.07	0.07	0.07	0.92	0.50	0.50	0.50
Total IPPs	611.97	649.23	696.40	733.78	4,599.88	4,879.96	5,234.49	5,515.48
Total VRA+IPPs	768.92	814.43	865.56	893.97	5,779.56	6,121.63	6,505.98	6,719.51

Source: PURC's Tariff Analyses, 2022-2025

Table 7-7 Summary of 2022-2025 Approved Electricity Generation Energy Revenue by Power Plant

Power Plant	Energy Revenue (MUSD)				Energy Revenue (MGHS)			
	2022	2023	2024	2025	2022	2023	2024	2025
VRA Generation:								
Akosombo	5.35	5.19	4.94	4.94	40.22	38.98	37.13	37.13
Kpong	0.98	0.95	0.90	0.90	7.36	7.13	6.79	6.79
TAPCo	126.32	121.15	129.18	130.30	949.51	910.63	970.97	979.41
TT1PP	22.99	22.99	32.18	34.43	172.84	172.84	241.87	258.76
KTPP	8.92	9.37	9.62	10.14	67.02	70.40	72.33	76.18
AMERI	28.61	74.47	84.37	105.95	215.02	559.78	634.20	796.39
Navrongo Solar Plant								
Lawra/Kaleo Solar Plant								
Total VRA Generation	193.17	234.12	261.20	286.66	1,451.98	1,759.76	1,963.30	2,154.67
IPP Generation:								
Sunon Asogli 1	38.22	58.52	58.52	58.52	287.26	439.86	439.86	439.86
Sunon Asogli 2	81.41	125.22	125.22	125.22	611.95	941.23	941.23	941.23
Karpowership	206.61	199.16	223.85	223.85	1,553.00	1,497.02	1,682.60	1,682.60
AKSA	31.04	-	-	-	233.29	-	-	-
CENIT	50.04	59.58	59.58	59.58	376.12	447.81	447.81	447.81
CENPOWER	123.46	119.14	137.13	137.13	927.95	895.52	1,030.77	1,030.77
Early Power Phase 1	-	-	14.15	84.32	-	-	106.39	633.78
AMANDI (TWIN CITY)	68.92	65.96	65.96	65.96	518.07	495.82	495.82	495.82
Bui Power	0.45	0.52	0.52	0.52	3.36	3.87	3.87	3.87
BPA Solar Farm	0.05	-	-	-	0.36	-	-	-
BXC Solar								
Meienergy Solar								
Safisana Biogas								
Total IPPs	600.20	628.10	684.94	755.10	4,511.37	4,721.13	5,148.35	5,675.74
Total VRA+IPPs	793.37	862.22	946.14	1,041.76	5,963.34	6,480.88	7,111.65	7,830.40

* The above revenue values have been arrived at using Projected Ghana Cedi/US Dollar Exchange Rate of 7.5165 and WACOG of USD5.9060/MMBtu
Source: PURC's Tariff Analyses, 2022-2025

8.0 ANALYSES OF COSTS AND TARIFF DECISION IN RESPECT OF TRANSMISSION GRID SERVICES

This section presents outcome of analyses of costs and tariffs as well as tariff decision in respect of transmission grid services.

8.1 Determination of the Transmission Utility's Annual Revenue Requirement

In determining the TSC, the Commission was guided by the fact that transmission of power is a monopoly business and therefore requires the requisite regulatory supervision to ensure that its costs are prudent and efficient.

The Commission's tariff decision in respect of GRIDCo's Annual Revenue Requirement (ARR) for 2022-2025 Tariff Control Period was determined based on the methodology indicated in Rate Setting Guidelines for Electricity Transmission and System Operations. It is worth noting that cost of transmission losses are not included in the ARR as these losses are fully borne by the distribution utilities in proportion to their usage of the grid systems and are paid directly to the generating companies.

The various components of the PURC approved costs in respect of GRIDCo's transmission grid services (TSC-1) are discussed below.

8.1.1 GRIDCo's Revenue Requirement/Costs Attributable to Transmission Network Operations

GRIDCo proposed a total revenue requirement of GHS 2,540.07Million to cover its operations for the 2022-2025 Tariff Control Period. The Commission, however approved an amount of GHS 1,138.39Million to cover the operating expenses of GRIDCo. The total operational expenses of operations of GRIDCo consists of four major components.

1. Direct operational expenses comprising human resource expenses, operation and maintenance expenses, general and administrative expenses
2. Cost on Working Capital Allowance
3. Capital Expenditure
4. Depreciation and Return on the Regulatory Asset Base (RAB).

Table 8-1 shows the breakdown of GRIDCo's total operational expenses approved by the Commission.

Table 8-1 Summary of PURC Approved Costs vs. Proposed Costs of GRIDCo

Cost Type	Existing Costs (MGHS)	Proposed Costs (MGHS)	Approved Costs (MGHS)
Approved Operating Cost:			
Administrative & General Expenses	36.63	89.32	89.32
Operation & Maintenance Expenses	75.31	150.92	150.92
Human Resource Expenses	219.41	305.85	305.85
Sub-Total	331.35	546.09	546.09
Cost of Working Capital Allowance		379.45	1.01
Capital Expenditure		96.69	96.69
Capital Recovery Cost (CRC):			
Depreciation	142.25	221.46	158.47
Return on Regulated Asset Base	197.48	1,276.42	326.82
Sub-Total	339.73	1,497.88	485.29
Corporate Tax		19.96	9.31
Total Electricity Network Business Revenue Requirement	671.08	2,540.07	1,138.39

Source: PURC's Tariff Analyses, 2022-2025

In approving the various operating costs of GRIDCo, including administrative and general expenses, operation and maintenance expenses, human resource expenses, the Commission undertook a historical analysis of GRIDCo's actual costs over the last 5 years. The results

indicate that these cost levels passed PURC's prudence and efficiency test. Details of the approved costs are explained in the following sections.

8.1.2 Administrative and General Expenses

GRIDCo proposed an annual average amount of GHS 89.32Million to cover various administrative and general expenses for 2022-2025 Tariff Control Period representing a 143.8% increase over 2019-2020 approved existing costs. The Commission approved the proposed administrative and general expenses of GRIDCo which amounts to an average of GHS 89.32Million for the 2022-2025 Tariff Control Period.

8.1.3 Operation and Maintenance Expenses

With respect to operation and maintenance expenses, the Commission approved an annual average amount of GHS150.92 Million for the 2022-2025 Tariff Control Period, which amount is the same as proposed by GRIDCo.

8.1.4 Human Resource Expenses

Details of GRIDCo's human resource expenses cover salaries of staff, staff allowances and other statutory payments in respect of GRIDCo's staff. The Commission approved total human resource expenses of GHS 305.85Million proposed by GRIDCo to cover human resource expenses for the Company for the 2022-2025 Tariff Control Period.

8.1.5 Cost of Working Capital Allowance

In respect of cost of working capital allowance, the Commission approved an average of GHS1.01 Million for the Company for the 2022-2025 Tariff Control Period as against GHS 379.45Million proposed by GRIDCo. This approval was conducted in line with the Commission's Rate Setting Guidelines for Electricity Transmission and System Operations. It is worth noting that GRIDCo's proposed cost of working capital allowance of GHS 379.45Million was not computed in line with the Commission's Rate Setting Guidelines.

8.1.6 Capital Expenditure

With respect to capital expenditure, the Commission approved an average of GHS 96.69 Million to cover GRIDCo's short-term critical investments over 2022-2025 Tariff Control Period. The Commission arrived at this amount by taking into consideration the cost of both the loan facility and interest as well as levelising the total short-term critical investments amount in line with GRIDCo's depreciation policy.

8.1.7 Depreciation

The Commission approved an average depreciation amount of GHS158.47 Million as against GRIDCo's proposal of GHS221.46 Million for the 2022-2025 Tariff Control Period. The approved amount represents 71.6% of amount proposed by GRIDCo. The Commission's approval was based on the use of net revalued regulated asset base which excluded assets acquired through grants.

8.1.8 Return on Revalued Net Fixed Assets

GRIDCo proposed an amount of GHS 1,276.42 Million as Return on Regulated Fixed Assets for the 2022-2025 Tariff Control Period. The Commission determined GRIDCo's return on revalued net fixed assets in line with the Rate Setting Guidelines for Electricity Transmission and System Operations. In so doing, the Commission utilised a weighted cost of debt based on GRIDCo's existing loans and a cost of equity calculated in accordance with the Commission's methodology for determination of Cost of Equity. This resulted in an average amount of GHS 326.82Million as approved return on revalued net fixed assets representing 25.6% of GRIDCo's proposal.

8.1.9 Corporate Tax

With respect to Corporate Tax to be incorporated into GRIDCo's operational costs, the Commission approved an annual average amount of GHS 9.31Million as Corporate Tax payable by GRIDCo over the 2022-2025 Tariff Control Period. The corporate tax for the 2022-2025 Tariff Control Period was determined by the Commission using PURC's corporate tax formula per Section 3.9 of PURC's Rate Setting Guidelines for Electricity Transmission and System Operations. The Commission notes that GRIDCo's proposed amount of GHS 19.96Million as Corporate Tax for the 2022-2025 Tariff Control Period was not in line with the Rate Setting Guidelines.

9.0 ANALYSES OF COSTS AND TARIFF DECISION IN RESPECT OF ELECTRICITY DISTRIBUTION SERVICES

In this section, analyses of costs and tariff decision in respect of Electricity Distribution services for ECG, NEDCo and EPC are presented. In that regard, the analyses were carried out within the framework of PURC's Rate Setting Guidelines for Electricity Distribution and Supply.

9.1 Electricity Company of Ghana

9.1.1 Determination of ECG's Annual Revenue Requirement

The ECG's Annual Revenue Requirement (ARR) determination for the 2022-2025 Tariff Control Period was within the governance framework of the Commission's Rate Setting Guidelines for Electricity Distribution and Supply taking into consideration projected electrical energy purchases and sales volumes, costs and revenue proposals as submitted by ECG.

ECG's tariff proposal covered the Company's operational costs itemised as administrative and general expenses, operation and maintenance expenses, human resource expenses and cost on working capital allowance totaling GHS 2,333.42 Million. In addition, a capital expenditure of GHS 832.33Million, Depreciation of GHS 1,728.96Million, Return on Regulated Asset Base of GHS 364.29 Million and Corporate Tax of GHS 100.81Million was proposed by ECG bringing the total proposed ARR for ECG to GHS 5,348.80Million.

However, the Commission approved an ARR of GHS 2,303.27Million broken down into an annual average fixed operating cost of GHS 1,829.43Million, cost of working capital allowance of GHS 1.08 Million, Capital expenditure amounting to GHS 230.20Million, Depreciation of GHS158.20Million, Return on Regulated Asset Base of GHS 75.32Million and Corporate Tax of GHS9.03 Million per annum for the 2022-2025 Tariff Control Period. The cost details which form the cost build-up of ECG's ARR are presented in Table 9-1.

Table 9-1 Summary of PURC Approved Costs vs. Proposed Costs of ECG

Cost Type	Existing (MGHS)	Proposed Costs (MGHS)	Approved Costs (MGHS)
Approved Operating Cost:			
Administrative & General Expenses	171.56	377.35	356.41
Operation & Maintenance Expenses	379.64	831.85	615.93
Human Resource Expenses	526.89	1,114.20	857.09
Sub-Total	1,078.09	2,323.40	1,829.43
Interest on Working Capital	4.15	10.02	1.08
Capital Expenditure	104.31	821.33	230.20
Capital Recovery Cost (CRC):			
Depreciation	188.46	1,728.96	158.20
Return on Regulated Asset Base	35.35	364.29	75.32
Sub-Total	223.81	2,093.24	233.52
Corporate Tax	-	100.81	9.03
Total Electricity Network Business Revenue Requirement	1,410.36	5,348.80	2,303.27

Source: PURC's Tariff Analyses, 2022-2025

In terms of Distribution Added Value (DAV) per kWh, the cost details presented in Table 9-1 resulted in a DSC of GHP 17.0429/kWh. It should be noted that this excludes the 2% provision for non-collectible revenue (NCR) as well as distribution system losses averaging 21.4% per annum over the 2022-2025 Tariff Control Period.

In approving the various operating costs of ECG, including administrative and general expenses, operation and maintenance expenses, human resource expenses, the Commission undertook a historical analysis of ECG's actual costs over the last 5 years, which costs were adjusted over the 2022-2025 Tariff Control Period by the Commission using a 12-month actual average inflation rate of 16.26% for 2022 and 8% projected annual inflation rate for 2023-2025. The inflation rate of 16.26% for 2022 was computed using actual monthly inflation data from July 2021 to June 2022. Details of the approved costs are explained in the following sections.

9.1.1.1 Administrative and General Expenses

ECG proposed an amount of GHS 377.35 million to cover various administrative and general expenses for the 2022-2025 Tariff Control Period. This was to cover all administrative expenses in ECG's operational regions and the headquarters. However, the Commission approved a total amount of GHS 356.41 Million as prudent and efficient based on methodology noted in Section 9.1.1 to cover ECG's administrative and general expenses for the 2022-2025 Tariff Control Period.

9.1.1.2 Operation and Maintenance Expenses

In terms of meeting ECG's operation and maintenance expenses, though the company proposed a total annual average amount of GHS 831.85 Million, the Commission approved a total annual average amount of GHS 615.93 Million which the Commission considers as prudent and efficient for the 2022-2025 Tariff Control Period.

9.1.1.3 Human Resource Expenses

With regards to human resource expenses, the Commission approved an amount of GHS 857.09 Million in line with methodology noted in Section 9.1.1 as against GHS 1,114.20 proposed by ECG for the 2022-2025 Tariff Control Period.

9.1.1.4 Cost on Working Capital Allowance

The Commission approved an average of GHS 1.08 Million as cost of working capital allowance for the Company for the 2022-2025 Tariff Control Period in line with Section 1.8.1 of the Rate Setting Guidelines for Electricity Distribution and Supply as against GHS 10.02 Million proposed by ECG was based on the Company's proposed operating expenses and Weighted Average Cost of Capital (WACC).

9.1.1.5 Capital Expenditure

With respect to capital expenditure, the Commission approved an average of GHS 230.20 Million to cover ECG's short-term critical investments over 2022-2025 Tariff Control Period. The Commission arrived at this amount by taking into consideration the cost of both the loan facility and interest as well as levelling the total short-term critical investments amount in line with ECG's depreciation policy.

9.1.1.6 Depreciation

With regards to depreciation, the Commission approved an annual average depreciation of GHS 158.20 Million as against ECG's proposal of GHS 1,728.96 Million for the 2022-2025 Tariff Control Period. The Commission's approved amount represents 9.1% of amount proposed by ECG and was based on the use of net revalued regulated asset base which excluded assets acquired through grants. The Commission also took the decision on the basis of the fact that current macroeconomic conditions and its effect on consumers should be ameliorated through a carrying forward strategy where the full amount of depreciation to be charged as part of the revenue requirement for the 2022-2025 Tariff Control Period could be deferred. It is also based on the fact that significant amount of funds was recovered in the form of depreciation by ECG which amount was expected to be invested in sinking fund to provide cover for replacement of assets.

9.1.1.7 Return on Revalued Net Fixed Assets

The Commission determined ECG's return on revalued net fixed assets based on ECG's proposed Cost of Debt and Cost of Equity, guided by PURC's Rate Setting Guidelines for Electricity Distribution and Supply. Similar to the Commission's decision on depreciation vis-à-vis current macroeconomic conditions, the Commission approved an annual average amount

of GHS 75.32 Million as return on revalued net fixed assets for the 2022-2025 Tariff Control Period as against GHS 364.29 Million proposed by ECG.

9.1.1.8 Corporate Tax

ECG proposed an amount of GHS 100.81 Million as Corporate Tax for the 2022-2025 Tariff Control Period. However, the Commission approved an annual average of GHS 9.03 Million as Corporate Tax payable by ECG over the 2022-2025 Tariff Control Period based on the approved net revalued regulated asset base and also in accordance with Section 1.9 of PURC's Rate Setting Guidelines for Electricity Distribution and Supply.

9.1.2 Cost of ECG's Distribution System Losses

The Commission has accounted for cost of power losses in the distribution network by applying the regulated benchmark average distribution system losses of 21.4% for 2022-2025 Tariff Control Period. PURC's approved total distribution losses for ECG on the basis of the 21.4% amounts to 3,676 GWh. These distribution losses are estimated at GHS 2,463.39 Million, representing an average cost of GHS 18.2277/kWh. The average cost of total distribution systems losses is prefixed as DSC-2.

It must be noted the DSC-2 is the rate that covers payment by DISCOs to electricity generators to compensate for the cost of PURC benchmarked electricity lost in distribution.

9.1.3 Non-collectible Revenue (NCR)

The Commission maintained its previous decision to approve a 2% allowance as provision for non-collectible revenue by ECG.

9.1.4 ECG's Total Annual Revenue Requirement (TARR)

The Commission determined ECG's TARR taking into consideration the following cost items:

- (i) Cost of power purchases from electricity generators including all losses in the process of high voltage transmission as well as the electricity that is not billed owing to technical and commercial losses within the utility company's distribution network (VRA and IPPs)
- (ii) Direct cost of transmission grid services (GRIDCo's Costs)
- (iii) Costs of the ECG's own operations (ECG's ARR)
- (iv) Provision for non-collectible revenue

9.1.4.1 ECG's Cost of Power Purchases for 2022-2025

As indicated by ECG, the company was to procure power from VRA and a number of Independent Power Producers (IPPs) for the 2022-2025 Tariff Control Period. The Commission approved a total projected annual electrical energy requirement of 17,911 GWh for the Company for the 2022-2025 Tariff Control Period. A total of 5,417 GWh is to be procured from VRA, comprising 3,639 GWh from Akosombo and Kpong Hydro Generating Stations as well as 1,778 GWh from VRA's Thermal Power Plants. Therefore, the balance of 12,494 GWh was projected to be procured from a number of bilateral contracted IPPs as noted in Table 9-2.

In light of above, the Commission approved a total annual average amount of GHS 11,319.45 Million to cover the total cost of electrical energy to be purchased by ECG for 2022-2025 Tariff Control Period. The cost build-up of ECG's electrical energy purchases for 2022-2025 tariff period is presented in Table 9-2.

9.1.4.1.1 ECG's Composite Bulk Generation Tariff

Having approved the total electrical energy allocated to ECG by VRA and IPP power plants vis-à-vis tariffs by power plant presented in Table 9-2, the Commission determined and approved

a Composite Bulk Generation Charge (CBGC) of GHp31.2499/kWh payable by ECG for power purchases from VRA and Composite Bulk Generation charge (CBGC) of GHp63.1997/kWh payable for power purchases by ECG in respect of power purchases from VRA and IPP power plants.

Table 9-2 Summary of PURC Approved Power Purchase Costs for ECG

Power Plant	Projected Electrical Energy (GWh)	Tariff (GHp/kWh)
VRA Plants		
VRA-Hydro:		
Akosombo	3,077	15.1893
Kpong	563	31.1394
Sub-Total VRA Hydro	3,639	
VRA-Thermal:		
TAPCo	776	56.8384
AMERI	1,002	60.8206
Sub-Total VRA Thermal	1,778	
Total VRA Electrical Energy/ VRA Composite Bulk Generation Tariff	5,417	31.2499
ECG IPPs:		
Sunon Asogli Phase I	984	80.1335
Sunon Asogli Phase II	1,916	78.1830
Karpowership	3,457	76.9651
AKSA	62	127.3665
Cenit	851	71.4094
Cenpower	2,450	86.4478
Early Power	330	85.8319
Amandi (Twin City)	1,369	77.6405
Bui Power Authority	996	76.9689
BPA Solar Farm	24	76.9689
BXC Solar	29	151.3612
Meienergy Solar	24	136.2215
Safisana Plant	0.5	131.5387
Sub-Total IPPs	12,494	
Total Electrical Energy/ VRA+ECG IPPs Composite Bulk Generation Charge	17,911	63.1997

Source: PURC's Tariff Analyses, 2022-2025

9.1.4.2 ECG's Transmission Grid Services Cost

ECG is required to pay for transmission grid services provided by GRIDCo as an additional cost for power purchases. For 2022-2025 Tariff Control Period, total electrical energy to be transmitted on behalf of ECG is projected at 17,911 GWh which includes transmission losses of 734.34GWh. Given that ECG's total purchases of 17,911 GWh includes transmission losses, ECG is required to pay the Transmission Service Charge (TSC-1) only, to GRIDCo.

The breakdown of total electricity purchases, transmission and distribution losses as well as sales for ECG are presented in Table 9-3.

Table 9-3 Summary of PURC Approved Transmission and Distribution System Losses for ECG

Power Purchases	GWh
Total Purchases	17,911
Transmission System Losses	734
Distribution System Losses	3,676
Final End-User Consumption	13,501

Source: PURC's Tariff Analyses, 2022-2025

9.1.4.3 Total Annual Revenue Requirement

Having considered and approved the various cost items as noted above, the Commission has established a Total Annual Revenue Requirement (TARR) for ECG amounting to GHS 14,981.19 Million as presented in Table 9-4.

Table 9-4 Summary of ECG's Total Annual Revenue Requirement

Item/Cost Center	PURC Approved (Million GHS)
Power Purchases (Incl. Trans. & Distr. System Losses)	11,319.45
Transmission Service Cost (Excl. Transmission Losses)	1,358.47
Total Power Purchases & Transmission Grid Service Costs	12,677.92
Administrative & General Expenses	615.93
Operation & Maintenance Expenses	356.41
Human Resource Expenses	857.09
Cost on Working Capital Allowance	1.08
Capital Expenditure	230.20
Depreciation	158.20
Return on Regulated Asset Base	75.32
Corporate Tax	9.03
ECG Annual Revenue Requirement (ARR)	2,303.27
Total Annual Revenue Requirement (TARR)	14,981.19

Source: PURC's Tariff Analysis, 2022-2025

The Commission directs ECG to bill and collect from its customers, the tariffs approved by the Commission as indicated above in order to meet all its obligations including power purchases, transmission services and distribution operating expenses.

9.2 Northern Electricity Distribution Company (NEDCo)

9.2.1 Determination of NEDCo's Revenue Requirement

Determination of NEDCo's Annual Revenue Requirement (ARR) for the 2022-2025 Tariff Control Period was executed within the governance framework of the Commission's Rate Setting Guidelines for Electricity Distribution and Supply taking into account projected electrical energy purchases and sales volumes, costs and revenue proposals as submitted by NEDCo.

NEDCo's proposal covered the Company's operational costs detailed as administrative and general expenses, operation and maintenance expenses, human resource expenses, depreciation and return on regulated asset base. This amounted to an annual average of GHS 736.90 Million for the 2022-2025 Tariff Control Period.

The Commission, however approved an annual average revenue requirement of GHS 530.71 Million broken down into Total Operating Expenses of GHS 494.31 Million, Cost of Working Capital Allowance of GHS0.29 Million, Capital Expenditure of GHS9.30 Million, Depreciation of GHS19.21 Million, Return on Revalued Net Fixed Assets of GHS6.51 Million and Corporate Tax of 1.09 Million. Details of the cost build-up of NEDCo's ARR for the 2022-2025 tariff period are presented in Table 9-5.

Table 9-5 Summary of PURC Approved Costs Vs. Proposed Costs of NEDCo

Cost Type	Existing (MGHS)	Proposed Costs (MGHS)	Approved Costs (MGHS)
Approved Operating Cost:			
Administrative & General Expenses	16.02	65.25	44.30
Operation & Maintenance Expenses	68.78	120.43	154.04
Human Resource Expenses	144.78	304.82	295.98
Sub-Total	229.58	490.50	494.31
Cost on Working Capital Allowance			0.29
Capital Expenditure			9.30
Capital Recovery Cost (CRC):			
Depreciation	69.9	170.66	19.21
Return on Regulated Asset Base	17.35	75.74	6.51
Sub-Total	87.25	246.40	25.72
Corporate Tax			1.09
Total Electricity Network Business Revenue Requirement	316.83	736.90	530.71

Source: PURC's Tariff Analyses, 2022-2025

NEDCo's ARR results in an average distribution added value (DAV) charge of GHp29.7065/kWh. It is worth noting that this excludes the 2% provision for non-collectible revenue (NCR) as well as distribution system losses averaging 21.4% per annum over the 2022-2025 Tariff Control Period.

It is important to note that the Commission in approving the various operating costs, including administrative and general expenses, operation and maintenance expenses as well as human resource expenses of NEDCo, undertook a historical analysis of NEDCo's actual costs over the last 5 years. These costs were adjusted over the 2022-2025 Tariff Control Period by the Commission using a 12-month actual average inflation rate of 16.26% for 2022 and 8% projected annual inflation rate for 2023-2025. The inflation rate of 16.26% for 2022 was computed using actual monthly inflation data from July 2021 to June 2022. Details of the approved costs are highlighted in the following sections.

9.2.1.1 Administrative and General Expenses

NEDCo proposed an annual average of GHS65.25 Million to cover various administrative expenses for 2022-2025 Tariff Control Period. However, the Commission approved an annual average of GHS 44.30 Million by applying the methodology indicated in Section 9.2.1. The Commission considers the approved administrative and general expenses to be prudent and efficient. and thus represents 67.9% of NEDCo's proposed costs.

9.2.1.2 Operation and Maintenance Expenses

With respect to operation and maintenance expenses, the Commission approved an annual average amount of GHS154.04 Million which the Commission considers as prudent and efficient as against GHS120.43 Million proposed by NEDCo for the 2022-2025 Tariff Control Period. This decision was informed by the state of NEDCo's operational area in meeting quality of service delivery to its customers.

9.2.1.3 Human Resource Expenses

In terms of meeting NEDCo's human resource expenses, the Commission approved an annual average of GHS144.78 Million to cover human resource expenses for the Company for the 2022-2025 Tariff Control Period in line with the methodology noted in Section 9.2.1.

9.2.1.4 Cost on Working Capital Allowance

Regarding cost of working capital allowance, the Commission approved an annual average of GHS0.29 Million for the Company for the 2022-2025 Tariff Control Period in line with Section 1.8.1 of the Rate Setting Guidelines for Electricity Distribution and Supply based on PURC approved operating expenses and Weighted Average Cost of Capital (WACC) for NEDCo.

9.2.1.5 Capital Expenditure

With respect to capital expenditure, the Commission approved an average of GHS 9.30 Million to cover NEDCo's short-term critical investments over 2022-2025 Tariff Control Period. It must be noted that this amount was arrived at by taking into consideration the cost of both the loan facility and interest as well as levelising the total short-term critical investments amount in line with NEDCo's depreciation policy.

9.2.1.6 Depreciation

The Commission approved an annual average depreciation of GHS19.21 Million as against NEDCo's proposed amount of GHS170.66 Million for the 2022-2025 Tariff Control Period. The Commission's decision was based on the use of net revalued regulated asset base which excluded assets acquired through grants. In addition, the Commission against the backdrop of current macroeconomic conditions and its effect on consumers, took the decision to ameliorate above effects by adopting a carrying forward strategy where the full amount of depreciation to be charged as part of the revenue requirement for the 2022-2025 Tariff Control Period could be deferred. The Commission's decision is also based on the fact that significant amount of funds was recovered by NEDCo in previous years through depreciation, which amount was expected to have been invested in sinking fund to provide cover for replacement of assets.

9.2.1.7 Return on Revalued Net Fixed Assets

Similar to the Commission's decision on depreciation vis-à-vis current macroeconomic conditions and guided by the Rate Setting Guidelines for Electricity Distribution and Supply, the Commission approved an annual average of GHS6.51 Million as return on revalued net fixed assets as against GHS 75.74 Million proposed by NEDCo.

9.2.1.8 Corporate Tax

In respect of Corporate Tax, the Commission approved an annual average of GHS 1.09 Million as Corporate Tax payable by NEDCo over the 2022-2025 Tariff Control Period based on the approved net revalued regulated asset base and in accordance with Section 1.9 of PURC's Rate Setting Guidelines for Electricity Distribution and Supply.

9.2.2 Cost of Distribution Losses

PURC's benchmarked total distribution system losses for NEDCo is 21.4% over the 2022-2025 Tariff Control Period which translates into an energy of 486GWh. The total cost of the distribution losses is estimated at GHS 327.22 Million, resulting in an average cost of GHP18.3162/kWh. Similar to the case of ECG, the average cost of total distribution system losses is prefixed as DSC-2 and is the rate that covers payment by DISCOs to electricity generators to compensate for the cost of PURC benchmarked electricity lost in distribution.

9.2.3 Non-collectible Revenue (NCR)

The Commission maintained and approved a 2% allowance to cover provision for non-collectible revenue by NEDCo.

9.2.4 NEDCo's Total Annual Revenue Requirement (TARR)

The Commission in determination of NEDCo's TARR considered the following costs:

- (i) Cost of power purchases from electricity generators including all losses in the process of high voltage transmission as well as the electricity that is not billed owing to technical and commercial losses within the utility company's network
- (ii) Direct cost of operating the high voltage transmission system of the power to the consumers

- (iii) Costs of NEDCo's own operations (ARR)
- (iv) Provision for non-collectible revenue

9.2.4.1 NEDCo's Cost of Power Purchases

For the 2022-2025 Tariff Period, the Commission approved a projected annual electrical energy of 2,370 GWh for NEDCo to meet the needs of its customers as well as provide for all losses in transmission and distribution of the electrical energy. It is worth noting that, NEDCo procures all its power requirements from VRA. The Commission approved an annual average amount of GHS1,191.73 million to cover the total cost of electricity to be purchased by NEDCo for 2022-2025 Tariff Control Period. Details of the cost build-up of NEDCo's electricity purchases for 2022-2025 Tariff Control Period are shown in Table 9-6.

9.2.4.1.1 NEDCo's Composite Bulk Generation Charge

The Commission approved a Composite Bulk Generation Charge (CBGC) of GHp50.2819/kWh for NEDCo for 2022-2025 Tariff Control Period. It is important to note that NEDCo's CBGC represents the weighted average cost of electricity to be procured by NEDCo from VRA including the electricity from the Akosombo and Kpong hydroelectric generating stations. The Approved CBGC for NEDCo translates into total cost of electricity purchases of GHS1,191.73 Million. Details of projected power purchases for NEDCo and tariffs by power plant are indicated in Table 9-6.

Table 9-6 Summary of PURC Approved Power Purchase Costs for NEDCo

Power Plant	Projected Electrical Energy (GWh)	Tariff (GHp/kWh)
VRA Plants		
VRA-Hydro:		
Akosombo	399	15.1893
Kpong	73	31.1394
Sub-Total VRA Hydro	472	
VRA-Thermal:		
TAPCo	1,457	
TT1PP	426	56.8384
Sub-Total VRA Thermal	1,883	63.1740
VRA-Renewable:		
Solar (Navrongo)	3	
Solar (Kaleo/Lawra)	12	93.8944
Sub-Total VRA Renewable	15	67.6485
Total VRA Electrical Energy/ VRA Composite Bulk Generation Tariff	2,370	50.2819

Source: PURC's Tariff Analyses, 2022-2025

9.2.4.2 NEDCo's Transmission Grid Services Cost

It is important to note that in addition to the cost of power purchases, NEDCo is required to pay for the transmission services provided by GRIDCo. The total power to be transmitted on behalf of NEDCo for the 2022-2025 tariff period is projected at 2,370 GWh which includes transmission losses of 97 GWh. Given that NEDCo's total purchases of 2,370 GWh includes the cost of transmission losses, NEDCo is required to pay to GRIDCo only the added value component (TSC-1) of the Transmission Service Charge.

Table 9-7 Summary of PURC Approved Transmission and Distribution System Losses for NEDCo

Description	GWh
Power Purchases	2,370
Transmission System Losses	97
Distribution System Losses	486
Final End-User Consumption (Sales)	1,787

Source: PURC's Tariff Analyses, 2022-2025

9.2.4.3 Total Annual Revenue Requirement

Similar to ECG, the Commission approved the above costs of NEDCo vis-à-vis performance targets. This yielded a Total Annual Revenue Requirement (TARR) for the Company amounting to GHS 1,902.21Million, which in the opinion of the Commission, is sufficient to cover the operational costs of NEDCo for the 2022-2025 Tariff Control Period. Details of these costs including cost of power purchases are presented in Table 9-8.

Table 9-8 Summary of NEDCo's Total Annual Revenue Requirement

Item/Cost Center	PURC Approved (Million GHS)
Power Purchases (Incl. Trans. & Distr. System Losses)	1,191.73
Transmission Service Cost (Excl. Transmission Losses)	179.77
Total Power Purchases & Transmission Grid Service Costs	1,371.50
Administrative & General Expenses	44.30
Operation & Maintenance Expenses	154.04
Human Resource Expenses	295.98
Cost on Working Capital Allowance	0.29
Capital Expenditure	9.3
Depreciation	19.21
Return on Regulated Asset Base	6.51
Corporate Tax	1.09
NEDCo Annual Revenue Requirement (ARR)	530.71
Total Annual Revenue Requirement (TARR)	1,902.21

Source: PURC's Tariff Analyses, 2022-2025

The Commission wishes to state that based on above approved costs, NEDCo is expected to bill and collect from its customers, the tariffs approved by the Commission in order to meet all its obligations including power purchases, transmission services, and distribution operating expenses.

9.3 Enclave Power Company (EPC)

9.3.1 Determination of EPC's Revenue Requirement

The Commission determined EPC's Annual Revenue Requirement (ARR) for the 2022-2025 Tariff Control Period within the governance framework of the Commission's Rate Setting Guidelines for Electricity Distribution and Supply taking into account projected electrical energy purchases and sales volumes, costs and revenue proposals as submitted by EPC. It must be stated that the Commission's approval of costs and electrical energy purchases for EPC covers only the regulated market served by EPC.

EPC's proposal covered the Company's administrative and general expenses, operation and maintenance expenses, human resource expenses, cost of working capital allowance, depreciation and return on regulated asset base, amounting to an annual average of GHS 134.26Million for the 2022-2025 Tariff Control Period.

It is worth noting that the Commission, approved an annual average revenue requirement of GHS 78.30Million comprising Total Operating Expenses of GHS 23.06Million, Cost of Working Capital Allowance of GHS0.06Million, Capital Expenditure of GHS14.93 Million, Depreciation of GHS11.58 Million, Return on Revalued Net Fixed Assets of GHS24.97 Million and Corporate Tax of 3.71 Million. Details of the cost build-up of EPC's ARR for the 2022-2025 tariff period are presented in Table 9-9.

Table 9-9 Summary of PURC Approved Costs Vs. Proposed Costs by EPC

Cost Type	Existing (MGHS)	Proposed Costs (MGHS)	Approved Costs (MGHS)
Approved Operating Cost:			
Administrative & General Expenses	1.44	19.35	17.24
Operation & Maintenance Expenses	2.16	0.48	0.64
Human Resource Expenses	4.58	14.08	5.18
Sub-Total	8.17	33.91	23.06
Cost on Working Capital Allowance		1.98	0.06
Capital Expenditure		33.19	14.93
Capital Recovery Cost (CRC):			
Depreciation	4.38	18.39	11.58
Return on Regulated Asset Base	13.98	46.79	24.97
Sub-Total	18.36	65.18	36.55
Corporate Tax			3.71
Total Electricity Network Business Revenue Requirement	26.53	134.26	78.30

Source: PURC's Tariff Analyses, 2022-2025

The approved annual average revenue requirement for EPC results in an average distribution added value (DAV) charge of GHp20.0766/kWh. It must be stated that this excludes the 2% provision for non-collectible revenue (NCR) as well as distribution system losses averaging 2% per annum over the 2022-2025 Tariff Control Period.

The Commission in approving the various operating costs of EPC, including administrative and general expenses, operation and maintenance expenses as well as human resource expenses of EPC, undertook a historical analysis of EPC's actual costs over the last 5 years. The actual costs were adjusted over the 2022-2025 Tariff Control Period by the Commission using a 12-month actual average inflation rate of 16.26% for 2022 and 8% projected annual inflation rate for 2023-2025. The inflation rate of 16.26% for 2022 was computed using actual monthly inflation data from July 2021 to June 2022. Details of the approved costs are presented in the following sections.

9.3.1.1 Administrative and General Expenses

With regards to administrative and general expenses, EPC proposed an annual average of GHS19.35 Million to cover various administrative expenses for 2022-2025 Tariff Control Period. However, the Commission based on the methodology noted in Section 9.3.1 approved an annual average of GHS 17.24 Million for the 2022-2025 Tariff Control Period, which costs are considered to be prudent and efficient.

9.3.1.2 Operation and Maintenance Expenses

The Commission approved an annual average amount of GHS0.64 Million as operation and maintenance expenses for EPC for the 2022-2025 Tariff Control Period.

9.3.1.3 Human Resource Expenses

In respect of EPC's human resource expenses, the Commission approved an annual average of GHS5.18 Million to cover the Company's staff expenses for the 2022-2025 Tariff Control Period. The approval by the Commission was in line with the methodology stated in Section 9.3.1.

9.3.1.4 Cost on Working Capital Allowance

In terms of cost of working capital allowance, the Commission approved an annual average of GHS0.29 Million for the Company for the 2022-2025 Tariff Control Period in line with Section 1.8.1 of the Rate Setting Guidelines for Electricity Distribution and Supply based on PURC approved operating expenses and Weighted Average Cost of Capital (WACC) for EPC.

9.3.1.5 Capital Expenditure

With respect to capital expenditure, the Commission approved an average annual amount of GHS 14.93 Million to cover EPC's short-term critical investments over 2022-2025 Tariff Control Period. It is important to note that this amount was arrived at by taking into consideration the

cost of both the loan facility and interest of the short-term critical investments as well as levelising the amount based on EPC's depreciation policy.

9.3.1.6 Depreciation

The Commission approved an annual average depreciation of GHS11.58 Million as against EPC's proposed amount of GHS18.39 Million for the 2022-2025 Tariff Control Period. It must be noted that the Commission's approval was based on the use of net revalued regulated asset base. The Commission took the decision that the current macroeconomic conditions and its effect on consumers should be ameliorated by adopting a carrying forward strategy where the full amount of depreciation to be charged as part of the revenue requirement for the 2022-2025 Tariff Control Period could be deferred. The Commission's decision was also based on the fact that significant amount of funds was recovered by EPC through depreciation in previous years, which amount was expected to have been invested in sinking fund to provide cover for replacement of assets.

9.3.1.7 Return on Revalued Net Fixed Assets

With regards to return on revalued net fixed assets, the Commission approved an annual average of GHS 24.97Million Million as return on revalued net fixed assets as against GHS 46.79 Million proposed by EPC. The decision of the Commission was influenced by the current macroeconomic conditions whilst being guided by the Rate Setting Guidelines for Electricity Distribution and Supply.

9.3.1.8 Corporate Tax

The Commission approved an annual average of GHS 3.79Million as Corporate Tax payable by EPC over the 2022-2025 Tariff Control Period based on the approved net revalued regulated asset base and in accordance with Section 1.9 of PURC's Rate Setting Guidelines for Electricity Distribution and Supply.

9.3.2 Cost of EPC's Distribution Losses

The Commission's benchmark total distribution system losses for EPC is 2% over the 2022-2025 Tariff Control Period which translates into an energy of 8GWh. The total cost of the distribution losses is estimated at GHS 5.35Million, resulting in an average cost of GHp1.3729/kWh. Similar to ECG and NEDCo, the average cost of total distribution systems losses is prefixed as DSC-2 which is the rate that covers payment by DISCOs to electricity generators to compensate for the cost of PURC benchmarked electricity lost in distribution.

9.3.3 Non-collectible Revenue (NCR)

The Commission maintained and approved a 2% allowance to cover provision for non-collectible revenue by EPC.

9.3.4 EPC's Total Annual Revenue Requirement (TARR)

The Commission in determination of EPC's TARR considered the following costs:

- (i) Cost of power purchases from electricity generators including all losses in the process of high voltage transmission as well as the electricity that is not billed owing to technical and commercial losses within the utility company's network
- (ii) Direct cost of operating the high voltage transmission system of the power to the consumers
- (iii) EPC's operation costs (ARR)
- (iv) Provision for non-collectible revenue

9.3.4.1 EPC’s Cost of Power Purchases

The Commission approved a projected annual electrical energy of 415 GWh for EPC to meet the needs of its regulated customers as well as provide for all losses in transmission and distribution of the projected electrical energy. It must be stated that, EPC procures all its power requirements from VRA. The Commission approved an annual average amount of GHS228.65 Million to cover the total cost of EPC power purchases for 2022-2025 tariff period. Details of the cost build-up of EPC’s electricity purchases for 2022-2025 Tariff Control Period is shown in Table 9-10.

9.3.4.1.1 EPC’s Composite Bulk Generation Charge

The Commission approved a Composite Bulk Generation Charge (CBGC) of GHp55.0979/kWh for EPC for 2022-2025 Tariff Control Period. EPC’s CBGC represents the weighted average cost of electricity to be procured by EPC from VRA. The Approved EPC CBGC results in a total annual electricity purchase cost of GHS228.65 Million. Details of projected power purchases for EPC and tariffs by power plant are indicated in Table 9-10.

Table 9-10 Summary of PURC Approved Power Purchase Costs for EPC

Power Plant	Projected Electrical Energy (GWh)	Tariff (GHp/kWh)
VRA Plants		
VRA-Hydro:		
Akosombo	52.92	15.1893
Kpong	9.68	31.1394
Sub-Total VRA Hydro	62.61	
VRA-Thermal:		
KTPP	148.25	63.0292
Ameri	204.14	60.8206
Sub-Total VRA Thermal	352.39	
Total VRA Electrical Energy/ VRA Composite Bulk Generation Tariff	415.00	55.0979

Source: PURC’s Tariff Analyses, 2022-2025

9.3.4.2 EPC’s Transmission Grid Services Cost

In addition to the cost of power purchases, EPC is required to pay for the transmission grid services provided by GRIDCo. The total electrical energy to be transmitted on behalf of EPC for the 2022-2025 Tariff Control Period is projected at 415 GWh which includes transmission losses of 8 GWh. Given that EPC’s total purchases of 415 GWh includes the cost of transmission losses, EPC is required to pay to GRIDCo only the added value component (TSC-1) of the Transmission Service Charge.

Table 9-11 Summary of PURC Approved Transmission and Distribution System Losses for EPC

Description	GWh
Power Purchases	415
Transmission System Losses	17
Distribution System Losses	8
Final End-User Consumption (Sales)	390

Source: PURC’s Tariff Analyses, 2022-2025

9.3.4.3 Total Annual Revenue Requirement

The Commission approved the above costs of EPC vis-à-vis performance targets which resulted in a Total Annual Revenue Requirement (TARR) for the Company amounting to GHS 790.84 Million, which is sufficient to cover the operational costs of EPC for the 2022-2025 Tariff Control Period. Details of these costs including cost of power purchases are presented in Table 9-12.

Table 9-12 Summary of EPC’s Total Annual Revenue Requirement

Item/Cost Center	PURC Approved (Million GHS)
Power Purchases (Incl. Trans. & Distr. System Losses)	228.65
Transmission Service Cost (Excl. Transmission Losses)	31.48
Total Power Purchases & Transmission Grid Service Costs	260.13
Administrative & General Expenses	17.24
Operation & Maintenance Expenses	0.64
Human Resource Expenses	5.18
Cost on Working Capital Allowance	0.06
Capital Expenditure	14.93
Depreciation	11.58
Return on Regulated Asset Base	24.97
Corporate Tax	3.71
EPC Annual Revenue Requirement (ARR)	78.30
Total Annual Revenue Requirement (TARR)	338.43

Source: PURC’s Tariff Analyses, 2022-2025

The Commission wishes to state that based on above approved costs, EPC is expected to bill and collect from its customers, the tariffs approved by the Commission to meet all its obligations including power purchases, transmission services, and distribution operating expenses.

10.0 ANALYSIS OF COSTS AND TARIFFS FOR WATER PRODUCTION, TRANSMISSION, DISTRIBUTION AND SUPPLY SERVICES

This section provides outcome of PURC’s analyses of costs and tariffs as well as the Commission’s decision on costs and tariffs for GWCL.

10.1 Determination of GWCL Annual Revenue Requirement

The Commission in its analyses of various costs and performance targets proposed by GWCL for the 2022-2025 Tariff Control Period was guided by the fact that potable water service delivery within urban Ghana is to a very large extent a monopoly business hence the need for the requisite regulatory supervision to ensure that incurred costs in service delivery are prudent and efficient and performance targets met.

The Commission approved an annual average amount of GHS 2,038.21 Million to cover operating expenses of GWCL for the 2022-2025 Tariff Control Period as against GWCL’s proposal of GHS 3,362.55 Million as shown in Table 10-1.

Table 10-1 Summary of GWCL Proposed and PURC Approved Costs

Cost Item	Existing Costs (MGHS)	Proposed Costs (MGHS)	Approved Costs (MGHS)
Total Operating Costs:			
Administrative & General Expenses	59.98	248.81	257.90
Operation & Maintenance Expenses	175.75	988.59	349.27
Human Resource Expenses	244.26	472.88	419.81
Electricity Expenses	338.62	330.49	360.95
Chemical Expenses	36.63	89.83	54.88
Total	855.24	2,130.59	1,442.81
Cost of Working Capital Allowance			0.94
CapEx		220.00	117.64
Capital Recovery Cost (CRC):			
Depreciation	245.05	841.54	204.93
Return on RNFA	62.85		104.96
Total CRC	307.90	841.54	309.89
Corporate Tax			22.75
Total GWCL Costs	1,163.14	3,192.13	1,894.03
Befesa Desalination Plant Costs			
Capacity Cost	91.40	156.14	128.14
Variable Cost	10.92	14.28	16.03
Sub Total	102.32	170.42	144.17
Grand Total GWCL+Befesa Revenue Requirement	1,272.49	3,362.55	2,038.21

Source: PURC’s Tariff Analyses, 2022-2025

Similar to the methodology employed in analysing various costs which were considered and approved by the Commission for regulated utilities along the Electricity Supply Industry Value Chain, the Commission in establishing the prudence and efficiency of the various operating costs of GWCL, including administrative and general expenses, operation and maintenance expenses as well as human resource expenses, undertook a historical analysis of GWCL’s actual costs over the last 5 years. These actual costs were adjusted over the 2022-2025 Tariff Control Period by the Commission using a 12-month actual average inflation rate of 16.26% for 2022 and 8% projected annual inflation rate for 2023-2025. The inflation rate of 16.26% for 2022 was computed using actual monthly inflation data from July 2021 to June 2022. Details of above approved costs are presented in the following sections.

10.1.1 Administrative and General Expenses

GWCL proposed an annual average of GHS248.81 Million to cover various administrative expenses for 2022-2025 Tariff Control Period. However, the Commission using the methodology described in Section 10.1 approved an annual average of GHS 257.90 Million for the 2022-2025 Tariff Control Period, which costs are considered to be prudent and efficient.

10.1.2 Operation and Maintenance Expenses

With regards to operation and maintenance expenses, the Commission in line with the methodology described in Section 10.1 approved an annual average amount of GHS349.27 Million for GWCL as against GHS988.59 Million proposed by the Company for the 2022-2025 Tariff Control Period.

10.1.3 Human Resource Expenses

In respect of GWCL's human resource expenses, the Commission approved an annual average of GHS419.81 Million to cover the Company's staff expenses for the 2022-2025 Tariff Control Period. These costs were approved by the Commission was in line with the methodology stated in Section 10.1.

10.1.4 Electricity Expenses

Per the Commission's analysis of historical electricity consumption data of GWCL, it has been established that the cost of electricity in GWCL's operations constitutes approximately 30% of the total cost of operations of GWCL. Thus, the Commission in determining electricity cost for GWCL for the 2022-2025 Tariff Control Period, took into account, the approved electricity tariffs effective September 01, 2022. This resulted in an approval of an annual amount GHS360.95 Million as GWCL's total electricity cost which includes Befesa's electricity cost.

10.1.5 Water Treatment Chemical Expenses

The Commission carried out an extensive engagement with GWCL on effect of continuing illegal mining activities on the operations of the company in catchment areas where these activities were being carried out. The objective of the Commission's engagement with the Company was to establish the quantity, price and costs of water treatment chemicals required to bring the level of water to quality required for consumption by consumers over the 2022-2025 Tariff Control Period.

There were also further engagements with other key Stakeholders not only to validate but also establish the veracity of the position of GWCL as stated above since the quantity of water treatment chemicals, level of price as well as total costs in procuring the required amount of chemicals to a very large extent all have an impact on the tariff to be approved by the Commission. Taking all of the above into consideration, the Commission came to the conclusion that an amount of GHS54.88 Million was not only prudent and sufficient to meet the financial needs of the company for the 2022-2025 Tariff Control Period but also ensure that GWCL water treatment chemicals are available in required quantities and quality throughout the year to ensure continuous operations.

10.1.6 Cost on Working Capital Allowance

In terms of cost of working capital allowance, the Commission approved an annual average of GHS0.98 Million for the Company for the 2022-2025 Tariff Control Period in line with Section 2.1.9.1 of the Rate Setting Guidelines for Water Production, Transmission, Distribution and Supply based on PURC approved operating expenses and Weighted Average Cost of Capital (WACC) for GWCL.

10.1.7 Capital Expenditure

With respect to capital expenditure, the Commission approved an average of GHS 117.64 Million to cover GWCL's short-term critical investments over 2022-2025 Tariff Control Period. It is important to note that this amount was arrived at by taking into consideration the cost of both the loan facility and interest of the short-term critical investments as well as levelising the amount based on GWCL's depreciation policy. The above approved capital expenditure covers payments in respect of smart meters, water filters and distribution pipeline extension which

capital investment items are supposed to be put in place over the 2022-2025 Tariff Control Period.

10.1.8 Depreciation

Within the framework of PURC's Rate Setting Guidelines, the Commission approved an annual average depreciation of GHS204.93 Million as against GWCL's proposed amount of GHS841.59 Million for the 2022-2025 Tariff Control Period. It must be noted that the Commission's approval was based on the use of net revalued regulated asset base which excluded assets acquired through grants.

An underpinning reason for the Commission's decision with respect to approval of depreciation as detailed out earlier was that the current macroeconomic conditions and its effect on consumers should be ameliorated by adopting a carrying forward strategy where the full amount of depreciation to be charged as part of the revenue requirement for the 2022-2025 Tariff Control Period could be deferred. The Commission's decision was also based on the fact that significant amount of funds was recovered by GWCL through depreciation in earlier periods, which amount was expected to have been invested in sinking fund to provide cover for future replacement of assets.

10.1.9 Return on Revalued Net Fixed Assets

The Commission acknowledged the effect of current macroeconomic conditions on operations of GWCL just as other regulated utilities in the Electricity Supply Industry Value Chain on one hand and consumers on the other hand as well as its decision to either allow or disallow fair return on revalued net fixed assets of GWCL. In taking decisions on approval or otherwise of return on GWCL's assets, the Commission considered the fact that, completely disallowing return on the Company's assets will create a situation where significant amount of the disallowed return will have to be factored into future Major Tariff Reviews which will result in higher adjustments in tariffs. In light of foregoing rationale and within the context of the Commission's Rate Setting Guidelines for Water Production, Transmission, Distribution and Supply, an average amount of GHS 104.96 Million was approved for GWCL to cover return on revalued net fixed assets (excluding grants procured assets) for the 2022-2025 Tariff Control Period.

10.1.10 Corporate Tax

In respect of Corporate Tax, the Commission approved an annual average of GHS 22.75 Million which is payable by GWCL over the 2022-2025 Tariff Control Period. The approved corporate tax was determined in accordance with Section 2.1.10 of PURC's Rate Setting Guidelines for Water Production, Transmission, Distribution and Supply.

10.1.11 Befesa Desalination Plant Costs

GWCL by a Water Purchase Agreement is to procure on daily basis 60,000 m³ of water from Befesa's Desalination Plant located at Teshie-Nungua. To enable GWCL pay for the full cost of its water purchases from Befesa, the Commission approved an annual average amount of GHS 170.42 Million for 2022-2025 tariff period which is to cover the full annual Capacity Payment and Variable Operation and Maintenance Expenses of the Befesa Desalination Plant.

10.2 Projected Water Production and Sales Volume

The Commission in its analysis approved an annual projected water production volume of 358.83 Mm³, which volume is an average of the aggregated production volumes from GWCL's 90 production systems and Befesa Desalination Plant over the 2022-2025 Tariff Control Period. In terms of water sales volume to be sold to consumers over the Tariff Control Period, the Commission approved projected annual water sales volume of 203.81 Mm³, adjusting for Benchmarked Non-Revenue Water Loss established for GWCL.

10.3 Non-Revenue Water

In terms of Non-Revenue Water performance, a 43.2% loss level was approved for GWCL over the 2022-2025 Tariff Control Period. A Non-Revenue Water Loss trajectory ranging from 45% in 2022 to 41.4% in 2025 was approved taking into consideration of Approved Capital Expenditure for GWCL in the form of Smart Meters, Filters, Distribution Network Expansion Projects among other loss reduction initiatives.

10.4 Non-collectible Revenue (NCR)

The Commission maintained and approved 2% as provision for non-collectible revenue for GWCL.

11.0 CONCLUSION

We have in this decision paper, examined, analysed and presented results from analyses of tariff proposals submitted by Utility Service Providers for consideration by the Commission as well as approval of rates to be charged for the 2022-2025 Tariff Control Period. The tariff proposals were submitted by Volta River Authority (VRA), Ghana National Gas Company Limited (GNGC), Ghana Grid Company (GRIDCo), Electricity Company of Ghana (ECG), Northern Electricity Distribution Company (NEDCo), Enclave Power Company (EPC) and Ghana Water Company Limited (GWCL).

Details in terms of both volume and price of Natural Gas by supply source and Heavy Fuel Oil (HFO) as the key fuels for generation of electrical energy for the 2022-2025 Tariff Control Period, which were presented to the Commission by GNPC, GNGC, VRA and ECG in respect of HFO resulted in the approval of Weighted Average Cost of Gas of USD 5.9060/MMBtu and USD 570/Metric Tonne for HFO.

In respect of power purchases, the Commission approved an annual average Composite Bulk Generation Tariff of GHP 63.1997/kWh for the 2022-2025 Tariff Control Period based on projected annual average electrical energy volume of 20,696 GWh to be supplied to the regulated electricity market by both VRA and selected Independent Power Producers (IPPs) under bilateral contract agreements with ECG for the 2022-2025 Tariff Control Period.

The tariff decision paper also indicated Transmission Service Charge-1 of GHP7.9090/kWh, Transmission Service Charge-2 of GHP2.7020/kWh, Distribution Service Charge-1 of GHP17.0429/kWh and Distribution Service Charge-2 of GHP18.2277/kWh approved by the Commission for the 2022-2025 Tariff Control Period for GRIDCo and the three DisCos namely ECG, NEDCo and EPC.

The approved Composite Bulk Generation Charge, Transmission Service Charge-1 and Distribution Service Charge-1 resulted in an annual average total revenue requirement of GHS15.28 Billion for the electricity sector. This resulted in approval by the Commission of a 27.15% average increase in rates payable by electricity consumers over the 2022-2025 Tariff Control Period.

With regards to water, the Commission approved an annual average total revenue requirement of GHS 2.08 Billion to cover Water Production, Transmission, Distribution and Supply for the 2022-2025 Tariff Control Period. This revenue requirement resulted in approval of a 21.55% average increase across board in water tariffs payable by water consumers for the 2022-2025 Tariff Control Period.

Appendix-1 - Key Assumptions

Summary of Key Assumptions Used in Determination of Natural Gas, Electricity and Water Tariffs

Item	Measure	Value
Fuel Price:		
Natural Gas	US\$/MMBtu	5.9060
HFO (Including In-Plant Handling, Treatment & Related Fees)	US\$/Metric Tonne	570
Macro-Economic Variable:		
Exchange Rate	GHS/US\$	7.5165
Inflation Rate:		
2022	%	16.26
2023-2025	%	8
Hydro Allocation:		
Akosombo GS	GWh	3,528
Kpong GS	GWh	646
Total	GWh	4,174
System Losses:		
Average Transmission System Losses	%	4.10
Average Distribution System Losses	%	21.4
Collection Loss Ratio	%	2
Non-Revenue Water	%	43.2

Appendix-2 - Stakeholder Consultative Meetings and Public Hearings

I. Stakeholder Consultative Meetings - May 04-12, 2022

Stakeholder Category	Institutions
Government Agencies/ Legislature	Ministry of Energy Ministry of Finance Ministry of Sanitation and Water Resources Parliamentary Select Committee on Mines and Energy Parliamentary Select Committee on Works and Housing
Development Partners	World Bank GIZ USAID-West Africa Energy Program (WAEP) Swiss State Secretariat for Economic Affairs (SECO)
Civil Society Organisations/Think Tanks	Africa Center for Energy Policy Institute of Economic Affairs (IEA) CUTS International Ghana Institute for Oil and Gas Institute for Energy Studies Civil Society Platform for Oil and Gas Consumer Protection Agency SNV KITE IDEG CEPIL COSECA INSTEPR ISODEC
Academia	University of Ghana GIMPA UPSA University of Cape Coast
Media	Ghana Television (GTV) TV3 JOY TV/JOY NEWS CITI FM/CITI TV METRO TV ADOM TV/FM PEACE FM United Television (UTV) Ghana News Agency (GNA) Ghanaian Times Ghana Web
Industry/Business Associations	Association of Ghana Industries

II. Public Hearings - May 16-June 14, 2022

Region	Date
Greater Accra	16 th May, 2022
Volta/Oti/Eastern Regions	3 rd June, 2022
Western/Western North/Central Regions	7 th June, 2022
Ashanti/Brong Ahafo Regions	10 th June, 2022
Northern Regions	14 th June, 2022

Appendix-3 - Approved Electricity and Water Rates

I. Electricity Rates Effective September 01, 2022

Tariff Category	Measure	New Tariff Effective September 01, 2022
First Schedule		
BGC VRA	GHp/kWh	37.9560
Composite BGC (VRA and IPPs)	GHp/kWh	63.1997
Second Schedule		
TSC 1	GHp/kWh	7.9090
TSC 2	GHp/kWh	2.7020
Third Schedule		
DSC 1	GHp/kWh	17.0429
DSC 2	GHp/kWh	18.2277
DWC	GHp/kWh	35.2706
Fourth Schedule		
Residential Customers:		
Lifeline Customers:		
0-30 kWh (Exclusive)	GHp/kWh	41.9065
Service Charge	GHS/Month	2.1300
All Other Residential Customers:		
0-300 kWh	GHp/kWh	89.0422
301-600 kWh	GHp/kWh	115.5595
601+ kWh	GHp/kWh	128.3995
Service Charge	GHS/Month	10.7309
Non-Residential Customers:		
0-300 kWh	GHp/kWh	83.7841
301-600 kWh	GHp/kWh	89.1552
601+ kWh	GHp/kWh	133.0919
Service Charge	GHS/Month	12.4282
Special Load Tariff (SLT) Customers:		
Low Voltage - LV		
Energy Charge per kWh	GHp/kWh	132.6125
Service Charge	GHS/Month	500.0000
Medium Voltage - MV		
Energy Charge per kWh	GHp/kWh	100.6863
Service Charge	GHS/Month	500.0000
High Voltage - HV		
Energy Charge per kWh	GHp/kWh	105.6746
Service Charge	GHS/Month	500.0000
High Voltage - Steel Companies		
Energy Charge per kWh	GHp/kWh	74.5315
Service Charge	GHS/Month	500.0000
High Voltage - HV Mines		
Energy Charge per kWh	GHp/kWh	263.9705
Service Charge	GHS/Month	500.0000

II. Water Rates Effective September 01, 2022

New Customer Class	Measure	New Tariff Effective September 01, 2022
Residential		
0-5m ³	GHp/m ³	400.1635
5m ³ +	GHp/m ³	680.9436
Service Charge	GHp/Month	729.3112
Non-Residential		
Service Charge	GHp/Month	729.3112
Sachet Water Producers		
Service Charge	GHp/Month	729.3112
Commercial Bottled Water and Drinks		
Service Charge	GHp/Month	729.3112
Industrial		
Service Charge	GHp/Month	729.3112
Public Institutions/Government		
Service Charge	GHp/Month	729.3112
Public Stand Pipes		
Service Charge	GHp/Month	729.3112
Ports and Harbours		
Service Charge	GHp/Month	729.3112
Bulk Supply		
Service Charge	GHp/Month	729.3112

Note:

Special Commercial refers to bulk customers who use GWCL treated water as the main raw material for bottling water for resale.

Appendix-4 - Methodology for Determination of Natural Gas, Electricity and Water Tariffs

A. Determination of Natural Gas Tariffs

A.1 Weighted Average Gas Commodity Charge

The Weighted Average Gas Commodity Charge (WAGCC) was determined by the Commission using the following formula.

$$WAGCC_t = \sum_i^n ((GCC_n * GMix_n))$$

Where:

WAGCC _t	is Projected Weighted Average Gas Commodity Charge
GCC _n	is Gas Commodity Charge by Gas Supply Source i.e. Jubilee, Sankofa, TEN, N-Gas, etc. as contained in the relevant GSPA
GMix _n	is Gas Supply Mix as Proportion of Total Gas Supply

A.2 Weighted Average Gas Gathering Charge

The Weighted Average Gas Gathering Charge (WAGGC) was determined using the following formulae.

A2.1 Gas Gathering Charge

$$GGC_t = \frac{OpEx_t + DepRAB_t + RtnRAB_t}{GGV_t}$$

Where:

GGC _t	Is Gas Gathering Charge for Regulatory Year 't'
OpEx _t	Is Operating Expenses for Regulatory Year 't'
DepRAB _t	Is Depreciation on Regulated Asset Base for Regulatory Year 't'
RtnRAB _t	Is Return on Regulated Asset Base for Regulatory Year 't'
GGV _t	Is Gas Gathering Volume for Regulatory Year 't'

A.2.2 Weighted Average Gas Gathering Charge

$$WAGGC_t = \sum_i^n ((GGC_n * GMix_n))$$

Where:

WAGGC _t	is Projected Weighted Average Gas Gathering Charge
GGC _n	is Gas Gathering Charge by Gas Supply Source i.e. Jubilee and TEN as Approved by PURC
GMix _n	is Gas Supply Mix as Proportion of Total Gas Supply

A.3 Weighted Average Gas Processing Charge

The Weighted Average Gas Processing Charge was determined using the following formulae.

A3.1 Gas Processing Charge

$$GPC_t = \frac{OpEx_t + DepRAB_t + RtnRAB_t}{GPV_t}$$

Where:

GPC _t	Is Gas Processing Charge for Regulatory Year 't'
OpEx _t	Is Operating Expenses for Regulatory Year 't'
DepRAB _t	Is Depreciation on Regulated Asset Base for Regulatory Year 't'
RtnRAB _t	Is Return on Regulated Asset Base for Regulatory Year 't'
GPV _t	Is Gas Processing Volume for Regulatory Year 't'

A3.2 Weighted Average Gas Processing Charge

$$WAGPC_t = \sum_i^n ((GPC_n * GMix_n))$$

Where:

- WAGPC_t is Projected Weighted Average Gas Processing Charge
GPC_n is Gas Processing Charge by Gas Supply Source i.e. Jubilee and TEN as Approved by PURC
GMix_n is Gas Supply Mix as Proportion of Total Gas Supply

A.4 Weighted Average Gas Transmission Service Charge

The Weighted Average Gas Transmission Service Charge was determined by applying the following formulae.

A4.1 Gas Transmission Service Charge

$$GTSC_t = \frac{OpEx_t + DepRAB_t + RtnRAB_t + CWCA_t + CorpTax_t}{GTV_t}$$

Where:

- GTSC_t Is Gas Transmission Service Charge for Regulatory Year 't'
OpEx_t Is Operating Expenses for Regulatory Year 't'
DepRAB_t Is Depreciation on Regulated Asset Base for Regulatory Year 't'
RtnRAB_t Is Return on Regulated Asset Base for Regulatory Year 't'
CWCA_t Is Cost of Working Capital Allowance for Regulatory Year 't'
CorpTax_t Is Corporate Tax for Regulatory Year 't'
GTV_t Is Gas Transmission Volume for Regulatory Year 't'

A4.2 Weighted Average Gas Transmission Service Charge

$$WAGTSC_t = \sum_i^n ((GTSC_n * GMix_n))$$

Where:

- WAGTSC_t is Projected Weighted Average Gas Transmission Service Charge
GTSC_n is Gas Transmission Service Charge of each Gas Transmission Pipeline including Regulatory Levy as Approved by PURC
GMix_n is Gas Supply Mix as Proportion of Total Gas Supply

A.5 Weighted Average Gas Service Charge

The Weighted Average Gas Service charge was determined by applying the following formula.

$$WAGSC_t = \sum_i^n (GSC_n * GMix_n)$$

Where:

- WAGSC_t is Projected Weighted Average Gas Service Charge
GSC_n is Gas Service Charge as Approved by PURC
GMix_n is Gas Supply Mix as Proportion of Total Gas Supply

A.6 Weighted Average Cost of Gas

The Weighted Average Cost of Gas (WACOG) was determined using the following formula.

$$WACOG_t = WAGCC_t + WAGGC_t + WAGPC_t + WAGTSC_t + WAGSC_t$$

Where:

WACOG _t	Is Projected Weighted Average Cost of Gas
WAGCC _t	Is Projected Weighted Average Gas Commodity Charge
WAGGC _t	Is Projected Weighted Average Gas Gathering Charge
WAGPC _t	Is Projected Weighted Average Gas Processing Charge
WAGTSC _t	Is Projected Weighted Average Gas Transmission Service Charge
WAGSC _t	Is Projected Weighted Average Gas Service Charge

B. Determination of Composite Bulk Generation Charge

The Composite Bulk Generation Charge was computed using the following formula.

$$CBGC = \sum_{i=1}^n (GT_i * GenMix_i)$$

Where:

CBGC	Is Composite Bulk Generation Charge in GHP/kWh
GT _i	Is Electricity Generation Tariff by Power Plant
GenMix _i	Is Each Power Plant's Guaranteed/Contracted Capacity and Energy as stated in underlying PPA as well as Approved Electricity Supply Plan/Electricity Market Oversight Panel (EMOP) Hydro Capacity and Energy Allocation as a proportion of Total Projected Capacity and Energy

C. Determination of Electricity Transmission Revenue Requirement (Added Value)

The Commission determined the revenue requirement for the Transmission Utility (GRIDCo) in by applying the following formula.

$$ARR(Trans)_t = OpEx_t + RnRAB_t + DepRAB_t + CRP(NewTransNIs)_t + CWCA_t + CorpTax_t$$

Where:

ARR(Trans) _t	means Annual Revenue Requirement in respect of Transmission Network Operations commencing Regulatory Year 't'
OpEx _t	means Operating Expenses in respect of Transmission Network Assets for Regulatory Year 't'
RnRAB _t	means Return on Transmission Network Regulated Asset Base commencing Regulatory Year 't'
DepRAB _t	means Depreciation on Transmission Network Regulated Asset Base commencing Regulatory Year 't'
CRP(NewTransNIs) _t	means Capital Recovery Payments in respect of New Investments made by Electricity Transmission Utility commencing Regulatory Year 't'
CWCA _t	means Cost of Working Capital Allowance in respect of Transmission Network Assets commencing Regulatory Year 't'
CorpTax _t	means Corporate Taxes in respect of Transmission Network operations commencing Regulatory Year 't'

C.1 Electricity Transmission Service Charge

The Commission computed the Electricity Transmission Charge using the following formula.

$$TSC-1_t = \frac{ARR(Trans)_t}{ETV_t}$$

Where:

TSC-1 _t	Is Transmission Service Charge-1 for Regulatory Year 't'
ARR(Trans) _t	Is Annual Revenue Requirement in respect of Electricity Transmission Network Operations for Regulatory Year 't'
ETV _t	Is Projected Electricity Transmission Volume for Regulatory Year 't'

D. Determination of Electricity Distribution Utilities Revenue Requirement

The Annual Revenue Requirement (ARR) for Distribution Utilities were determined using the following formula.

$$ARR(Dis)_t = OpEx_t + RnRAB_t + DepRAB_t + CRP(NewDisNIs)_t + CWCA_t + CorpTax_t$$

Where:

ARR(Dis) _t	means Annual Revenue Requirement in respect of Distribution Network Operations commencing Regulatory Year 't'
OpEx _t	means Operating Expenses in respect of Distribution Network Assets for Regulatory Year 't'
RnRAB _t	means Return on Distribution Network Regulated Asset Base commencing Regulatory Year 't'
DepRAB _t	means Depreciation on Distribution Network Regulated Asset Base commencing Regulatory Year 't'
CRP(NewDisNIs) _t	means Capital Recovery Payments in respect of New Investments made by Electricity Distribution Utility commencing Regulatory Year 't'
CWCA _t	means Cost of Working Capital Allowance in respect of Distribution Network Assets commencing Regulatory Year 't'
CorpTax _t	means Corporate Taxes in respect of Distribution Network operations commencing Regulatory Year 't'

D.1 Electricity Distribution Service Charge

The Commission computed the Electricity Distribution Charge using the following formula.

$$DSC-1_t = \frac{ARR(Dis)_t}{ESV_t}$$

Where:

DSC-1 _t	Is Distribution Service Charge-1 for Regulatory Year 't'
ARR(Dis) _t	Is Annual Revenue Requirement in respect of Electricity Distribution Network Operations for Regulatory Year 't'
ESV _t	Is Projected Electricity Sales Volume for Regulatory Year 't'

E. Determination of Total Annual Revenue Requirement for Regulated Electricity Supply Industry Value Chain

The Commission determined the Total Revenue Requirement for the Electricity Supply Value Chain using the following formula.

$$TC_{EUT} = \frac{PPC_t + DSCost_t + SuppCost_t}{(1-TCLR_t)}$$

TC _{EUT}	means Total Cost of Electricity Retail Sale/Supply to Retail Customers in respect of Regulatory Year 't'
PPC _t	means Power Purchase Cost in respect of Regulatory Year 't'
DSCost _t	means Distribution Service Cost, which shall be equal to the Annual Revenue Requirement (Distribution) in respect of Regulatory Year 't'
SuppCost _t	means Supply Cost which shall be equal to Annual Revenue Requirement (Retail Sale/ Supply) in respect of Regulatory Year 't'
TCLR _t	means the Target Collection Loss Ratio in respect of Regulatory Year 't'

F. Determination of Water Production, Transmission, Distribution and Supply Revenue Requirement

The Commission determined Water Production, Transmission, Distribution and Supply Annual Revenue Requirement using the following formula.

$$ARR_t = OpEx_t + RnRAB_t + DepRAB_t + CRP(NewWIs)_t + CWCA_t + CorpTax_t + IWPC_t$$

Where:

ARR _t	means Annual Revenue Requirement in respect of Water Production, Transmission, Distribution and Supply Operations commencing Regulatory Year 't'
OpEx _t	means Operating Expenses in respect of Water Production, Transmission, Distribution and Supply Operations Assets for Regulatory Year 't'
RnRAB _t	means Return on Water Production, Transmission, Distribution and Supply Operations Regulated Asset Base commencing Regulatory Year 't'
DepRAB _t	means Depreciation on Water Production, Transmission, Distribution and Supply Operations Regulated Asset Base commencing Regulatory Year 't'
CRP(NewWIs) _t	means Capital Recovery Payments in respect of New Investments made by Water Utility commencing Regulatory Year 't'
CWCA _t	means Cost of Working Capital Allowance in respect of Water Production, Transmission, Distribution and Supply Operations Assets commencing Regulatory Year 't'
CorpTax _t	means Corporate Taxes in respect of Water Production, Transmission, Distribution and Supply Operations commencing Regulatory Year 't'
IWPC _t	means Independent Water Purchase Cost

F.1 Average Water End-User Tariff

The Commission computed the Average Water End-User Tariff using the following formula.

$$AWT_t = \frac{ARR_t}{WSV_t}$$

Where:

AWT _t	Is Average Water Tariff for Regulatory Year 't'
ARR _t	Is Annual Revenue Requirement in respect of Water Production, Transmission, Distribution and Supply Operations for Regulatory Year 't'
WSV _t	Is Projected Water Sales Volume for Regulatory Year 't'