



PUBLIC UTILITIES REGULATORY COMMISSION



Rate Setting Guidelines for **Procurement and Supply of Electricity Generation Capacity and Energy for the Regulated Electricity Market**



June 2023

CONTENT AND STRUCTURE OF DOCUMENT

This document is organized as follows:

- Part 1 - Methodology for Determination of Cost of Generation Capacity
- Part 2 - Methodology for Determination and Recovery of Fuel Supply Cost
- Part 3 - Methodology for Determination of Bulk Generation Charge
- Part 4 - Indexation of Monthly Billing of Capacity and Energy Procured for the Regulated Electricity Market
- Part 5 - Publication of Underpinning Tariff Parameters and Data

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PURPOSE, SCOPE, APPLICATION AND REVISION

Purpose

These Guidelines are issued by the Public Utilities Regulatory Commission (PURC) under Sections 3 (a), (b), 17 and 18 of the Public Utilities Regulatory Commission Act, 1997 (Act 538), and Section 25 of the Renewable Energy Act, 2011 (Act 832) as amended by the Renewable Energy (Amendment) Act, 2020 (Act 1045).

The Guidelines are issued in accordance with Government Policy for Competitive Procurement of Energy Supply and Services Contracts and Policy Guidelines for Least Cost Fuel Procurement. The policy stipulates that generation capacity additions and fuel supply arrangements shall be procured in a sustainable and least-cost manner in accordance with the Public Procurement Act, 2003 (Act 663), as amended by the Public Procurement (Amendment) Act, 2016 (Act 914), and other applicable laws of Ghana.

The purpose of these guidelines is to set out the principles, methodology and processes applied or to be applied by the PURC for:

- a) the approval of tariffs for existing power plants; and
- b) the determination of a Reference Capacity Charge for the competitive procurement of energy supply and services contracts

Scope and Application

The Guidelines apply to the following categories of power plants.

- | | |
|---|---------------------------|
| a) Existing power generation and supply by Independent Power Producers and State- Owned Power Plants governed by Power Purchase Agreements. | Type A |
| b) Existing power generation and supply by Independent Power Producers and State- Owned Power Plants whose Useful Investment Life and PPAs have expired but which continue to supply electricity to the regulated market. | Type B₁ |
| c) Existing power generation and supply with no Power Purchase Agreements. | Type B₂ |
| d) New Entrant Power Plants. | Type C |

Effective Date, Review, Additions and Amendments


- i. These Guidelines shall take effect from June 2022.
- ii. The Commission reserves the right to review or add to the Guidelines periodically. Review or addition shall be done in consultation with stakeholders and in accordance with Act 538. ("the Act").
- iii. Amendments, additions and relaxations to the guidelines may be made only with the approval of the Commission.

Enforceability

These Guidelines are issued as an Order of the Commission and are enforceable in accordance with the Act.

In accordance with Section 17 of the Act, the Commission reserves the right, at any time, to investigate the cost of production of a generator in order to determine the reasonableness of the cost, where a public utility does not itself produce or generate the service which it provides to consumers, but obtains it from another source.

Approved by the Commission on the.....⁹ Day of^{June} 2023

Signed.....

Mr. Ebo B. Quagraine
Chairman, PURC

Signed.....

Dr. Ishmael Ackah
Executive Secretary, PURC

DEFINITIONS AND INTERPRETATION

TERM	DEFINITION
Act	Means the Public Utilities Regulatory Commission Act, 1997 (Act 538).
Bulk Supply Tariff	Means the price of electricity at the bulk supply point set to recover the capacity and energy charges of generation and transmission service charges.
Commission	Means the Public Utilities Regulatory Commission established under the Act.
Consumer	Means a person or his successor, who purchases, receives or makes use of any service provided by a public utility and who does not deliver or re-sell the service to others.
Corporate Tax	Means as stipulated in the Ghana Income Tax Act, 2015 (Act 896) and its amendments.
Cost of Debt	Means the effective interest rate that a public utility pays on its current debt to fund its operations.
Cost of Equity	Means the rate of return on investment that is required by shareholders of a public utility.
Country Risk Free Rate	Means the return that an investor can expect on an investment in a country without default risk.
Depreciation	Means a measure of the consumption, use or wearing out of a generation asset over the period of its economic life.
Exchange Rate (GHS/ US Dollars)	Means the Average Daily Inter Bank Foreign Exchange Rate between the Ghana Cedi and US Dollar published by the Bank of Ghana over the 20 Business Days preceding the relevant date of determination.
Generation	Means the process of producing electrical power (kilowatts or kW) and energy (kilo-watt hours or kWh) through conversion of other primary forms of energy.
Net Effective / Guaranteed Capacity	Means PURC Approved Percentage of installed capacity (MW) of a power plant which is available for dispatch at all times taking into consideration PURC Benchmark ambient conditions.
Plant Heat Rate	Means the measure of efficiency of power plants that convert fuel into heat and into electricity.
Power Purchase Agreement	Means bilateral contracts established between Distribution Utilities and wholesale power suppliers for the purchase of electrical power and energy.
PURC	Means the Commission.
Regulatory Year	Means a designated consecutive twelve-month period of operations, for which the approved tariffs shall apply during the tenure of the Power Purchase Agreement.

TERM	DEFINITION
Reference Capacity Charge	Means a maximum or ceiling price approved by PURC upon which potential Electrical Generation Capacity Suppliers shall bid. For purposes of preventing collusion/uncompetitive procurement outcomes, there shall be no disclosure of the Reference Capacity Charge to bidders.
Selected Power Plant Type	Means simple cycle power plants, combined cycle power plants and any other generation facilities determined by PURC in consultation with the Energy Commission.
Spot Market	Means power supply transactions to settle: (i) the differences between the contractual obligations of wholesale power suppliers to distribution utilities and/or other customers and the hour-by-hour amounts of power and energy produced on the basis of economic merit order dispatch of generation facilities in the National Interconnected System, and (ii) the differences between the hour by hour and contractual consumption of distributors and/or other customers.
Type A Plant	Means an existing and operating Independent Power Producer (IPP) or State-Owned power plant, either hydroelectric, thermal or renewable / non-conventional and governed by Power Purchase Agreement.
Type B1 Plant	Means an existing and operating Independent Power Producer (IPP) or State-Owned power plant which has served its Useful Investment Life but continues to supply electricity to the regulated market.
Type B2 Plant	Means an existing and operating power plant with no Power Purchase Agreement.
Type C Plant	Means a new entrant power plant.
US CPI	Means the Average US Standard Consumer Price Index of the relevant Year published by the United States Department of Labour Bureau of Labour Statistics (http://data.bls.gov), as the series Consumer Price Index - All Urban Consumers (series ID: CUUR000SAO), not seasonally adjusted for the area "U.S. city average" item "all items", base period "1982-84=100", with the column "Annual" containing the relevant values.
Useful Investment Life	Means the investment life of a generation asset as determined by the PURC with a minimum of 20 years for thermal generation assets and 45 years for hydroelectric generating stations.
Wholesale Electricity Market	Means an electricity market established by market rules approved by the Energy Commission for bulk trading of electricity, ancillary services or any other related electricity supply product or service.
Wholesale Supplier	Means a person licensed under the Energy Commission Act, 1997 (Act 541) to install and operate a facility to procure or produce electricity for sale to a bulk customer or to a distribution company for distribution and sale to consumers.

Interpretations

These Guidelines shall be interpreted in accordance with Act 538 and Government Policy Guidelines on Energy Supply and Services Contract and other applicable laws of Ghana.

Capitalised terms used but not defined shall have the meanings assigned in the Act.

EQUATION PARAMETERS

Allowable Rate of Return	As calculated pursuant to Section C2.1.4
Capacity Charge	As calculated pursuant to Part A1 & Part C
Composite Bulk Electricity Generation Charge	As calculated pursuant to Section 3.1
Corporate Tax	As calculated in pursuant to Section C2.4
Depreciation	As calculated pursuant to Section C2.1.2
Fixed Operation & Maintenance Expenses (FOMEx)	As calculated pursuant to Part A3 & Section C2.2
Fuel Recovery Charge	As calculated pursuant to Section 2.4
Non-Fuel Variable Operation & Maintenance Ex-penses (NFVOM)	As calculated pursuant to Section 2.5
Return on Debt	As calculated pursuant to Section C2.1.4.2
Return on Equity	As calculated pursuant to Section C2.1.4.1
Total Costs of Electricity Generation	As calculated pursuant to Section 3.2
Working Capital Allowance	As calculated pursuant to Section C2.3

PART 1: METHODOLOGY FOR DETERMINATION OF COST OF PROCURING GENERATION CAPACITY

The cost at which a Distribution Company (DisCo) shall procure generation capacity whether from an existing power plant or a new entrant power plant shall be determined by PURC as a Capacity Charge. The Capacity Charge comprises Capital Costs and Fixed Operation and Maintenance Costs.

PART A: Existing Power Plants – Type A Plants

A1. Capacity Charge for Conventional Type A Plants

The tariffs approved by the PURC for a plant under a Power Purchase Agreement (PPA) existing prior to the effective date of these Guidelines, shall remain applicable as provided for in the PPA.

In determination of the Capacity Charge for a Type A Plant, the methodology adopted by the PURC is as follows:

$$CC = \frac{PURCAppCRC + WCA + FOMEx + CorpTax}{NEGC}$$

Where:

CC Is Capacity Charge (USD/MW/Year)

PURCAppCRC is Gas Commodity Charge by Gas Supply Source i.e., Jubilee, Sankofa, TEN, N-Gas, etc. as contained in the relevant GSPA

WCA Is PURC Approved Benchmark/Standard Working Capital Allowance calculated in accordance with Section C2.3

FOMEx Is PURC Approved Benchmark/Standard Fixed Operation and Maintenance Expenses calculated in accordance with Section C2.2

CorpTax Is Corporate Tax calculated in accordance with Section C2.4

NEGC Is Net Effective/Guaranteed Capacity (MW)

A2. Capacity Charge for Non-Conventional Type A Plants

A non-conventional Type A Plant is not entitled to recover its Capacity Charge on the basis of Capacity. Such plants shall be entitled to recovery of their Capacity Charge on the basis of energy determined by PURC, using their capacity factor and net effective capacity (kW/MW)

A3. Fixed Operation and Maintenance Costs

In determination of fixed operation and maintenance costs for a Type A Plant, the methodology adopted by the PURC is as provided below. This methodology shall also apply to existing operating Independent Power Producers (IPPs) which have served their useful life and fully recovered their investment costs but which continue to supply electricity to the regulated market, that is, Type B1 Plants.

$$FOMEx_{t+1} = FOMEx_t * (CPI_{Actual} / CPI_{Base})$$

Where:

FOMEx_{t+1} Is Fixed Operation and Maintenance Recovery Charge for Regulatory Year (t)

FOMEx_t Is Base Fixed Operation and Maintenance Recovery Charge as Approved by PURC

CPI_{Actual} Is Actual Consumer Price Index of Billing Period (t) as Published by US Bureau of Labour Statistics (series id: CUUR0000SA0).

CPI_{Base} Is Consumer Price Index as published by US Bureau of Labour Statistics on effective date of PURC Approved Tariff (series id: CUUR0000SA0).

allowing such revaluations will lead to over-recovery of their capital/investment costs. However, where revaluations of such power plants are allowed, tariff revenue from such revaluation shall be paid fully into a sinking fund established by the off-taker.

Upon expiry of the contractual period of a hydroelectric generating station under contract², the Capacity Charge shall be determined as per 'PART A' of these guidelines taking into account its revaluation report.

PART B: Existing Power Plants – Type B Plants

B1. Type B1 Plants – Expired PPA

The tariff at which a Type B1 plant continues to supply electricity to the regulated market upon expiry of its PPA, shall be determined and approved by PURC in accordance with these guidelines as follows.

B1.1 Disallowance of Capital Recovery Charge

PURC shall restrict recovery of Capacity Charge to the approved fixed operation and maintenance charge only; hence recovery of the Capital Recovery Charge component of the Capacity Charge formula shall be disallowed. This shall apply to both hydroelectric generating stations under contract¹ and thermal power plants in the Type B1 category.

The disallowance is due to the expiry of the Useful Investment Life of 20 years which formed the basis of PURC's determination and approval of their Capital Recovery Charge; hence capital/investment costs for Type B1 Plants are fully recovered after 20 years.

B1.2 Effect of Revaluation

Thermal power plants under Power Purchase Agreements (PPAs) shall not benefit from periodic revaluation of their assets since

B1.3 Fixed Operation and Maintenance Costs

For plants in the Type B1 category, fixed operation and maintenance costs shall be determined as provided in Section A2 of these Guidelines above.

B2. Type B2 Plants – No PPA

The tariff approved by the PURC between a generation utility and a DisCo prior to the effective date of these guidelines, where no PPA exists, shall remain as approved by PURC in accordance with these guidelines.

B2.1 New Investments to Extend Useful Investment Life

Where a Type B Plant is assessed collaboratively by the Energy Commission and PURC, and approved by the Energy Commission as capable of providing electrical energy generation capacity efficiently but requires new investments (overhaul investments) for such purpose, the PURC shall determine a new Capacity Charge for the plant taking into consideration the new investments (overhaul investments) made. The new Capacity Charge so determined by the PURC shall be made up of Capital Recovery Charge including Corporate Tax, Fixed Operation and Maintenance Charge and Cost of Working Capital Allowance.

¹ Bui Hydroelectric Generating Station.

² Bui Hydroelectric Generating Station.

PART C: New Entrant Power Plants – Type C Plants

C1. Mandatory Competitive Procurement

From the effective date of these Guidelines, no new generation capacity and energy shall be procured for the regulated market unless it is competitively procured

C2. Reference Capacity Charge for New Entrant Power Plants

The procurement of generation capacity and energy under a competitive procurement process for deployment in the regulated electricity market shall be based on a Reference Capacity Charge determined by PURC in line with these Guidelines and applicable law.

The Commission shall determine and publish annually, a maximum or ceiling price known as the Reference Capacity Charge. Promoters or potential generators shall bid on the Reference Capacity Charge to supply electricity to the regulated market regardless of equipment or plant type.

The winning Bid Price following a competitive procurement process shall be equal to or lower than the Reference Capacity Charge approved by the PURC.

The Reference Capacity Charge for Type C plants shall be determined in line with these guidelines and other applicable laws as follows:

$$RCC_t = \frac{(PABCapC * CRF) + WCA + FOMEx + CorpTax}{NEGC}$$

Where:

RCC_t Is Reference Capacity Charge (USD/MW) for Initial Regulatory Year

CRF Is Capital Recovery Factor using PURC Approved Useful Investment Life and a PURC determined Weighted Average Cost of Capital in accordance with Section C2.1.1 as Discount Rate by PURC

WCA Is Working Capital Allowance calculated in accordance with Section C2.3

FOMEx Is PURC Approved Benchmark/Standard Fixed Operation and Maintenance Expenses calculated in accordance with Section C2.2

CorpTax Is Corporate Tax calculated in accordance with Section C2.4

CorpTax Is Corporate Tax calculated in accordance with Section C2.4

NEGC Is Net Effective/Guaranteed Capacity (MW)

C2.1 Capital Recovery Charge

In determining the Reference Capacity Charge for Type C plants, PURC shall determine the Capital Recovery Charge as annuity of PURC Approved Benchmark/Standard Capital/Investment Cost. However, as per the formula captured in Section C2, Capital Recovery Charge for an existing operating hydroelectric generation station which has been revalued shall be determined by PURC either as an annuity of replacement value of assets in service or as combination of depreciation plus return on such assets.

C2.1.1 Capital Recovery Factor

The capital recovery factor, in other words annuity, shall be determined by PURC using the Useful Investment Life for thermal power plants and hydroelectric generating stations as well as Weighted Average Cost of Capital as discount rate. Specifically, the Capital Recovery Factor shall be calculated for each type of technology (using the Useful Investment Life) as follows:

$$CRF = \frac{WACC * (1 + WACC)^P}{(1 + WACC)^P - 1}$$

Where:

- CRF Is Capital Recovery Factor.
- P Is PURC Approved Useful Investment Life applicable to each technology.
- WACC Is Weighted Average Cost of Capital calculated in accordance with Section C2.1.4.

C2.1.2 Depreciation

Depreciation expense shall be determined for an existing operating hydroelectric generation asset in accordance with the International Financial Reporting Standards (IFRS). The annual depreciation expense so determined shall be appropriately adjusted using Ghana Cedi-U.S. Dollar Exchange Rate in Regulatory Year (t+1) as an adjustment factor³.

C2.1.3 Gearing

In calculating the allowable rate of return on RAB, PURC shall apply its benchmark gearing level of 30% equity and 70% debt⁴.

C2.1.4 Allowable Rate of Return on Regulated Asset

The allowable rate of return shall be set equal to the estimated weighted average cost of capital (WACC). The PURC shall determine the WACC, by taking into consideration, cost of equity and cost of debt as well as the Commission's benchmark debt and equity ratios using the following formulae:

$$WACC = \left[\frac{E}{D+E} \right] * K_e + \left[\frac{D}{D+E} \right] * K_d$$

Where:

- E Is Equity
- D is Debt

K_e Is Cost of Equity Using the Capital Asset Pricing Model (CAPM)

K_d Is Cost of Debt

C2.1.4.1 Cost of Equity

The PURC shall adopt the following methodology to determine the Cost of Equity.

$$R_e = R_{f_G} + \text{Beta} * (\text{CRP})$$

Where:

R_{te} Is Required Rate of Return on Equity

R_{f_G} Is Ghana's Risk-Free Rate (Ghana Eurobond Rate Coinciding with Multi-Year Major Tariff Review Test Year)

Beta Is Global Electricity Generation Utility Asset Beta in relation to US Market Index

CRP Is Ghana's Country Risk Premium

Alternatively, where no 5-Year Ghana Government Eurobond Issue exists, PURC shall adopt one of the following methodologies to determine the Cost of Equity.

Methodology-1

$$R_e = R_{f_{GRS}} + \text{Beta} * (\text{CRP})$$

Where:

R_{te} Means Required Rate of Return on Equity

R_{f_G} Means Ghana's Risk-Free Rate (Ghana Eurobond Rate Coinciding with Multi-Year Major Tariff Review Test Year)

³ This is not applicable to existing operating IPPs due to the restriction on non-revaluation of their assets.

⁴ Refers to Corporate Entities which have Debt as part of their Capital Structure. The Commission's Benchmark Debt Component in the Capital Structure is 70%. However, where the Cost of Debt is determined by the Commission to be significantly lower than the Average Market Cost of Debt, the Commission may opt for a higher Debt Proportion beyond the 70% in the Capital Structure.

Beta Means Global Electricity Generation Utility Asset Beta in relation to US Market Index

CRP Means Ghana's Country Risk Premium

Methodology-2

$$R_e = R_{fUS} + (\text{Beta} * \text{ERP}_{MM}) + \text{CRP}$$

Where:

R_{fUS} Means Required Rate of Return on Equity

R_{te} Means US Risk Free Rate (5-year Treasury Bond Rate Coinciding with Multi-Year Major Tariff Review Test Year)

Beta Means Global Electricity Generation Utility Asset Beta in relation to US Market Index

ERP_{MM} Means Equity Risk Premium for Mature Market

CRP Means Ghana's Country Risk Premium

C2.1.4.2.1 Pre-Tax Cost of Debt

$$\text{PrCoD} = R_{fUS} + \text{CDS}$$

Where:

PrCoD Is Pre-Tax Cost of Debt

R_{fUS} Is US Risk Free Rate (US Treasury Note Rate Coinciding with Multi-Year Major Tariff Review Test Year)

CDS Is Ghana's Country Default Spread

C2.1.4.2.2 Post-Tax Cost of Debt

$$\text{PoCoD} = (R_{fUS} + \text{CDS}) * (1 - T)$$

Where:

PoCoD Is Post Tax Cost of Debt

R_{fUS} Is US Risk Free Rate (5-Year US Treasury Note Rate)

CDS Is Ghana's Country Default Spread (Risk of Default on Debt Obligation)

T Is Corporate Tax Rate

C2.1.4.1.1 Equity Beta

To determine Equity Beta for purposes of computing Cost of Equity, PURC shall adopt the following methodology:

$$\beta_L = \beta_U * [1 + (1 - T)D/E]$$

Where:

β_L Is Levered Beta (Equity Beta)

β_U Is Unlevered Beta (Asset Beta)

T Is Corporate Tax

D Is Market Value of Debt

E Is Market Value of Equity

C2.1.4.2 Cost of Debt

The PURC shall adopt the following methodologies to determine the Cost of Debt.

C2.2 Fixed Operation and Maintenance Expenses for Type C Plants

For Type C Plants, the PURC shall apply its Approved Fixed O&M Benchmark Percentage to the Initial Infrastructure/Capital Cost approved by the Commission using the following formula:

$$\text{FOMEx}_t = \text{PAInC} * \gamma$$

Where:

FOMEx_t Is Initial Fixed Operation and Maintenance Expenses

PAInC Is PURC Approved Initial Infrastructure Cost

γ Is PURC Approved Fixed O&M Benchmark Percentage

C2.3 Cost of Working Capital Allowance

The cost of working capital allowance for the Regulatory Year (t) shall be calculated as follows:

$$CWCA_t = \frac{(\text{Lag (days)}_t - \text{Lead (days)}_t) * \text{OpEx}_t * \text{WACC}}{365}$$

Where:

CWCA _t	Is Cost of Working Capital Allowance calculated for Regulatory Year (t)
Lag Days	Is Average Debtor Days calculated for Regulatory Year (t)
Lead Days	Is Average Creditor Days calculated for Regulatory Year (t)
OpEx _t	Is Sum of Operating Expenses calculated for Regulatory Year (t)
WACC	Is Weighted Average Cost of Capital

C2.4 Corporate Tax

Corporate tax shall be determined and included in the Annual Revenue Requirement for electricity generation utilities in accordance with the applicable Tax Laws of the Ghana Revenue Authority. To that end, the following formula shall be employed:

$$\text{CorpTax}_t = (\text{Pre-Tax WACC} - \text{Post-Tax WACC}) * \text{RAB}$$

Where:

CorpTax _t	Means Corporate Tax
Pre-Tax WACC	Means Weighted Average Cost of Capital Including Corporate Tax Percentage
Post-Tax WACC	Means Weighted Average Cost of Capital Excluding Corporate Tax Percentage

RAB

Means PURC Approved Test Year Regulatory Asset Base for Existing Power Plants or PURC Approved Project Investment Cost for New Entrant Power Plants

C3. Recovery of Capital Investment Cost and Capacity Utilisation

The recovery of capital investment cost and capacity utilisation shall apply to both conventional and non-conventional energy generating facilities.

C3.1 Conventional Type C Plants

Conventional Type C Plants procured under Take-or-Pay Power Purchase Agreements, shall be allowed to recover their capital investment cost over the Useful Investment Life (years) of such power plants as stated in their PPAs.

C3.2 Non-Conventional Type C Plants

Non-Conventional (Renewable Energy) Type C Plants shall not be allowed to recover their capital investment cost under Take-or-Pay Power Purchase Agreements but rather under Take-and-Pay Power Purchase Agreements.

C3.3 Determination of Capacity Utilisation

In determining capacity utilisation, the approved lifespan (years) of operation of the power plant shall be converted into hours of capacity utilisation, calculated as follows:

$$\text{LCU} = \text{APCU} * \text{NHY} * \text{ULP}$$

Where:

LCU	Is Lifespan Capacity Utilisation (Hours)
APCU	Is PURC Approved Annual Capacity Utilisation (%)
NHY	Is Total Number of Hours in a Year
ULP	Is PURC Approved Useful Life of Power Plant (Years)

Thus, where a new entrant power plant has not achieved or operated for the total number of hours of lifespan capacity utilisation but has recovered its capital investment cost via Capacity Charge payments by the off-taker, the plant shall not be allowed to be decommissioned but continue to operate over the remaining total number of hours of the PURC approved lifespan capacity utilisation as contained in its Power Purchase Agreement⁵.

In terms of recoverable tariffs, the New Entrant Power Plant shall be entitled to Fixed

Operation and Maintenance Costs and Non-Fuel Variable Operation and Maintenance Costs only, as approved by the PURC.

C3.4 No Objection Provision and Validity of Winning Bid Capacity Charge

The winner of competitively bid new entrant power plant shall submit the winning Bid Price/Capacity Charge through the regulated off-taker, to PURC for a no objection. The Winning Bid Price/Capacity Charge for which PURC has provided a no objection shall have a validity period not exceeding two years.

PART 2: METHODOLOGY FOR DETERMINATION AND RECOVERY OF FUEL SUPPLY COST

2.1 Mandatory Competitive Fuel Procurement Under Supply Contracts

Fuel for power generation by all plant categories, that is Plant Types A, B1, B2 and C shall be procured in line with the Government Policy Guidelines on Least Cost Procurement of Fuel.

2.2 Recovery of Fuel Supply Cost

The cost of fuel shall be recovered as fuel recovery charge, which shall be determined by the Commission as a pass-through cost in energy generation tariffs in accordance with these Guidelines.

2.3 Investigation of Fuel Supply Contracts

In accordance with Section 17 and 24 (3) of Act 538, the Commission may investigate fuel supply contracts to determine the appropriate cost to be passed through tariffs. Section 17(1) provides:

“In order to assess the cost of production of a service by a public utility for the purposes of this Act, the Board may investigate and determine whether an expenditure incurred by the public utility is justified or reasonable”.

In investigating fuel supply, the Commission shall take cognisance of benchmark specific fuel characteristics and associated costs including the following where applicable.

1. Grade/Quality
2. Calorific Value
3. Transportation
4. Premium and Fuel Handling Surcharges

2.4 Submission of Fuel Analysis Report

Fuel procured under Government Policy on Least Cost Fuel Procurement shall be subject to quality analysis by a licensed Laboratory or Authority. Such Laboratories or Authorities shall issue reports, specifying findings and submit same to PURC. The PURC shall review the laboratory findings vis-à-vis its Benchmark fuel characteristics as and when fuel is procured. Where fuel characteristics as analysed vary markedly from PURC Benchmark, PURC shall assume a price for such fuel(s) on the basis of variations in quality characteristics.

2.5 Recovery of Fuel Supply Cost/Fuel Recovery Charge

In determining the Fuel Recovery Charge PURC shall:

1. Determine the Heat Rate of Selected Plant Type; and
2. Ascertain the Delivered Fuel Cost per Least Cost Fuel Procurement Policy

2.5.1 Determination of Heat Rate

Contractual heat rates to be included in Power Purchase Agreements (PPAs) negotiated between New Entrant Power Plants and a Distribution Company as off-taker shall be determined in line with PURC's methodology provided for that purpose as contained in these Guidelines. In that regard, the Commission shall establish Heat Rates for both Combined Cycle power plants and Simple Cycle power plants using the following data and methodology.

1. Manufacturer's Nameplate Heat Rate (MNPHR) based on ISO conditions at stated ambient temperature conditions.

- Six monthly average ambient temperature conditions of Ghana as published periodically by the Ghana Meteorological Agency.

The Commission shall use the following formula to determine PURC's Approved Reference Heat Rate for both Combined Cycle and Simple Cycle Power Plants.

$$PURC_{ARHR} = MNPHR_{@ISOCon} + (MNPHR_{@ISOCon} * OvDiE)$$

Where:

$PURC_{ARHR}$	Is PURC Approved Reference Heat Rate
$MNPHR_{@ISOCon}$	Is Manufacturer's Nameplate Heat Rate at Stated ISO Condition
OvDiE	Is Overall Deterioration in Efficiency (%) due to Degree Change in Ambient Condition as stated by Manufacturer and computed using Ghana Meteorological Agency's Six-Month Average Published Temperature Data

The heat rates determined on the basis of the above methodology shall be monitored by PURC on periodic basis to ensure compliance.

2.5.2 Delivered Fuel Cost

PURC shall ascertain the delivered fuel cost as per the requirements of the Least Fuel Cost Procurement Policy.

PURC shall not approve the cost of any fuel which has not been procured in accordance with the Least Fuel Cost Procurement Policy to be passed through the tariff.

However, where circumstances dictate the use of fuel that has not been procured in line with the Least Fuel Cost Procurement Policy, the cost of such fuel shall be justified for PURC's consideration, approval and pass-through as Fuel Recovery Charge.

2.5.3 Fuel Recovery Charge

Upon establishment and approval of heat rates and delivered fuel cost, the Commission shall determine the Fuel Recovery Charge as follows:

$$FRC = PURC_{HR} * DFC * 10^6$$

Where:

FRC	Is Fuel Recovery Charge
$PURC_{HR}$	Is PURC Approved/Benchmark Plant Heat Rate
DFC	Is Delivered Fuel Cost per Least Cost Fuel Procurement Policy

2.6 Non-Fuel Variable Operation and Maintenance Costs

2.6.1 Type A, B1 and B2 Plants

The Commission shall allow hydroelectric and thermal generating plants to charge non-fuel variable operation and maintenance charges approved by the Commission using the following formula. This formula shall also be applicable to existing operating Independent Power Producers who have served their useful life and fully recovered their investment costs but continue to operate.

$$NFVOMC_{t+1} = NFVOMC_t * (CPI_{Actual} / CPI_{Base})$$

Where:

$NFVOMC_{t+1}$	Is Non-Fuel Variable Operation and Maintenance Recovery Charge for Regulatory Year (t+1)
$NFVOMC_t$	Is Non-Fuel Variable Operation and Maintenance Recovery Charge as Approved by PURC

CPI_{Actual} Is Actual Consumer Price Index of Billing Period (t) as Published by US Bureau of Labour Statistics (series id: CUUR0000SA0).

CPI_{Base} Is Consumer Price Index as published by US Bureau of Labour Statistics on effective date of PURC Approved Tariff (series id: CUUR0000SA0).

$$NFVOMC_t = PAMMCC * \lambda$$

Where:

$NFVOMC_t$ Is Initial Non-Fuel Variable Operation and Maintenance Costs

$PAMMCC$ Is PURC Approved Major Maintenance and Consumables Costs

λ Is PURC Approved NFVOM Benchmark Percentage

2.6.2 Type C Plants

For new entrant power plants, PURC shall apply its approved Non-Fuel Variable O&M benchmark percentage to major maintenance and consumables costs approved by the Commission using the following formula.

PART 3: METHODOLOGY FOR DETERMINATION OF COMPOSITE BULK GENERATION CHARGE

3.1 Composite Bulk Electricity Generation Charge

For purposes of establishing a uniform price at which all DisCos shall procure their capacity and energy, PURC shall determine a Composite Bulk Generation Charge using the formula below, taking into consideration the following vis-à-vis the approved PURC tariff for each Power Plant:

- a. Contracted capacity and energy as stated in the underlying PPAs
- b. Approved Electricity Supply Plan
- c. Hydro Allocation Volume by the Electricity Market Oversight Panel (EMOP)

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

Where:

- CBGC Is Weighted Bulk Generation Charge in GHp/kWh
- GT_i Is Electricity Generation Tariff by Power Plant as per Section 3.2

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

3.2 Total Electricity Generation Charge Per Power Plant

The Total Electricity Generation Charge for each power plant shall be determined as follows:

$$TEGC = CC + EC$$

Where:

- TEGC Is Total Electricity Generation Charge
- CC Is Capacity Charge
- EC Is Energy Charge which is FRC plus NFVOMC

PART 4: DECISION VARIABLES, OVER AND UNDER RECOVERIES AND TRIGGER CONDITIONS

4.1 Wholesale Electricity Market Participation by DisCos

Electricity Distribution Utilities (DisCos) licensed under Section 26 of the Energy Commission Act, 1997, (Act 541) as wholesale electricity market participants and as per Section 2(1), b(ii) of the Electricity Regulations, 2008 (LI 1937), shall procure their firm capacity and associated energy requirements of their customers from the wholesale electricity market under long-term Power Purchase and Supply Contracts.

Similarly, as per Section 2(1), b(ii) of the Electricity Regulations, 2008 (LI 1937), DisCos may procure their capacity and associated energy from the Spot Market organised by the Market Administrator and System Operator (MA&SO). These transactions in the Spot Market may occur under the following conditions.

1. Where a wholesale supplier is unable to meet its contractual capacity and associated energy supply obligations to a DisCo either completely or partially and where such obligations as per the contract can either be met by the wholesale supplier or DisCo from the wholesale electricity market.
2. Where a DisCo's capacity and associated energy requirements at a particular point in time exceed its contracted capacity and associated energy, requiring the deficit to be procured from the wholesale electricity market.

4.2 Purchase Price of Capacity and Energy from Wholesale Electricity Market

The purchase price of power and energy procured by a DisCo from the Wholesale

Electricity Market shall comprise a capacity charge plus an energy charge determined as follows:

4.2.1 Long-term Power Purchase and Supply Contracts

1. Capacity Charge set at a value equal to the investment annuity and approved discount rate plus fixed operation and maintenance costs as per PART A and PART B of these Guidelines.
2. Energy Charge as captured in PART 2 of these Guidelines.

4.2.2 Spot Market Transactions

Capacity and Energy Charge determined by supply and demand conditions on the wholesale electricity market.

4.3 Treatment of Purchase Price of Capacity and Energy Procured from Wholesale Electricity Market

The treatment of purchase price of capacity and associated energy procured by a DisCo from the wholesale electricity market shall be based on the two conditions stipulated in Section 3.1 of these Guidelines.

1. Under Condition (1) of Section 3.1, the cost of capacity and energy procured shall be borne wholly by the wholesale supplier and shall not be treated as a pass-through cost to consumers.
2. Alternatively, where the capacity and energy so procured, is paid for by the DisCo, the wholesale supplier shall reimburse the DisCo with the full purchase price of the capacity and electrical energy procured.

3. In the event that the price of capacity and electrical energy procured in the wholesale electricity market is higher than the contracted price agreed between the wholesale supplier and the DisCo, the wholesale supplier shall pay to the DisCo the difference between the wholesale electricity market price and the contracted price.
4. Under Condition (2) of Section 3.1, the price paid by the DisCo on the wholesale electricity market for capacity and electrical energy procured shall be treated as a pass-through cost to end users.

4.4 Purchase Price of Electrical Energy from Embedded Power Generation Facilities

DisCos shall enter into long-term Power Sale and Purchase Contracts with wholesale suppliers for the supply of electrical energy from Embedded Power Generation Facilities for local distribution and retail within a particular distribution system.

The PURC shall approve a specific Bulk Supply Tariff (BST) for electrical energy supply procured from such Embedded Power Generation Facilities. The level of such specific BST shall not exceed the avoided costs of procuring electrical energy directly from the wholesale electricity market.

PART 5: INDEXATION OF MONTHLY BILLING OF CAPACITY AND ENERGY PROCURED FOR THE REGULATED ELECTRICITY MARKET

The following indexation formulae shall be employed by all Generators in billing capacity and energy procured under a Power Purchase Agreements by DisCos for the regulated electricity market.

5.1 Indexation of Capacity Charge

For monthly billing of Capital Charge, the following indexation shall apply:

$$CC_{bp(t)} = CRC + (FOMRC_{Base} * CPI_{Actual} / CPI_{PBP})$$

Where:

$CC_{bp(t)}$	Is Capacity Charge payable in billing Period (t)
CRC	Is Base Capital Recovery Charge as Approved by PURC
$FOMRC_{Base}$	Is Base Fixed Operation and Maintenance Recovery Charge as Approved by PURC
CPI_{Actual}	Is Actual Consumer Price Index for Billing Period (t) as Published by US Bureau of Labour Statistics (series id: CUUR0000SA0)
CPI_{PBP}	Is Consumer Price Index for Billing Period (t), Projected by Generator in Preceding Billing Period (t-1) and Approved by PURC

5.2 Indexation of Non-Fuel Variable Operating and Maintenance Recovery Charge

For monthly billing of Non-Fuel Variable Operating and Maintenance Recovery Charge, the following indexation mechanism will apply:

$$NFVOMRC_{bp(t)} = NEG_{bp(t)} * NFVOMRC_{Base} * CPI_{Actual} / CPI_{PBP}$$

Where:

$NFVOMRC_{bp(t)}$	Is Non-Fuel Variable Operating and Maintenance Recovery Charge payable in billing Period (t)
$NEG_{bp(t)}$	Is Net Electricity Generated in Billing Period (t)
$NFVOMRC_{Base}$	Is Base Non-Fuel Variable Operating and Maintenance Recovery Charge as Approved by PURC
CPI_{Actual}	Is Actual Consumer Price Index of billing period (t) as Published by US Bureau of Labour Statistics (series id: CUUR0000SA0).
CPI_{PBP}	Is Consumer Price Index for Billing Period (t), Projected by Generator in Preceding Billing Period (t-1) and Approved by PURC

5.3 Indexation of Fuel Recovery Charge

The PURC shall determine Fuel Recovery Charge (USCents/kWh) as a pass-through cost in electrical energy generation. However, the applicable amount of Fuel Recovery Charge to be passed on to DisCos shall be adjusted from time to time within the context of PURC's Quarterly Review of Natural Gas, Electricity and Water Tariffs taking cognisance of changes in fuel price in USD/MMBtu.

PART 6: PUBLICATION OF UNDERPINNING TARIFF PARAMETERS/DATA

The PURC shall publish quarterly, the following Benchmark Parameters which shall be derived from studies conducted by the Commission taking into account data and recommendations from independent third parties.

1. Ghana's Risk Free Rate
2. US Risk Free Rate
3. Ghana's Country Default Spread
4. Ghana Cedi- US Dollar Exchange Rate
5. Levered Beta (Equity Beta)
6. Unlevered Beta (Asset Beta)
7. Benchmark Useful Investment Life by Technology Type
8. Benchmark Capital Investment Cost by Technology Type
9. Benchmark Fixed Operation and Maintenance Percentage by Technology Type
10. Benchmark Non-Fuel Variable Operation and Maintenance Percentage by Technology Type



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Customer Type : Residential

Preference : Consumption (kWh)

Consumption (kWh) :

Energy Charge (GHS) :

Levies/Taxes (GHS) :

Service Charge (GHS) :

Total Amount (GHS) :

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WATER TARIFFS

Consumption (m3) → Total Amount (GHS)

Customer Type : Residential

Preference : Consumption (m3)

Consumption (m3) :

Water Charge (GHS) :

Levies (GHS) :

Service Charge (GHS) :

Total Amount (GHS) :

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OUR CONTACTS

HEAD OFFICE

2nd Floor Olympic Committee Building
No. 53, Liberation Road, Ridge
P. O. Box CT 3095 Cantonments, Accra
Digital Address: GA-052-9469
Tel: (233-302) 244181-4
Fax: (233-302) 244188
WhatsApp: (233-558) 082547
Email: info@purc.com.gh
Website: <http://www.purc.com.gh>

KUMASI

1st Floor Cocobod Jubilee House
P. O. Box 1001, U.S.T
Kumasi, Ashanti Region
Tel: (233-322) 037510
Fax: (233-322) 080937
WhatsApp: (233-540) 126202

TAKORADI

2nd Floor, GPHA Credit Union House
Behind Bank of Ghana
P. O. Box AX 1985
Takoradi, Western Region
Tel: (233-312) 024010
Fax: (233-312) 025261
WhatsApp: (233-540) 126203

TAMALE

1st Floor, NCA Building
Opposite Regional Coordinating Council,
P. O. Box TL 1870
Tamale, Northern Region
Tel: +233-372) 026380
Fax: (233-372) 027918
WhatsApp: (233-540) 126204

KOFORIDUA

Galloway, Near Jubilee Park Koforidua
P. O. Box KF 2781
Koforidua, Eastern Region
Tel: (233-342) 020770
Fax: (233-342) 020771
WhatsApp: (233-540) 126205

ACCRA

Ground Floor, GNAT Heights
Opposite Zenith Bank, Liberation Road
Tel: (233-302) 240046
WhatsApp: (233-540) 126201

HO

1st Floor God is Great Building
P. O. Box HP 1373
Ho, Volta Region
Tel: (233-362) 028607
Fax: (233-362) 028608
WhatsApp: (233-540) 126206

SUNYANI

Plot 15/16 South Industrial Estate
Sunyani Magazine
P. O. Box SY 1003
Sunyani, Bono Region
Tel: (233-352) 021651
(233-352) 021653
WhatsApp: (233-540) 126207

CAPE COAST

First Floor Data Bank Building
Tantri Road
P. O. Box CC 453
Cape Coast, Central Region
Tel: (233-332) 137926
WhatsApp: (233-540) 126208

WA

2nd Floor Stanbic Bank Building
Opposite Societe Generale
P. O. Box 445
Wa, Upper West Region
Tel: (233-392) 024275
WhatsApp: (233-540) 126209

BOLGATANGA

Ground Floor, NCA Building, Opposite the Regional Hospital - Bolgatanga
P. O. Box BG 273, Bolgatanga
Bolgatanga, Upper East Region
Tel: (233-382) 024524
WhatsApp: (233-540) 126210