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MODULE II: GUIDELINES ON ACCOUNTING FOR KEY DETERMINANTS OF COST OF SERVICE AND HOW TO CALCULATE THEM

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MODULE II: GUIDELINES ON ACCOUNTING FOR KEY DETERMINANTS OF COST OF SERVICE AND HOW TO CALCULATE THEM

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Author(s): KPMG Tax and Advisory LLC, JSC "Kept"
Timur Syzdykov
Vassily Savin
Sergei Ignatushchenko
Viktoria Trukhanovich

National Association of Regulatory Utility Commissioners

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List of Acronyms

β	Beta equity ratio
CAPEX	Capital expenditure
CAPM	Capital asset pricing model
CEER	Council of European Energy Regulators
CHP	Combined heat and power
CIP	Construction in progress
CoS	Cost of Service
CP	Country risk premium
CRNM	Committee on Regulation of Natural Monopolies
CZK	Czech koruna
DP	The debt premium
DSO	Distribution system operator
EEG-surcharge	Renewable Energy Sources Act surcharge (Erneuerbare-Energien-Gesetz)
ERP	The expected premium for the risk of investing in stocks
ERRA	Energy Regulators Regional Association
FAS	Federal Antimonopoly Service of Russia
FXRP	Premium for currency risk
GNERC	Georgian National Energy and Water Supply Regulatory Commission
IFRS	International Financial Reporting Standards
KNFRS	Kazakh National Financial Reporting Standards
KPI	Key Performance Indicators
LRAIC	Long-run incremental cost
n/a	Not available
NSBU	National Accounting standard of the Republic of Uzbekistan
Ofgem	Office of Gas and Electricity Markets
OPEX	Operating expenditure
Re	Cost of equity
Rd	Cost of borrowed capital
Rf	Risk–free rate
RAB	Regulatory asset base
RAO UES	OAO Unified Energy System of Russia
Re	Cost of equity
Rd	Cost of borrowed capital
RIIO	Revenue using Incentives to deliver Innovation and Outputs
RoR	Rate of Return
RPI-X	Retail Price Index, x – corrective factor
RR	Revenue Requirement
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SP	Premium for size
T	Income tax rate
TOTEX	Capital Expenditure + Operational Expenditure
TRT fee	The Turkish Radio and Television Corporation

TSO	Transmission system operator
UK	United Kingdom
VAT	Value-added tax
WACC	Weighted average cost of capital
WC	Working capital

1. Module II: Guidelines on Accounting for Key Determinants of Cost of Service and How to Calculate Them

The cost of service (CoS)/revenue requirement (RR) for each organization, carrying out regulated activities, is set at a level sufficient to cover the following components:

- The effective level of operating expenses (OPEX)
- Depreciation of assets related to operating activities (Depr)
- Return on invested capital (Return)

Depending on the regulator's country of origin, CoS may include several other parameters (e.g., working capital or WC). The general and most common approach to calculating CoS is:[1]

$$\text{CoS (RR)} = \text{Depr} + \text{Return} + \text{OPEX} + \text{Taxes} + \text{Adj}$$

- Depr = Invested Capital (Regulatory asset base) × Depreciation rate
- Return = Invested Capital (Regulatory asset base) × Rate of return (WACC)
- ADJ = revenue adjustment and other CoS components

A detailed description of each CoS element is provided throughout the module. Various approaches to CoS components are analyzed in the context of benefits/disadvantages for the key stakeholders (i.e., consumers, investors, owners).

1.1 Rate Base

The regulatory asset base (RAB) is the value of a regulated entity's assets in operation, built with the use of invested capital and considered when calculating long-term regulated tariffs via method of return on invested capital. The RAB serves as a fundamental parameter in utility regulation to determine the allowed profit. The most common objectives for a regulator when switching to a RAB regime are the following:

- Actively stimulate the volume of investments to upgrade/improve electricity and power infrastructure in the next few years, offering a competitive return on investment
- Privatize assets at the highest price to support vulnerable consumers in the future
- Achieve tariff containment while protecting the interests of consumers

The RAB can provide for the recovery of both old and new investments and should be formed by the assets deployed for the provision of the regulated service using their depreciated value. In addition to fixed assets, other components such as capital contributions of third parties (i.e., depreciation/return of such assets), leased assets, and construction in progress, or CIP (i.e., recovery/accumulation interest during construction of such assets) may be accounted in the RAB, but according to the conducted analysis the majority of the considered countries do not include them. The range of components included in the RAB and corresponding valuation methods vary significantly among countries.

The adjustment to the RAB can be performed if the company has invested more or less than planned. At the end of the year, an adjustment is made depending on the actual capital expenditure (CAPEX) value. The issue of RAB indexation is closely linked to the rate of return (RoR) concept. In the case of nominal RoR, the RAB does not need to be indexed for inflation. Nominal RoR is the most common approach in the considered countries.

[1] "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." ECA. 2020. https://www.eca-uk.com/tso-dso-study_final/

1.1.1 Existing International Practices[2]

Table 1: RAB components in different countries (TSO and DSO entities)

Country	When CAPEX enters RAB	Is factor considered in the RAB?			Is factor considered in the CoS?
		CIP assets	Third parties' contributions	Leased assets	Working capital
Europe					
Czech Republic	1	✓	✓	✓	⊘
Estonia	2	⊘	⊘	✓	✓
Germany	n/a	✓	⊘	⊘	✓
Latvia	2	⊘	⊘	✓ ⊘	⊘
Lithuania	3	⊘	⊘	⊘ ✓	⊘
Moldova	1	✓	⊘	n/a	n/a
Poland	3	✓	⊘	⊘	⊘
Russia	1	⊘	⊘	⊘	✓
Slovakia	1	⊘	✓	n/a	n/a
Sweden	n/a	⊘	✓	✓	⊘
United Kingdom	n/a	✓	✓	⊘	⊘
Caspian					
Armenia	1	⊘	⊘	n/a	✓
Azerbaijan	1	⊘	⊘	n/a	n/a
Georgia	1	✓	⊘	n/a	⊘
Kazakhstan	1	⊘	⊘	⊘	⊘
Uzbekistan[1]	1	⊘	⊘	⊘	⊘
South and Western Asia					
Turkey	1	⊘	✓	n/a	n/a
India	n/a	✓	⊘	n/a	✓
Pakistan	1 and 2	✓	⊘	⊘	⊘
South America					
Peru	3, n/a	⊘	⊘ ✓	n/a	n/a
Africa					
Nigeria	2	n/a	✓	n/a	n/a

Sources: Adapted from CEER, "CEER Report on Investment Conditions in European Countries." 2017; CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Central Electricity Regulatory Commission, Terms and Conditions of Tariff No.L-1/144/2013/CERC, 2014; EC and INOGATE Technical Secretariat, "A Review of Energy Tariffs in INOGATE Partner Countries." 2015; ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; Order of the Federal Tariff Service No. 228-e, "On approval of Methodological Guidelines on tariff Regulation using the method of return on invested capital." 2012; Order of the Minister of Energy of the Republic of Kazakhstan No. 205 "On approval of the Methodology for determining the RoR taken into account when approving marginal tariffs for electricity, as well as a fixed profit for balancing, taken into account when approving marginal tariffs for balancing electricity." 2020; Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 310 "On measures to further improve the tariff policy in the electric power industry." 2019

1.1.1.1 Fixed Assets

Fixed assets are included in the RAB in all countries under consideration and are the main portion of the RAB. Fixed assets that are not associated with regulated activity are not included in the RAB.

[2] *Note:* There is a decree in Uzbekistan that sets the methodology of RAB regulation. However, at the moment, tariffs are not calculated according to this methodology. It is expected that the transition will take place starting from 2023. In some countries, the RAB regime has already been implemented (for more information, please refer to table 22), while in other countries the methodology development stage is presented. For column "When CAPEX enters RAB": 1 – the asset is commissioned; 2 – the money is spent and approved; and 3 – the asset is constructed. Where two symbols are used in one cell (separated by comma) – the first is for the TSO, and the second is for the DSO.

In the first years, initial RAB has the strongest impact on tariffs, and in the long run, the main influence is exerted by new capital (new RAB). Therefore, it is important to determine initial RAB accurately. There are several approaches to evaluating initial RAB.

Table 2: Approaches to fixed assets valuation of the initial RAB

Approach	Description	Advantages	Disadvantages
Book value of asset (Historical cost) Armenia Azerbaijan, Czech Republic, Estonia, Georgia, Latvia, Pakistan, Poland, Slovakia, Turkey, United Kingdom	• The capital base is determined at the level of the book value of assets • An adjustment is possible to clear the cost from the revaluation effect • An adjustment is possible to account for inflation for the period from the date of asset's commission to the date of RAB application (book value of assets adjusted for inflation)	• Easy to implement • Absence of the subjectivity factor • Transparent methodology • Fairly accurately reflects the cost for new assets	• May not always be implemented for companies using IFRS reporting, since under IFRS the value of assets depends on future cash flows • Does not consider the fact that assets can be fully depreciated • Potential undervaluation of assets due to the lack of inflation adjustment (when applicable) • For old assets and under unstable economic conditions (high inflation, volatile exchange rate), may often lead to significant cost distortions
Depreciated replacement cost Germany Russia Moldova, Nigeria, Peru	• Modern equivalent asset: The cost of replacing an asset with another asset capable of providing the same services • Like-for-like: the cost of purchasing the same asset, • Optimized: the cost of replacing an asset with another asset capable of providing the same services more efficiently • Adjusting for depreciation to reflect the asset's remaining useful life is common to all methods under this approach	• Reflects the cost of replacement at current prices, considering changes in technology • Determines the actual useful life and the level of fair depreciation	• Relatively expensive to collect the necessary information • The presence of a subjective factor (the appraiser's opinion) • The absence of a secondary market for specialized assets does not allow determination of certain values
Economic value (fair value)	The capital base is determined at the level of value that can be obtained from the sale of an asset on the market, or as the amount of discounted cash flows expected from operating activities	• Reflects the monetary value of assets	• The emergence of a circular reference when cash flows determine the value of capital base, which, in turn, affects cash flows within the framework of the RAB regulation • The absence of a secondary market for specialized assets does not allow determination of the fair value
RAB = 0 DSO in Turkey	Approach appeared in France and implied a concession agreement. The capital base is determined at zero and return is accrued only on new investments after switching to a new regime	• Low tariff for consumers • Allows for combining a tariff restriction and a large number of investments return • Free asset for a new investor	• There is no compensation for investments incurred before the transition • The current owner is forced to give assets away for free • time and cost for establishment and approval of the concession agreement
Long-run incremental cost (LRAIC) Lithuania	The change in the total long-run cost resulting from additional asset		• Since marginal or incremental costs may well be less than average costs for electricity networks, which are characterized by strong economies of scale, setting tariffs purely based on LRAIC may not provide enough revenue for financial viability

Source: KPMG analysis

Fixed assets rollover (write-off/ acquisition/sale of assets) must be accounted for in the RAB. Financial leasing should be considered in the RAB (in contrast to operational leasing) as it implies the possibility to redeem the asset. However, in practice it is difficult to separate these two types, so most countries do not consider leased assets in the RAB. Some countries (e.g., Russia) take leased assets into account in the CoS as a separate element.

In addition to accounting for fixed assets, there are various points at which CAPEX could enter the RAB:

- Once the asset is commissioned and becomes 'used and useful' (i.e., Armenia, Azerbaijan, Czech Republic, Georgia, Moldova, Pakistan, Russia, Slovakia, Turkey)
- Once the money is spent, provided it is approved (i.e., Estonia, Latvia, Nigeria, Pakistan)
- Once the asset is constructed (i.e., Lithuania, Peru, Poland)

The key advantage of adding the CAPEX when it is incurred is that it is easier to administer because there are no complexities related to CAPEX being incurred in one regulatory period, but not commissioned until the next. The main drawback is that users may pay for CAPEX that is not yet operational. At the same time, adding investments to the RAB only once they are fully constructed or commissioned can create financing difficulties for the regulated entity.

1.1.1.2 CIP Assets

In eight countries out of 21, the RAB considers CIP assets. According to international experience, the methodology of some countries assumes that CIP assets should be considered in the RAB upon incurring costs, which minimizes the impact of changes in the value of money over time and more accurately calculates the return of capital. However, the positive effect of not including the CIP in the calculation of tariff is as follows:

- The consumer does not pay for facilities that have not yet been built, the costs of which have not yet been fully approved by the regulator.
- The company is interested in building and commissioning facilities faster to minimize the impact of the time value of money factor.

At the same time, capitalized interest can be included in the cost of construction (and then included in the RAB at the time of commissioning). There are several options for accounting for CIP in the RAB:

- Only recover interest during construction (i.e., Georgia)
- Return on asset value recognized only for large projects (in the Czech Republic, the period of the investments is more than two years, and the total price of individual investment exceeds CZK500 mln (or EUR20 mln))
- Accumulated interest during construction is added to commissioned asset value (i.e., Moldova)

To determine the price of CAPEX that enters the RAB, accounting (i.e., book value of assets) or normative approaches (e.g., marginal cost per kilometer of line) can be used.

1.1.1.3 WC

WC can be described as the average net amount of capital employed by a regulated entity that is required for the day-to-day operations. As a rule, WC is not considered as part of the RAB and is considered as an element of CoS. The logic behind this is that WC should not be included in the RAB, since the RAB contains only long-term assets. If WC is considered in the CoS, the amount of net WC

is set by the regulator for the long-term in the amount required to carry out regulated activities without cash shortages. For instance, in Estonia, the level of normative WC is determined as 5% of income.

The rate at which WC is recovered can be established based on RoR, the short-term borrowing rate, WACC, the allowed cost of debt, etc. Hypothetically, WC would not be considered in the CoS if the industry were arranged on a prepayment basis, when in fact consumers pay for the actual energy consumed.

1.1.1.4 Assets Received from Third Parties

Seven out of 21 countries account for assets received from third parties when calculating the RAB. Contributions from third parties such as connection fees, contributions from public institutions, funding under cohesion/structural funds, grants, and other capital contributions are mostly not included in the RAB (though some countries choose to include the depreciation/return of such assets in the CoS). This approach is based on reasoning that to the extent that the asset was not financed by the regulated entity, it must not be included in the RAB and compensated.

Accounting for connection fees in the RAB will lead to a double bill: the consumer will first pay directly at the time of connection, and then as part of the tariff. However, if there are various feed-in tariffs for connection fees, the difference between the actual cost of connection for the company and the preferential cost paid by the consumer should be included in the RAB or compensated in some other way.

However, a case could be made that utility should be permitted to recover depreciation to be able to fund the replacement of asset in future. So, there are two approaches to accounting for third parties' contributions in the CoS/RAB:

- Recover depreciation, but not return (i.e., Czech Republic, Nigeria)
- Recover depreciation and return (i.e., Slovakia, Turkey, DSO only in Peru)

The contribution of the state (grant) can be deducted from the RAB if investments were initially made and accounted in the RAB, and then the grant compensates them to reduce the tariff.

1.1.2 Selected Case Studies from Countries Using Different Methodologies

As per our analysis, in the context of transitioning to a RAB methodology, it is not strictly accurate to talk about just one example of the best practice as different stakeholders benefit from different approaches. The cases presented are examples of countries that use significantly varying approaches to account for key elements and therefore appear to have a greater analytical use. The same rationale is implied when selecting case studies in the following sections of the module.

Table 3: RAB methodology in Russia and the Czech Republic

	Russia	**Czech Republic**
Components of RAB	Fixed assets only	Fixed assets, CIP, third party contributions, leased assets
Regulatory asset value	• During the transition to a RAB regime, the initial assessment of the RAB was made by independent appraisers (i.e., it was planned to use the depreciated replacement cost method). However, then, to curb the growth of tariffs, the assessment of initial RAB was conducted by counting backwards from the permissible level of tariff burden	The RAB is based on revaluated values of assets according to the annual financial statement

	Russia	Czech Republic
	• For the subsequent evaluation of RAB, it was supposed to maintain a separate regulated accounting (different from bookkeeping) for the RAB.	
RAB adjustments	• On an annual basis, the RAB is adjusted considering the actual entry of assets for the previous period • Revaluation of the RAB, as well as indexation of the RAB, is not allowed	• RAB adjustment is "investment – depreciation x k;" k is revaluation coefficient (set annually), which is calculated by dividing the planned value of the RAB by the planned residual value of assets (both taken in year i-1). • There is no RAB indexation
Description	• The initial RAB is determined once at the beginning of the first regulatory period by an independent appraiser and defined as the amount of invested capital to build assets used in regulated activities • The forecast RAB is calculated considering: (i) the approved investment program for the period of regulation (forecast of asset commissioning), (ii) return of capital calculated based on the established period • The RAB is divided into two parts: "old" (RAB existing before switching to the RAB regime) and "new" (RAB created after switching to the RAB regime). For both components, separate accounting is necessary and conducted to calculate the return of invested capital and disposal • The invested capital after the transition to RAB increases by the amount of fixed assets commissioning (CAPEX incurred)	• The calculation of RAB in the current regulatory period (RP) uses as input the planned values which are corrected due to the actual values. In order to maintain continuity between preceding and current RP, the initial level of RAB was set at the planned value of the RAB for the year 2015 • In the subsequent RP years, the initial level of the RAB is increased/decreased by the difference between capitalized investments and depreciation which is adjusted with revaluation coefficient • The assets under construction are included in the RAB. These assets are part of the RAB under certain conditions: the investment phase is more than two years (preparation stage is not included) and the total target amount of individual investment exceeds CZK500 mln (or EUR20 mln) • Local regulation allows utilities to recover only depreciation expenses on the third-party capital contributions, but not return

Sources: Adapted from CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Order of the Federal Tariff Service No. 228-e, "On approval of Methodological Guidelines on tariff Regulation using the method of return on invested capital," 2012.

1.1.3 Recommended Approach for Kazakhstan and Uzbekistan

- In most of the considered countries, fixed assets in RAB are valued at the level of book value or indexed book value. However, it should be noted that Kazakhstan and Uzbekistan had periods of hyperinflation in the past, so an assessment of assets' value using depreciated replacement cost method or actual investment approach can be considered preferable for determination of the initial RAB, since the book value does not necessarily represent real value of investment.
- The most common approach regarding the moment of assets entering RAB is the commissioning and becoming "used and useful." This method is advised for consideration by Kazakhstan and Uzbekistan regulatory bodies since it encourages not to delay construction and protects consumers from paying for facilities that have not yet been built.
- WC in most countries is not considered as part of the RAB, since the RAB approach implies accounting for long-term assets only. However, to carry out entities' regulated activity without cash shortages, WC might be permitted by regulatory authorities as a component of the CoS.
- The practice of the countries reviewed indicates that contributions from third parties are mostly excluded from the RAB, since it is not financed by the regulated entity. However, we consider that an opportunity for utilities to recover depreciation in order to fund the replacement of assets in the future may be considered by the regulators.
- While determining the RAB, regulatory bodies should consider on the one hand the fixed assets and assets under financial leasing used in regulated activities, and on the other hand may consider additional components (like recover depreciation on third parties' contributions). It is essential to make comparative calculations and take into consideration the impact of one or another approach to RAB evaluation, as well as the inclusion of various

components, on the resulting tariff level together with other factors (e.g., RoR, OPEX calculation, depreciation).

1.2 RoR and Capital Structure

The regulatory RoR is a fixed rate for a three- to five-year period, set by the regulator to reflect regulatory risk. The most common approach to determine the RoR is the implied weighted average cost of capital (WACC), which may be far from the company specific WACC of an individual company. The regulator must set RoR using an implied WACC, since the company specific WACC is a specific value for each company that is continuously changing due to macroeconomic factors.

1.2.1 Existing International Practices

The economically justified level of return on invested capital is determined on the basis of WACC. The WACC reflects the average cost of equity and debt capital used by the company, weighted according to proportions of the capital structure. The WACC considers both operational risks and risks associated with financing a company's activities.

Table 4: WACC calculation

Formula	Components
$\mathrm{WACC} = \mathrm{Re} * \frac{\mathrm{E}}{(\mathrm{D} + \mathrm{E})} + \mathrm{Rd} * * (1 - \mathrm{T}) * \frac{\mathrm{D}}{(\mathrm{D} + \mathrm{E})}$	• WACC • Re - cost of equity; Rd - cost of borrowed capital • E / (D+E) - share of equity; D / (D+E) - share of debt funds • T - income tax rate

Source: KPMG analysis

The WACC plays a key role in regulated industries. The key task of regulatory authorities is not only to meet the needs of consumers, but also to provide conditions to raise financing for companies operating in regulated industries by setting a competitive RoR on invested capital.

Table 5: WACC calculation in different countries (TSO and DSO entities)

Country	Cost of equity	Cost of debt	Capital structure (Gearing)	Vanilla, pre-, and post-tax rates	Nominal and real rates
Europe					
Czech Republic	CAPM	1	Notional (45.75%)	Pre-tax	Nominal
Estonia	CAPM	1	Notional (50%)	Pre-tax	Nominal
Germany	There is no use of WACC. The regulatory authority sets the cost of capital depending on the structure of the new and old assets in the RAB. For the Re calculation sum of the nominal Rf and the risk premium multiplied by the corporate tax is used. The common market interest rate for comparable loans is used to determine the Rd				
Latvia	CAPM	4	Whichever (notional or actual) produces the lowest WACC (70%)	Pre-tax	Nominal
Lithuania	CAPM	4	Notional (50%)	Pre-tax	Nominal
Moldova	Rf + CP / CAPM	4	Notional (50%)	Pre-tax	Nominal
Poland	CAPM	1	Notional (50%)	Pre-tax	Real
Russia	CAPM	2	Notional (30%)	Post-tax	Nominal
Slovakia	CAPM	3	Notional (60%)	Pre-tax	Nominal
Sweden	CAPM	1	Notional (50%)	Pre-tax	Real
United Kingdom	Sum of Rf and ERP multiplied by β	n/a	Notional (55-60%)	Vanilla	Real
Caspian					

Country	Cost of equity	Cost of debt	Capital structure (Gearing)	Vanilla, pre-, and post-tax rates	Nominal and real rates
Armenia	Derived from companies with a similar risk profile	3	Notional (n/a)	Post-tax	Real
Azerbaijan	There is no use of WACC.				
Georgia	CAPM	3	Notional (60%)	Pre-tax	Nominal
Kazakhstan	CAPM	3	Notional (72.5%)	Vanilla	Nominal
Uzbekistan	Rf + CP	4	Notional (60%)	Post-tax	Nominal
South and Western Asia					
Turkey	CAPM	1	Notional (50%)	Pre-tax	Nominal
India	There is no use of WACC. The regulatory authority sets the cost of capital (15.5% for TSO) with an additional Re depending on project specifics. The notional equity portion is 30%. The interest on loan shall be calculated using normative average loan in the year and the weighted average rate of interest				
Pakistan	CAPM	2, 1	Notional (70%)	Post-tax nominal RoE with financial charges as pass-through	
South America					
Peru	There is no use of CAPM. Real rate set in law.				
Africa					
Nigeria	CAPM	1	Notional (30%)	Pre-tax	Real

Sources: Adapted from CEER, "CEER Report on Investment Conditions in European Countries." 2017; CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Central Electricity Regulatory Commission, Terms and Conditions of Tariff No.L-1/144/2013/CERC, 2014; EC and INOGATE Technical Secretariat, "A Review of Energy Tariffs in INOGATE Partner Countries." 2015; ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; Order of the Federal Tariff Service No. 228-e, "On approval of Methodological Guidelines on tariff Regulation using the method of return on invested capital." 2012; Order of the Minister of Energy of the Republic of Kazakhstan No. 205 "On approval of the Methodology for determining the rate of return taken into account when approving marginal tariffs for electricity, as well as a fixed profit for balancing, taken into account when approving marginal tariffs for balancing electricity," 2020; Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 310 "On measures to further improve the tariff policy in the electric power industry." 2019.
Note: For "Cost of debt" column: 1 – market-based estimates; 2 – Embedded estimates; 3 – Benchmarking; 4 – other

1.2.1.1 Cost of Equity

The cost of equity or required return on equity (Re) is the opportunity cost of using equity capital to fund the project rather than allocate to other investments. This RoR is necessary to secure equity financing. The capital asset pricing model (CAPM) is the most common theoretical model in international practice – it is used by regulators in 14 out of 21 countries to calculate the Re. Other approaches can also be used to evaluate Re (i.e., benchmarking, dividend growth model, investors surveys, etc.).

According to the CAPM, Re is calculated via the following formula: $\mathrm{Re} = \mathrm{Rf} + \beta * \mathrm{ERP} + \mathrm{SP} + \mathrm{CP} + \mathrm{FXRP}$.

Table 6: CAPM components

Component	Description	Approach
Rf - risk-free rate	• The RoR on investments that are not exposed to risk (i.e., investments with no risk of default) • Bond maturity should be equal to the expected period of entity operation	• Government borrowing rate: Czech Republic, Georgia, Latvia, Lithuania, Nigeria, Pakistan, Poland, Russia, Slovakia, Turkey, United Kingdom • Government foreign borrowing rate: Estonia, Moldova
β - beta equity ratio	• The β coefficient is a measure of systematic (market) risk • The market portfolio is a broadly diversified index (e.g., the S&P 500) • Reflects how much the profitability of a stock depends on the profitability of the market portfolio	• Using β from other regulators: Georgia, Latvia, Lithuania, Pakistan, Turkey • Benchmarking to similar industries: Estonia, Slovakia, Turkey • Measuring volatility of the entity's stock against market: Czech Republic, Pakistan • Use β = 0: Nigeria

ERP - the expected premium for the risk of investing in stocks	• The ERP reflects premium for the risk of additional investment in equities • The risk premium significantly depends on the choice of benchmark for calculating market profitability and the type of risk-free asset	• Historical data on investment returns (international markets): Czech Republic, Estonia, Georgia, Nigeria, Slovakia, Turkey • Historical data (national market): Pakistan, Poland • Precedents set by other regulators: Lithuania • CP + ERP in a developed capital market: Latvia
Optional		
CP - country risk premium (applied depending on the selected Rf)	• The CP is an additional premium that considers the risk associated with the fact that cash flows are produced in the particular country	• Based on local sovereign rating and estimated default spread for that rating (based upon traded country bonds) over a default-free government bond rate • CDS spread for the country (if available) adjusted for the US CDS spread
FXRP - premium for currency risk	• This component reflects premium for additional risks inherent in investment in a company, whose main cash flows are denominated in a currency other than US dollars	• Spread between yield values for government bonds, denominated in local currency, and government Eurobonds, denominated in foreign currency (determined by Rf) with the same maturities • Calculation based on inflation spread as the difference between long-term inflation in the country and long-term inflation in benchmark country (determined by Rf)
SP - premium for size	• Companies' risk varies with market capitalization, so large-cap companies with a stable business have lower risk of bankruptcy and are less exposed to market fluctuations. • Main advantage of applying the size premium is better accounting of increased risks, associated with small size businesses • The premium is rarely used (not observed in the countries under consideration), but in general can be applicable when calculating cost of equity	

Source: Adapted from ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; KPMG analysis

1.2.1.2 Cost of Debt

The cost of borrowed capital should be calculated based on long-term lending rates, sufficient for raising new loans for the target company.

Table 7: Methods for the cost of debt determination

Approach	Description
Market-based estimates: Czech Republic, Estonia, Poland, Sweden, Pakistan, Nigeria	$Rd = Rf + DP$ • Rf - risk-free rate is the RoR on a risk-free investment • DP - debt premium, based on the utility's credit rating
Embedded estimates: Russia, Pakistan	• The entity's historical borrowing costs in financial accounts • The presence of public debt: the current yield to maturity displayed by the entity's bonds indicates the marginal cost of issuing debt • Reflects market's opinion on the company's credit risk, also works as a reliable indicator of the marginal cost of borrowing • Not always applicable: not all companies have long-term debt securities, which are publicly traded and sufficiently liquid, or public information about the debt is not available
Benchmarking: Slovakia, Georgia, Kazakhstan	• Prevailing market lending rate in the same industry • Interest rates for loans of comparable maturity, issued to non-financial organizations over the last month • If dollar discount rate is calculated, the dollar-nominated loan rate is taken as the basis for the cost of borrowed capital

Source: Adapted from ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations," 2020; KPMG analysis

1.2.1.3 Capital Structure

There are two main options for the regulators in terms of setting capital structure for implied WACC:

- Actual gearing: actual capital structure of an entity as it stands or is expected is used by the regulator for the regulatory period
- Notional gearing: typical, objective, or efficient capital structure can be considered by the regulator regardless of actual capital structure

In theory, debt is cheaper than equity, and the company's WACC will be lower with a higher gearing ratio. However, this overlooks the impact that gearing decision and equity beta (β) have on each other. As companies increase gearing, business risk concentrates on the small equity portion and shareholders demand higher RoR (increased β), that will partially offset the diminishing effect of debt portion.

1.2.1.4 Vanilla, Pre-, and Post-Tax Rates

There are three main approaches to calculating WACC, depending on accounting methods for taxes and the resulting impact on cost of equity and debt capital.

Table 8: WACC calculation depending on tax consideration approach

Approach	Formula	Components
Pre-tax The cost of equity is increased by the amount of income tax to account for tax payments that will have to be paid as part of the operating costs, in accordance with the tariff estimate	$\text{WACC} = \frac{\text{Re}}{(1 - \text{T})} * \frac{\text{E}}{(\text{D} + \text{E})} + \text{Rd} * \frac{\text{D}}{(\text{D} + \text{E})}$	• Re – cost of equity • Rd – cost of borrowed capital • E / (D+E) – share of equity • D / (D+E) –share of borrowed funds • T – income tax rate
Vanilla The impact of taxes on RoR on invested capital is not considered	$\text{WACC} = \text{Re} * \frac{\text{E}}{(\text{D} + \text{E})} + \text{Rd} * \frac{\text{D}}{(\text{D} + \text{E})}$	
Post-tax Considers benefits of the tax shield (as interest reduces taxable profit)	$\text{WACC} = \text{Re} * \frac{\text{E}}{(\text{D} + \text{E})} + \text{Rd} * * (1 - \text{T}) * \frac{\text{D}}{(\text{D} + \text{E})}$	

Source: KPMG analysis

It is worth noting that if the tax rates change, this should not affect investors, since they are not in control of tax policy risks. For companies in regulated industries, taxes are part of the cost of regulated activities and can be reimbursed by:

- Accounting for tax deductions in the tariff estimate (using post-tax WACC)
- Adjusting the required return on equity to compensate for taxes and maintaining the appropriate RoR for investors (using pre-tax WACC)

1.2.1.5 Nominal and Real Rates

Nominal WACC is the most common approach in the considered countries. However, in an unstable business environment associated with high inflation (e.g., emerging markets), real return may be more appropriate indicator than nominal. In this case Inflation is one of the key inputs to calculate WACC. From a theoretical side, the use of nominal or real WACC will provide the same return for investor (except cases with regular revaluation of assets).

Table 9: Real WACC calculation

Formula	Components
$\text{WACC}_{\text{real}} = \frac{1 + \text{WACC}_{\text{n}}}{(1 + \text{CPI}_{\text{LT}})} - 1$	• WACCn – nominal WACC • CPILT – long-term inflation index of the currency for which the nominal WACC value calculated

Source: KPMG analysis

There are two methods of accounting for inflation when calculating WACC for the purpose of setting tariff in regulated industries:

- Inflation is counted by the annual indexation of the RAB along with the use of real WACC rate.
- Expected inflation is counted using nominal WACC. Adjustment of the RAB is not required in this case since inflation has already been considered in WACC.

1.2.2 Selected Case Studies from Countries Using Different Methodologies

Table 10: ROR methodology in Estonia and Germany

	Estonia	Germany
Type of WACC	Pre-tax WACC nominal	No use of WACC
Calculating return on equity	CAPM: $\text{Re} = \text{Rf} + \text{ERP} * \beta + \text{CP}$ • Rf: average RoR for a 10-year government bond Germany issued in the past ten years (Estonia has not issued long-term government bonds) • ERP: McKinsey[1] market risk premium • β: The beta coefficient is determined via relevant benchmarks of other European and/or US regulated companies (there are no comparable energy entities in Estonia that are traded in the stock market) • CP: country risk premium, corresponding with the country's risk rating (Moody's)	Sum of nominal Rf and risk premium (ERP multiplied by β) multiplied by corporate tax: • Rf: current average yield of 10-year fixed-interest securities • ERP and β: product of market risk premium and systematic (market) risk factor • Corporate tax: accounted for via factor applied to the sum of risk-free rate and market premium • Formula: $\text{Re} = (\text{Rf} + \text{ERP} * \beta) * \text{Tax}$
Calculating return on debt	$\text{Rd} = \text{Rf} + \text{CP} + \text{DP}$ Rd - cost of debt capital Rf - risk-free RoR, CP - Estonian country risk premium DP – entity's debt capital risk premium (credit rating and additional liabilities treated as debt capital)	Existing debt capital is recognized to the extent that interest does not exceed average market interest rate for comparable loans
Description	• To calculate WACC, the anti-trust authority uses capital structure of 50% debt and 50% equity capital	• Return on equity comprising Rf, ERP, and corporate tax factor is applied to "new assets." The rate is adjusted to take account of inflation is applied to "old assets." • For existing assets, Re is granted for existing assets to a maximum of 40% of the imputed necessary business assets. Any equity available more than this will be subject to a different interest rate. This "return on equity II" is aligned with standard interest rates for procured capital and is set as an average 10-year yield from the German Bundesbank

Sources: Adapted from CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Estonian Competition Authority, Manual to Calculate Weighted Average Cost of Capital, 2019, https://www.konkurentsiamet.ee/sites/default/files/juhend_kaalutud_keskm_kapitali_hinna_ar_eng2019_1.pdf
Note: McKinsey & Company; Koller, Tim; Goedhart, Marc; Wessels, David. (2015). Valuation: Measuring and Managing the Values of Companies. 6th Edition. John Wiley & Sons, Inc., New Jersey, page 274

1.2.3 Recommended Approach for Kazakhstan and Uzbekistan

- It is important to draw the line of risk sharing between investors and consumers, since the risks that investor assumes determine the level of RoR.

- To determine RoR on invested capital most of the considered countries use the generally accepted method of implied WACC. To account for volatility of macroeconomic parameters when calculating the implied WACC a certain premium for currency and country risks should be considered.
- In accordance with international practice, the WACC should be fixed throughout the regulated period and adjustments to the WACC components are applied at the beginning of the new regulated period.
- The same RoR should be used for all entities. Differentiation can distort information about the market and influence the decisions made by the management. Thus, a legal framework could specify that all companies within a sector apply the same debt-to-capital ratio and beta coefficient.
- The CAPM model is a worldwide practice and is used to estimate the cost of equity, which is why it can be easily applied in Kazakhstan and Uzbekistan. A simpler approach would be to estimate the cost of equity via the sum of the risk-free rate and the CP. However, in that case it results in a lower RoR compared to CAPM, since it does not include equity risk premium.
- The cost of debt is usually estimated via market-based indicators. However, not all entities have credit rating or public debt information, in that case benchmarks are used. Also, benchmarking helps to maintain the investment attractiveness of the industry (not of individual enterprises) and to incentivize companies to seek cheaper financing.
- All the reviewed countries use a notional capital structure for implied WACC. The most common capital structure in the sample implies 50-60% of debt. According to A. Damodaran's data for Emerging Markets, the average share of debt in the power industry is 51%. Given the well-known and credible reputation of the source, widely used in practice, and recognized by the investment community, A. Damodaran's data can be used when calculating the WACC gearing.
- Pre-tax WACC is the most common approach in the sample under consideration. However, for simplicity and transparency of calculation, it is recommended to use post-tax WACC. To reflect the post-tax profitability in the tariff estimate, revenue should be directly reduced by the sum of payable taxes.
- Nominal WACC should be used as it is more widespread and better understood by investors (in this case, RAB should not be indexed).
- In the process of determining the RoR and individual components, it is necessary to perform calculations to evaluate the impact of each approach on the volume of investment inflow and tariff affordability to the industry and to the households, considering other factors (e.g., RAB value, OPEX calculation, depreciation approach).

1.3 Regulatory Treatment of Utility Operating Expenses, Including Amortization

1.3.1 Existing International Practices

Table 11: OPEX calculation and incentives in different countries (TSO and DSO entities)

Country	COST base method	Uncontrollable OPEX	OPEX efficiency incentives	KPIs[1]	
				SAIFI	SAIDI
Europe					
Czech Republic	4	⊘	Expert opinion: factor (1%)	0.35	0.48
Estonia	1, 3	✓	⊘	0.18	0.30
Germany	5	✓	External benchmarking	0.30	0.25
Latvia	2	⊘	Expert opinion: factor (1%)	0.42	0.99
Lithuania	1	⊘	⊘	0.40	0.40
Moldova	1	✓	⊘	1.50	1.33
Poland	1	⊘	Expert opinion: factor (1.5%)	1.09	1.13
Russia	4	✓	External benchmarking: 1-3%	0.05	0.17

Country	COST base method	Uncontrollable OPEX	OPEX efficiency incentives	KPIs[1]	
				SAIFI	SAIDI
Slovakia	2	⊘	Factor (3.5%)	0.68	0.88
Sweden	1	✓	Expert opinion: factor (1%), External benchmarking	0.66	0.61
United Kingdom	5	✓	⊘	n/a	n/a
Caspian					
Armenia	n/a	✓	n/a	7.2	10.86
Azerbaijan	n/a	✓	n/a	0.96	0.86
Georgia	1	✓	External benchmarking: factor (1.5%)	3.69	4.69
Kazakhstan	n/a	⊘	⊘	0.91	0.96
Uzbekistan	1	⊘	⊘	0.08	0.22
South and Western Asia					
Turkey	4, 3	✓	⊘, Internal benchmarking	19.53	44.69
India	1 and 2	✓	n/a	2.18	2.73
Pakistan	1, 3	✓	⊘, External benchmarking: factor (< 3%)	90	99
South America					
Peru	Other, 3	⊘	⊘	1.73	6.39
Africa					
Nigeria	1 and 3	⊘	Factor (4%), ⊘	n/a	n/a

Sources: Adapted from CEER, "CEER Report on Investment Conditions in European Countries." 2017; CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Central Electricity Regulatory Commission, Terms and Conditions of Tariff No.L-1/144/2013/CERC, 2014; EC and INOGATE Technical Secretariat, "A Review of Energy Tariffs in INOGATE Partner Countries." 2015; ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; Order of the Federal Tariff Service No. 228-e, "On approval of Methodological Guidelines on tariff Regulation using the method of return on invested capital." 2012; Order of the Minister of Energy of the Republic of Kazakhstan No. 205 "On approval of the Methodology for determining the RoR taken into account when approving marginal tariffs for electricity, as well as a fixed profit for balancing, taken into account when approving marginal tariffs for balancing electricity." 2020; Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 310 "On measures to further improve the tariff policy in the electric power industry." 2019.
Note: Annual data (in the largest business city of each economy) are collected from DSO and national regulators (the World Bank, Doing Business archive data: https://archive.doingbusiness.org/en/data). For column "COST base method": 1 – Bottom-up; 2 – Top-down; 3 – Yardstick; 4 – Historical outturn OPEX; 5 – Totex

1.3.2 Cost Base

The cost base is formed out of allowed controllable (i.e., materials, salary, maintenance and repairs, administrative expenses, etc.) and uncontrollable (i.e., taxes and fees, system loss price, force majeure, etc.) costs. It is determined in the base year and then indexed in the following years. The allowed operating expenditure (OPEX) is typically determined based on one of the four (or a mix) of broad approaches presented in Table 11. The bottom-up method is the most common approach in the reviewed sample countries (9 out of 21).

Table 12: Approaches to allowed OPEX determination

Approach	Description	Regulatory cost / complexity
Bottom-up	• The entity proposes a set of individual OPEX items for the regulator's verification. • Audited financial statements, historical data and statistical analysis serve to estimate an efficient cost level for each item	• Complicated as detailed study of individual cost items is required
Top-down	• Cost for general OPEX categories is defined by the regulator • An efficient level for each category is often assessed by comparable companies, however the regulator preserves prudence	• Access to a dataset of efficiency/productivity measures of companies is necessary
Yardstick	• Allowed OPEX determined via external benchmark, using data from other entities	• Modelling requires extensive and complex data

Approach	Description	Regulatory cost / complexity
	• Differs from top-down method, where external comparators just inform the regulator	
Historical outturn OPEX	• Allowed OPEX built on an internal benchmark, using the entity's own historical costs • Future OPEX is set by the regulator based on past efficient OPEX, accounting for extraordinary costs, inflation, efficiency, and asset growth indexes • In contrast to the bottom-up method, previous OPEX items do not determine the cap for the current cost	• Relatively simple and inexpensive approach
Totex	• The allowed OPEX and CAPEX are estimated together using benchmarking or statistical analysis	• Modelling requires extensive and complex data • Major change to regulatory regime and approach

Source: Adapted from ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; CEER, "CEER Report on Investment Conditions in European Countries." 2017.

International practice shows that regulators often differentiate between OPEX associated with regulated network services and OPEX related to non-regulated activities to guarantee that the regulated utility is only compensated for the cost of regulated services, without using regulated revenues to subsidize other activities. Dividends and depreciation should not be part of OPEX. Amortization can be included in OPEX, but in capital intensive industries such as electricity transmission, this value is usually insignificant.

If OPEX changes within the regulatory period due to expansion (for example, a new area will be put into operation, therefore, there is an increase in OPEX for servicing new consumers), then a special calculation index for changing the service area (index of changes in assets quantity) can be used to adjust OPEX. Since residential consumers pay for electricity services upon the provision of these services, there is a delay in payment and, accordingly, the accounts receivable arises. Part of this is compensated for by the consumers after a while. However, another part becomes a loss of the entity. Hence, bad debt provision should be considered as an additional OPEX component.

Expenses related to compensation for losses are a controversial OPEX item. On the one hand, planned prices for the purchase of electric energy (capacity) to compensate for losses is an uncontrolled factor for the company. On the other hand, the volume of electricity losses is a controllable factor. For indexation of the cost base, CPI, PPI, or a special custom index (entity-specific) can be used. CPI is most used, since (i) the regulator looks from the consumer's side (general level of prices in the economy), (ii) it is easy to observe, and (iii) PPI can be very volatile and difficult to predict.

1.3.2.1 Uncontrollable OPEX

The main goal of incentive-based regulation is to make incentives to minimize cost and allow businesses to bear the consequences of destitute or good management of the controllable cost. Uncontrollable OPEX, in contrast, are the costs beyond the utility's control, which are sufficient to have material damage to its finances. These costs are frequently allowed to be passed through to consumers (at least partially). Ten out of 21 countries under review make a distinction between controllable and uncontrollable OPEX. As per international practice, the following costs can be considered uncontrollable:

- Taxes and fees (i.e., Azerbaijan, Estonia, Moldova, Russia, Georgia, Pakistan, DSO in Turkey)
- Salaries (i.e., Pakistan)
- System loss (i.e., Turkey)
- Ancillary services (i.e., Turkey)
- Force majeure (i.e., Moldova)

- Fuel costs (i.e., Azerbaijan)
- Upstream network costs (i.e., DSO in Turkey)

1.3.3 OPEX Incentives

Many developed countries use incentive methods in which regulatory authorities define requirements for reliability and quality indicators to ensure an appropriate level of quality of services provided by electric grid companies to domestic consumers at reasonable prices in a natural monopoly environment. Incentive mechanisms reward companies that comply with the KPIs for quality and reliability of services.

The efficiency index can be used for both OPEX and CAPEX. The use of the efficiency index when approving CAPEX takes place in several countries, but this approach entails several disadvantages. The main drawback is that the entity has an inherent incentive to initially overestimate the cost of the investment program. Stimulating the economic efficiency of operating expenses (because profitability is tied to assets, and not to costs) provides an opportunity for entities to save operating expenses (requires discretion on the regulator's part concerning further efficiency improvement).

Table 13: Efficiency of incentives depending on cost base calculation method

Approach	Efficiency incentives
Bottom-up	• Limited efficiency incentives due to the focus on individual OPEX items
Top-down	• Holistic approach could deliver strong efficiency incentives
Yardstick	• Strong efficiency incentives due to revenue-cost decoupling
Historical outturn OPEX	• Provides strong efficiency incentives for cost reduction over time
Totex	• The most consistent with efficiency as it eliminates incentive to favor one type of expenditure to increase profits

Source: Adapted from ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations," 2020; CEER, "CEER Report on Investment Conditions in European Countries." 2017.

OPEX to CAPEX conversion

Due to technological progress, a company can shift its focus from manual to automated labor. Thus, there are two effects: (i) the growth of the RAB due to new equipment, which can serve as an incentive for companies, and (ii) the reduction of OPEX, which also brings additional income via savings retention.

X-factor and savings retention

The efficiency index (x-factor) of OPEX is established by the regulator for a long-term regulatory period for each regulated entity to (i) describe the dynamics in the level of costs associated with the relevant service, and (ii) gradually reach the efficient level of controlled OPEX of the entity.

"Expert opinion" and internal/external benchmarking are two widespread methods for determining the efficiency factor. Often, efficiency factor results from observing the historical OPEX of the utility and OPEX efficiency components adopted by other regulators. However, the regulator may also take a more formal approach to benchmarking. The approach to calculating the efficiency index will be different across the initial and the following regulatory periods:

Table 14: Efficiency index across regulation periods

Period	Efficiency index
Initial regulatory period	The efficiency index for the first regulatory period is approved at the level of 0%. This allows to identify savings and understand the true level of OPEX.
Second regulatory period and beyond	The regulator approves efficiency forecast for each company in the range of 1% to 3%. Usually based on forecast indicators provided by entities, as well as analysis of historical data.

Source: KPMG analysis

Once the x-factor is established, the company may still deviate from the specified level both in the direction of profit and loss. The entity can achieve the following savings:

- Savings of controlled OPEX
- Savings from the losses reduction

Regulators have two broad options. One is for the utility to bear all losses and retain all savings. Another is for the utility to share savings and losses with network users. If savings retention is allowed for the company, then there is an incentive to reduce OPEX to make a profit in the remaining years of the regulatory period. As a rule, savings retention is allowed over the three- to five-year span. As the tariff is set at the start, reduction in OPEX will not affect revenue and the profit will rise. However, in the next regulatory period, regulators will revise OPEX downward and reduce the tariff. Therefore, under the x-factor and savings incentive mechanism, the utility benefits in the short-term (by receiving additional profit), and consumers benefit in the long-term (by paying a cheaper tariff).

When aiming to reduce OPEX, it is important to prevent a decrease in the quality of services provided. As a counterbalance to OPEX incentives, quality indicators are used that do not allow an excessive reduction of OPEX to the detriment of service quality. There are three main groups of quality indicators used in international practice:

- Reliability of supply: SAIFI (the System Average Interruption Frequency Index) – the average time of interruptions per consumer per year, SAIDI (the System Average Interruption Duration Index) – the number of interruptions per consumer per year, CAIDI (The Consumer Average Interruption Duration Index) – the average duration of a single shutdown per consumer affected per year.
- Commercial quality (i.e., the speed of response to consumer complaints, the response time to consumer's request to connect to the network, the inspection time in case of malfunctions, etc.).
- Voltage quality (i.e., norms of voltage drops, flicker, imbalance, etc.).

In case of non-submission or the submission of unreliable data (deliberately misleading or complicated) for the calculation of quality and reliability indicators, the subject company faces a fine. The reported data is considered unreliable if a significant deviation is detected (i.e., deviation of value) calculated based on the reported data from the value reported by the company.

1.3.4 Selected Case Studies from Countries Using Different Methodologies

Table 15: OPEX composition and incentives in Russia and Poland

	Russia	Poland
OPEX method	Historical outturn OPEX: $\mathrm{OPEX_i} = \mathrm{OPEX_0} \times \prod_{j=1}^{i} (1 - \mathrm{EI_j}) \times$ $\times \left(1 + \mathrm{CPI_j}\right) \times (\mathrm{AI_j})$ $\mathrm{OPEX_0}$ - basic level of operating costs; $\mathrm{EI_j}$ - OPEX efficiency index; $\mathrm{CPI_j}$ - consumer price index; $\mathrm{AI_j}$ – network growth index;	Bottom-up with item-by-item approval of entity's costs
Uncontrollable OPEX	• Expenses for regulated activities in the power industry • Rental expenses • Income tax and other mandatory taxes, payments, and fees • Losses from connection of power devices at maximum capacity	There is no division between controlled and uncontrolled costs

	• The regulator adjusts the amount of uncontrolled expenses annually	
OPEX incentives	• The calculation of the OPEX efficiency index and OPEX base level is performed using peer analysis as an industry distribution by groups, considering price level and climate in the region, as well as operating indicators of entities. • For each group, an individual efficiency index of controllable OPEX is established	• X-factor is included in the tariff in the first year of the regulatory period (RP) and then reset in the following years. A quality charge (for maintaining power system standards) is also applied to the tariff of TSO and DSO companies • Regulation adopts the use of the quality factor, impacting the return on capital. This factor depends on the DSO's performance in the supply quality, measured via SAIDI/SAIFI indicators

Sources: Adapted from CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Order of the Federal Tariff Service No. 228-e, "On approval of Methodological Guidelines on tariff Regulation using the method of return on invested capital." 2012.

1.3.5 Recommended Approach for Kazakhstan and Uzbekistan

- In international practice, the bottom-up method is most often used to determine the cost base for the TSO (bottom-up and yardstick for the DSO). In a stable macroeconomic environment, the historical outturn OPEX may be preferred due to low regulatory cost, simplicity, transparency, and strong efficiency incentives. Another option is a top-down method, which abolishes the item-by-item control of expenses, arguing that regulators should control the amount of the cost base instead of each cost item.
- The division of expenses into controllable, uncontrollable, and compensation of losses (provided that in case of losses volume is a controllable factor, but price is not) simplifies the determination of the OPEX base, reduces the administrative burden of the regulator, and provides better incentives for controllable costs.
- The base level of controlled expenses should be established at the beginning of the regulatory period. This level cannot change during the period of regulation.
- Introducing incentives for OPEX reduction (OPEX savings retention for up to five years and X-factor) is advisable. The opportunity to use savings within the RP at the entity's discretion will create natural incentives to look for ways to reduce costs and eventually pass on the savings to consumers in the following regulatory period. Moreover, the use of the x-factor mechanism indicates the authority's expectation that costs will be reduced in real terms.
- The following regulation can be established for bad debt: (i) estimating the share of bad debt as a percentage (%) of revenue from retail sales, (ii) determining the cost of such debt from collection bureaus, (iii) subtracting the percentage (%) of bad debt and the cost of selling, and (iv) distributing the real losses from bad debt between the entity and consumers.
- Pegging the tariff to a specified quality/reliability parameter describing the efficiency of the regulated entity may be a strong tool. However, when assessing the impact of various OPEX methods, the interaction with the other CoS components should be considered (i.e., RAB value, RoR, depreciation, etc.).

1.4 Allowing for Depreciation and Taxes

1.4.1 Depreciation

Depreciation is one of the key elements of the CoS that a regulated entity is allowed to recover from the annual tariff revenue. The asset is depreciated, allowing the firm to recover the cost of replacing the investment over the economic life of the asset, which is a return on capital. Depreciation rate is closely related to RAB/RoR component, as it reduces the value of assets that accumulate income.

1.4.1.1 Existing international practices

Table 16: Depreciation regulation in different countries (TSO and DSO)

Country	Depreciation rate method	Asset value	Regulatory Depreciation Principles
Europe			
Czech Republic	Straight-line	Historical cost	Life of assets, rate method
Estonia	Straight-line Accelerated	Historical cost	Life of assets, rate method
Germany	Straight-line	Replacement cost	Life of assets, rate method
Latvia	Straight-line According to IFRS	Historical cost	Rate method
Lithuania	Straight-line	Historical cost, LRAIC	Life of assets, rate method
Moldova	Straight-line	Replacement cost	Rate method
Poland	Straight-line	Historical cost	Life of assets, rate method
Russia	Straight-line	Historical cost Replacement cost	Life of assets, rate method
Slovakia	Unit of production	Historical cost	Life of assets, rate method
Sweden	Straight-line	n/a	Life of assets, rate method
United Kingdom	Straight-line	Historical cost	Life of assets, rate method
Caspian			
Armenia	Straight-line	Historical cost	Rate method
Azerbaijan	Straight-line	Historical cost	n/a
Georgia	Straight-line	Historical cost Replacement cost	Life of assets, rate method
Kazakhstan	Straight-line According to KNFRS	Historical cost Replacement cost	Accounting depreciation
Uzbekistan	According to NSBU	Historical cost	Accounting depreciation
South and Western Asia			
Turkey	Straight-line	Historical cost	Life of assets, rate method
India	Straight-line	Admitted by the State Commission	Life of assets, rate method
Pakistan	Straight-line	Historical cost	Rate method
South America			
Peru	Straight-line	Replacement cost	n/a
Africa			
Nigeria	Straight-line	Replacement cost	n/a

Sources: Data adapted from CEER, "Report on Regulatory Frameworks for European Energy Networks 2020," 2024; ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; NEPRA, National electric power regulatory authority guidelines for determination of consumer end tariff (methodology and process), 2015; EC and INOGATE Technical Secretariat, "A Review of Energy Tariffs in INOGATE Partner Countries." 2015; Decree of the Government of the Russian Federation of December 29, 2011 N 1178 "On pricing in the field of regulated prices (tariffs) in the electric power industry." 2011; Order of the Minister of Energy of the Republic of Kazakhstan No. 205 "On approval of the Methodology for determining the RoR taken into account when approving marginal tariffs for electricity, as well as a fixed profit for balancing, taken into account when approving marginal tariffs for balancing electricity." 2020; Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 310 "On measures to further improve the tariff policy in the electric power industry." 2019; Ministry of Power India, "The notification of the Government of India in the erstwhile Ministry of Power and Non-conventional Energy Sources, Department of Power, No.S.O. 92(E) dated the 23rd January, 1992." 1992.

1.4.1.2 Depreciation Rate

In general, there are two main approaches to determine depreciation cost: the "value" concept and the "cost allocation" concept. Under the "value" concept, depreciation is calculated as an annual reduction in the asset value via periodic estimations. Due to its complexity and uncertainty, this concept is not widely used by regulators to account for depreciation. Under the "cost allocation" concept, depreciation is the amount of initial asset cost allocated to each accounting period over the asset life. The cost allocation concept is considered appropriate for the electricity and power industry and is used by regulators to set cost-reflective tariffs.

Table 17: Cost allocation methods for determining depreciation

Approach	Description	Advantages and disadvantages
Age-life methods		
Straight-Line	The depreciable cost of an asset distributed evenly over the service life	Relatively simple and straightforward for both regulators and investors, reducing volatility in the tariff, which is favored by consumers
	Formula: Depreciation = $\frac{Depreciable\ cost}{Service\ life}$; Depreciation rate (%) = $\frac{Annual\ Depreciation}{Total\ initial\ Asset\ value}$	
Accelerated "Sum-of-the-Years-Digits"	The rate varies with the age of service, resulting in higher charges in early life and lower charges later. The initial cost of the asset is fully recovered by the end of asset life	If the asset is depreciated in the early years, then utility may not have an incentive to maintain the asset, but rather to invest in its replacement, leading to overinvestment
	Formula: Depreciation rate (%) = $\frac{L-n+1}{\sum_1^L x}$ × (100% – Net salvage %); L – a measure of the asset's life, $\sum_1^L x$ – the sum of each whole number from 1 to L	
Accelerated "Declining Balance"	The depreciation rate is constant and applied to the net asset balance, not the gross asset balance. The depreciation rate is set at 1.5 or 2 times the straight-line rate	Accelerated methods can cause fluctuations in the annual depreciation cost in the tariff, and like the "Sum-of-the-Years-Digits" method, it does not reflect the true consumption pattern of the assets. Accelerated methods can be convenient for investors with a lower RoR on capital, as there is an incentive to depreciate and replace the asset
	Formula: Depreciation rate (%) = 2 × $\frac{100\% - Net\ salvage\ (\%)}{Average\ Service\ Life}$; Depreciation = Depreciation rate (%) × (Total initial Asset value – Reserve)	
Deferred	The most common variation is the sinking fund method, which considers the opportunity cost of an investment in terms of the interest that would be received if the funds were invested elsewhere. The depreciation rate is determined in such a way, that along with the interest charged on the reserve it covers the full cost of the asset	This method produces lower depreciation cost at the outset and higher cost in the subsequent years as the asset ages due to interest earned on the increasing depreciation reserve. This method requires discretion on account of both investors and regulators when estimating the life of the assets. This method is not applied by any country covered in this module
	Formula: Depreciation rate (%) = (1 – Net salvage %) × $\frac{i}{(1+i)^L-1}$; Depreciation = (Depreciation rate × Total Initial Asset Value) + (i × Reserve) L – a measure of the asset's life, i – the net interest rate	
Unit of production methods		
Unit of production	Depreciation cost is based on units of production	Asset capacity to provide regulated service can be determined by the production units rather than years of service life. At the same time, volume fluctuations will be reflected in the tariff, which makes this method less convenient. Also, accounting can be difficult
	Formula: Depreciation = $\frac{Original\ value - Salvage\ value}{Estimated\ production\ capabilty}$ × U; U – Units per year	

Source: Data adapted from "Depreciation expense: A primer for utility regulators." USAID and NARUC. 2021. https://pubs.naruc.org/pub.cfm?id=6ADEB9EF-1866-DAAC-99FB-DBB28B7DF4FB

1.4.1.3 Asset Value

Asset value is the key input for calculating depreciation. An asset may need to be revaluated during its useful life to accurately reflect its true economic value. Thus, there is a practice of separate accounting for depreciation of the initial RAB and of the new RAB. The value of fixed assets is usually taken at the beginning of the year.

In practice, regulators often use a hybrid approach, combining the use of historical costs for the new assets with ad-hoc or periodic re-valuations using replacement cost. On the other hand, it is preferable for regulators to use a consistent approach. Consistency on behalf of a regulator provides certainty to the regulated entity that it will recover its capital by means of allowed depreciation (as well as return on capital), minimizes the risk associated with the investment, and provides transparency for the creditors and tariff stability for the consumers. A more detailed analysis of methods to determine the fixed assets' value is given in paragraph 1.1.1.1 "Fixed assets" of the current module.

1.4.1.4 Regulatory Principles

Most countries use the straight-line method in their depreciation accounting. Regulators predominantly use the same depreciation approach for TSO and DSO companies, although there may be slight differences between them. Asset life can be up to 65 years (i.e., Lithuania), but the typical range for power assets is from 20 to 50 years.[3] Some countries use a specific depreciation rate for each type of asset. However, some regulators apply average rates for all companies and all assets to simplify the calculation of depreciation.

As with RAB valuation, the depreciation of assets can be based on historical cost, revalued cost, or a combination of the two. Most regulators allow depreciation of tangible and intangible assets, calculated on the same basis as the RAB. It can be difficult for the regulator to separate (and monitor) the RAB from general accounting; therefore, regulators often use accounting depreciation along with the historical cost of assets.

1.4.1.5 Selected Case Studies from Countries Using Different Methodologies

Georgia

Georgia's power grid network consists of old assets built in the Soviet period, and new assets built after 2000. Before the start of the energy sector reform in 1995, there was no legal framework for the legacy assets, which would require any records of the assets. Therefore, information on the cost of those assets was not available.

The Georgian National Energy and Water Supply Regulatory Commission (GNERC) has noted in its Tariff Methodology that in cases where cost information on the old assets is not available, "replacement cost" is used as a one-time proxy.[4] The regulator also specifies annual depreciation rates that utilities should apply to assets acquired after the 2014 tariff methodology was adopted and asset life groups. However, utilities are allowed to follow the prior approach to estimate the depreciation of old assets, as change in the tariff regime did not affect the repayment of loans to build those assets. GNERC uses the straight-line depreciation method to level off cash flows over the asset life, smoothing out its impact on tariff rates.

Estonia

Estonia, having a common Soviet past with Georgia, uses a different approach to accounting for the depreciation of obsolete facilities. Since 2003, the Estonian regulator has used a regulatory CAPEX method that differs from the accounting depreciation. In the normative accounting of CAPEX, assets

[3] "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." ECA. 2020.

[4] "Depreciation Expense: A primer for Utility Regulators." USAID & NARUC. 2021.

are divided into two parts: old and new investments. For the assets acquired before the specified year, an accelerated depreciation rate (7.14% of residual value) is applied. For new assets, the rate of 2.86%-3.33% of the investment value is used.[5]

1.4.1.6 Recommended Approach for Kazakhstan and Uzbekistan

The regulation of RAB depreciation should be considered along with the capital return rate, provided that at the lower return, it will be more profitable for a regulated entity to depreciate assets faster, and under the higher return, more slowly.

We would recommend using the straight-line depreciation method, which allocates asset cost evenly to the tariff and avoids unnecessary volatility. As global practice shows, this method is used by most countries. It is also possible to consider a mixed approach using accelerated depreciation for old assets, like Estonia, or performing a revaluation to account for the fair value of old assets in the tariff, like Georgia. Also, in some countries, asset life rates are prescribed. They are broken down by asset type, which helps to depreciate different assets accurately, but complicates the accounting for these assets.

1.4.2 Taxes

Taxes other than income tax are not usually one of the main drivers of electricity tariffs unless the taxation regime is drastically changed. The introduction of various environmental taxes, namely the carbon tax, can materially affect the CoS, placing this burden onto consumers. In some heavily taxed countries, taxes can constitute more than half the cost of the fare (i.e., Germany). From the regulatory point of view, taxes are usually non-controllable expenses.

1.4.2.1 Existing International Practices on Taxes

Generally, standard taxes, presented in 4.2.2, are featured in most jurisdictions, whereas the table below shows less conventional types of taxes imposed recently by some countries in the power industry.

Table 18: Non-standard energy taxes in different countries

Country	Energy tax	Carbon tax	Renewable tax	Excise tax	Other specific
Europe					
Czech Republic	✓	⊘	✓	⊘	
Estonia	n/a	✓	✓	✓	
Germany	✓	⊘	✓	✓	• EEG-surcharge (EEGUmlage) • Concession fee
Latvia	✓	✓	✓	⊘	• Mandatory procurement component • Regulation of public utilities fee
Lithuania	n/a	⊘	✓	✓	
Moldova	n/a	⊘	⊘		
Poland	n/a	✓	✓	✓	
Russia	⊘	⊘	⊘	⊘	
Slovakia	n/a	⊘	✓	✓	• Nuclear
Sweden	✓	✓	✓	✓	
United Kingdom	⊘	✓	✓	⊘	
Caspian					
Armenia	n/a	⊘	n/a	n/a	
Azerbaijan	⊘	⊘	⊘	⊘	

[5] "Report on Regulatory Frameworks for European Energy Networks 2020." CEER. 2021.

Country	Energy tax	Carbon tax	Renewable tax	Excise tax	Other specific
Georgia	n/a	⊘	n/a	n/a	
Kazakhstan	⊘	⊘	⊘	⊘	
Uzbekistan	⊘	⊘	⊘	⊘	
South and Western Asia					
Turkey	✓	⊘	✓	⊘	• Energy fund fee • TRT fee
India	✓	✓	⊘	✓	
Pakistan	n/a	n/a	n/a	n/a	
South America					
Peru	n/a	n/a	n/a	n/a	
Africa					
Nigeria	n/a	⊘	n/a	n/a	

Sources: "Carbon Pricing Dashboard." The World Bank. https://carbonpricingdashboard.worldbank.org/map_data; "Energy Prices." IEA. March 2022 edition Database documentation, 2022; "Renewables Obligation (RO)." Ofgem official site, https://www.ofgem.gov.uk/environmental-and-social-schemes/renewables-obligation-ro; "Electricity Tax Act (StromStG) of March 24, 1999: § 9a." StromStG, https://www.gesetze-im-internet.de/stromstg/__9.html

1.4.2.2 Standard Taxes in the CoS

Table 19: Standard taxes

Tax	Description
Income tax	A tax levied on taxpayers on their income or profits (commonly referred to as taxable income). Income tax is usually calculated as the product of the tax rate and taxable income. It may or may not be included in the RoR, which is described in more detail above in the module, paragraph 2.1.4
Value-added tax	Value-added tax (VAT) comprises the general consumption tax, charged on the value added to goods and services.
Social taxes	Social security contributions
Environmental taxes	Environmental taxes are taxes and fees for environmental use. These include, for example, carbon tax, NO tax, soil remediation tax, and others
Other taxes	Other taxes, such as property tax, transport tax, and taxes of local authorities. Covers all excise taxes applied to energy products, which are not included in the environmental, renewable energy, energy supply security, and/or social taxes.

1.4.2.3 Potential New Taxes

Potential new taxes are taxes that have been introduced so far by a few countries, following new policies, but not always directly associated with the regulated service. These taxes vary significantly from country to country.

Table 20: Potential new (non-standard) taxes

Tax	Description
Energy / Electricity tax	An electricity tax has been levied on final consumption
Carbon tax	Special case of environmental tax: the tax is intended to reduce emissions of greenhouse gases and carbon dioxide, a colorless, odorless, non-flammable gas, into the atmosphere
Carbon border tax	Tax on carbon emissions associated with imported goods that are not subject to a carbon tax at source. This system helps national companies from foreign competitors, for which there are less stringent rules regarding climate change
Renewable support taxes	Renewable energy supply taxes comprise all taxes and levies applied with the aim of supporting investment in renewable energy technologies
Excise tax	An excise tax is a legislated tax on specific goods or services at purchase
Nuclear tax	In Slovakia, where more than half of the energy is generated by nuclear power plants, taxes on "excess profits" on nuclear power are introduced. In Sweden, the government, amid growing concerns over the continued viability of existing plants, has agreed to phase out the tax on nuclear power from 2017 onwards

Source: "Slovak Republic 2018 Review." IEA. 2018.

1.4.2.4 Selected Case Studies from Countries Using Different Methodologies

Germany

In Germany, various taxes and fees make up a significant part of the electricity tariff and the overall tax burden on the tariff is one of the highest in the world.[6] Electricity is subject to a number of levies and taxes. EEG, for example, is a surcharge to support renewable energy producers, and the combined heat and power (CHP) levy is an electricity duty used to finance eligible CHP plants.

At the same time, there are certain tax reliefs for activities, which are important for the international competitiveness of the German economy. For instance, the following activities are exempt from the electricity tax:[7]

- Electricity from renewable energy sources
- Electricity used for generating electricity
- Electricity from renewable or highly efficient CHP systems with a nominal electrical output of up to 2 megawatts (MW), if consumed by the system operator
- Electricity produced by emergency power generators for temporary supply of power
- Electricity generated/consumed on board ships or aircraft

An electricity tax is not levied on certain energy-intensive activities or may be refunded when applied. These activities include, for example: electrolysis; the manufacture of glass, bricks, and cement; metal production and processing; and chemical reduction processes. The German system demonstrates a considerable number of tax mechanisms and tax benefits, aiming to support and develop certain industries and promote economic growth. At the same time, this leads to a significant tax component in the resulting energy tariff.

1.4.2.5 Recommended Approach for Kazakhstan and Uzbekistan

Complicated tax systems in the power sector are widespread in European countries and are largely explained by the high share of fuel imports for energy production and growing environmental agenda. The electricity in these countries is expensive, but the population is relatively wealthy and can afford the price. It is important for Kazakhstan and Uzbekistan regulators to exercise discretion when considering potential change in the tax regime, namely, to protect utility companies from suffering severe losses, and vulnerable consumers from sharp tariff increases.

1.5 The Importance of a Regulator's Prudence Review

In the primer "Promoting Transparency and Public Participation in Energy Regulation: A Communications Primer for Utility Regulators," NARUC defines four basic principles that ensure the stable, transparent, and reliable operation of the regulator:[8]

- **Autonomy:** The regulator must be independent from undue influence from government, utilities, and the public
- **Authority:** The regulator should have full power to set tariffs and issue licenses
- **Accountability:** The regulator should ensure transparency and credibility, with specific opportunities for public participation and judicial review of decisions
- **Ability:** The regulator should be able to perform regulatory functions, including qualified personnel, reliable management, and effective monitoring and enforcement

[6] "Household electricity prices in select countries worldwide in 2019." Statista. https://www.statista.com/statistics/1123031/household-electricity-prices-select-country-by-component/

[7] "Electricity Tax Act (StromStG) of March 24, 1999: § 9a." StromStG, https://www.gesetze-im-internet.de/stromstg/__9.html

[8] "Promoting Transparency and Public Participation in Energy Regulation: A Communications Primer for Utility Regulators." USAID & NARUC. 2019.

1.5.1 The Regulator's Governance Position

Table 21: Regulator's governance position in different countries

Country	Governance position of regulatory authority	Organizational structure of regulatory authority	Appointment of board of commissioners of the regulatory authority	Entities that develop and approve the allowed revenue methodology
Europe				
Czech Republic	Independent regulator	A board of commissioners and technical staff	Proposed and appointed by executive	Regulator
Estonia	Non-independent regulator	A managing director and technical staff	Proposed by the civil service through an open call and appointed by executive	Regulator
Germany	Independent regulator	A president and technical staff	Proposed by the Advisory Board of the Federal Network Agency and appointed by executive	Ministry of economic affairs
Latvia	Independent regulator	A board of commissioners, supported by a managing director and technical staff	Proposed by executive and appointed by legislature	Regulator
Lithuania	Independent regulator	A board of commissioners, supported by a managing director and technical staff	Proposed by executive and appointed by legislature	Regulator
Moldova	Independent regulator	A board of commissioners, supported by a managing director and technical staff	Proposed and appointed by legislature through an open call	Regulator
Poland	Independent regulator	A managing director and technical staff	Proposed and appointed by executive	Regulator
Russia	Non-independent regulator	A managing director and technical staff	The head of the FAS of Russia (Regulator)	Regulator
Slovakia	Independent regulator	A managing director and technical staff	Proposed and appointed by executive	Regulator
Sweden	Independent regulator	Several departments and technical staff	n/a	Regulator (revenue cap)
United Kingdom	Independent regulator	A board of commissioners, supported by a managing director and technical staff	Appointed by executive	Regulator
Caspian				
Armenia	Independent regulator	A board of commissioners and technical staff	Appointed by legislature	Regulator
Azerbaijan	Non-independent regulator	A board of commissioners and technical staff	Proposed and appointed by executive	Developed by Tariff Council, Approved by Government
Georgia	Independent regulator	A board of commissioners, supported by a managing director and technical staff	Proposed by executive and appointed by legislature	Regulator
Kazakhstan	Non-independent regulators	A managing director and technical staff	Appointed by executive	Ministry of Energy – generation of energy; CRNM – TSO and DSO
Uzbekistan	Non-independent regulator	A board of commissioners, supported by a managing director	Appointed by executive	Regulator
South and Western Asia				
Turkey	Independent regulator	A board of commissioners, supported by a managing director and technical staff	Proposed and appointed by executive	Regulator
India	Independent regulator	A board of commissioners, supported by technical staff	Selection of Chairman/members by	Regulator

Country	Governance position of regulatory authority	Organizational structure of regulatory authority	Appointment of board of commissioners of the regulatory authority	Entities that develop and approve the allowed revenue methodology
Pakistan	Non-independent regulator	A board of commissioners, supported by a managing director and technical staff	Government on advice of selection committee Proposed and appointed by executive	Regulator
South America				
Peru	Non-independent regulator	A board of commissioners, supported by a managing director and technical staff	Proposed and appointed by executive	Regulator
Africa				
Nigeria	Independent regulator	A board of commissioners and technical staff	Proposed by executive and appointed by legislature	Regulator

Sources: ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; ACER, "Practice Report on Transmission Tariff Methodologies in Europe." 2019; ERRA, "Energy Regulatory Office (URE)." https://erranet.org/member/ure-poland/; Order of the FAS of Russia n 457/16 dated 15.04.2016 "On approval of the regulations on the power industry regulation department of the Federal antimonopoly service." 2016; Ofgem, official site, https://www.ofgem.gov.uk; Armenia, law ed. 18.11.21 HO-364-N "About the public services regulatory body." 2021; Decision of the Cabinet of Ministers of the Republic of Uzbekistan 03.12.2019 "On measures to organize the activities of the interdepartmental tariff commission under the Cabinet of Ministers of the Republic of Uzbekistan." 2019; Ministry of Energy of the Republic of Kazakhstan, official site, https://www.gov.kz/memleket/entities/energo; Committee on Regulation of Natural Monopolies (CRNM) of the Ministry of national economy of the Republic of Kazakhstan, official site, https://www.gov.kz/memleket/entities/krem

1.5.1.1 Governance Position of Regulatory Authority

The governance position of the regulatory authority pertains first to the independence of the regulator. The regulator should provide balance between end users and utilities, representing the center of technical expertise, free from political interference. In most countries, regulators are independent of the government.

1.5.1.2 Organizational Structure of the Regulatory Authority

The concentration of decision-making power in the hands of a small group is prone to external influence. The best option is thus a commission structure. In most countries under review, regulators are headed by a board of commissioners.

1.5.1.3 Appointment of Board of Commissioners of the Regulatory Authority

There should be no political leverage when appointing commissioners or managing directors. Usually, a legislative or an executive power proposes and appoints the head of the regulatory body. A separate right to propose and appoint the head of the regulator can be considered.

1.5.1.4 Entities that Develop and Approve the Allowed Revenue Methodology

Generally, regulators develop and approve the revenue requirement methodology. This authority should be with the regulator to avoid conflicts of interest or contradictions. Of the countries reviewed, the division of these powers is observed in Azerbaijan (the government approves the methodology) and Kazakhstan (two regulators).

1.5.2 Public Oversight of Regulatory Activities

Public oversight of the regulator's activities is important for the efficient operation of the industry. This allows for transparency in tariff setting, both for consumers and for utilities.

Table 22: Public oversight over regulatory activities in different countries

Country	Public availability of allowed revenue and tariff documents	Detailing the costs of subjects of TSO	Appealing regulatory decisions	Public consultations
Europe				
Czech Republic	• Allowed revenue methodology • Decision on approved tariffs	n/a	Regulatory decisions cannot be appealed	✓ ERRA, CEER member
Estonia	• Allowed revenue methodology • Tariff calculation models • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	✓ ERRA, CEER member
Germany	• Allowed revenue methodology • Decision on allowed revenues • Decision on approved tariffs	Only overall costs	n/a	Only specific stakeholders, Advisory board, CEER member
Latvia	• Allowed revenue methodology • Decision on allowed revenues • Decision on approved tariffs	Only overall costs	End users, Network users, Government, Utility may appeal	✓ ERRA, CEER member
Lithuania	• Allowed revenue methodology • Decision on allowed revenues • Tariff calculation models • Decision on approved tariffs	✓	End users, Network users, Government, Utility may appeal	✓ ERRA, CEER member
Moldova	• Allowed revenue methodology • Tariff calculation models • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	✓ ERRA, CEER observer
Poland	• Allowed revenue methodology • Tariff calculation models • Decision on approved tariffs	✓	Utility may appeal	Only specific stakeholders, ERRA, CEER member
Russia	• Allowed revenue methodology	⊘	Utility may appeal	✓ ERRA member
Slovakia	• Allowed revenue methodology • Tariff calculation models • Decision on approved tariffs	n/a	Utility may appeal	✓ ERRA, CEER member
Sweden	• n/a	✓	n/a	✓ CEER member
United Kingdom	• Allowed revenue methodology • Tariff calculation models • Decision on approved tariffs	✓	Utility may appeal	✓ CEER member
Caspian				
Armenia	• Decision on approved tariffs	n/a	Utility may appeal except the amount of tariff	✓ ERRA member
Azerbaijan	• n/a	n/a	Government and Utility may appeal	n/a, ERRA member
Georgia	• Allowed revenue methodology • Decision on allowed revenues • Tariff calculation models • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	n/a, ERRA, CEER observer
Kazakhstan	• Allowed revenue methodology • Decision on approved tariffs	✓	Utility may appeal	✓ Tariff Policy Council under the Regulator, ERRA member
Uzbekistan	• Decision on approved tariffs	n/a	n/a	✓
South and Western Asia				

Country	Public availability of allowed revenue and tariff documents	Detailing the costs of subjects of TSO	Appealing regulatory decisions	Public consultations
Turkey	• Allowed revenue methodology • Decision on allowed revenues • Tariff calculation models • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	n/a, ERRA member
India	• Allowed revenue methodology • Decision on allowed revenues • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	✓ Central Advisory Committee
Pakistan	• Allowed revenue methodology • Decision on allowed revenues • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	n/a, ERRA member
South America				
Peru	• Allowed revenue methodology • Decision on allowed revenues • Tariff calculation models • Decision on approved tariffs	n/a	End users, Network users, Government, Utility may appeal	n/a, ERRA associate member
Africa	•			
Nigeria	• Allowed revenue methodology • Decision on allowed revenues • Tariff calculation models • Decision on approved tariffs	n/a	Utility may appeal	✓ ERRA member

Sources: ACER, "Practice Report on Transmission Tariff Methodologies in Europe." 2019; Energy Regulatory Office (ERÚ) of Czech Republic, official site, https://www.eru.cz; Republic of Estonia Competition Authority, official site, https://www.konkurentsiamet.ee; The Bundesnetzagentur of Germany, official site, https://www.bundesnetzagentur.de; The National Agency for Energy Regulation of the Republic of Moldova, official site, https://www.anre.md; The Regulatory Office for Network Industries of the Slovak Republic (URSO), official site, https://www.urso.gov.sk; Energimarknadsinspektionen of Sweden, official site, https://www.ei.se/; Ofgem, official site, https://www.ofgem.gov.uk; Law of the Republic of Kazakhstan dated December 27, 2018 No. 204-VI ZRK "On natural monopolies."; "The Electricity Act, 2003," India, 2003; Nigerian Electricity Regulatory Commission (NERC), official site, http://nerc.gov.ng
Note: ERRA – Energy Regulators Regional Association, CEER – Council of European Energy Regulators

1.5.2.1 Public availability of Allowed Revenue and Tariff Documents

It is important to ensure transparency of the regulator's activities via the mandatory disclosure of regulatory documentation for public access. Openly accessible materials, containing rationale for key methods, the composition of tariffs, the composition of expenses, and proprietary practices will make the regulatory process transparent. Also, it is important to hold public hearings with key stakeholders to consider their views and interests. Under this policy, the regulator is left with less room to maneuver when having disputes with main stakeholders. At the same time, market-sensitive information should be protected.

1.5.2.2 Authority to Approve Prudent or Disapprove Imprudent Costs

From the regulatory standpoint, utilities' expenses, charged via tariff, should be attributed only to operating activities; other expenses should not be included in the tariff. Regulators usually review the costs reported by companies and verify their validity. Some regulators disclose utilities' costs, as in Germany, to provide transparency to consumers on the price of service.

1.5.2.3 Appealing Regulatory Decisions

Most countries provide an opportunity to appeal against the regulator's decisions. Regulatory decisions are subject to appeal in all jurisdictions reviewed except the Czech Republic and Hungary. As a rule, these appeals are considered in court. In Azerbaijan, appeals go through the executive authorities, which is an alternative to appealing in court.

1.5.2.4 Public Consultations

Regulators in most countries consult with third parties on tariff setting. Also, a lot of the countries in our sample are members of regulatory associations such as ERRA and CEER. This allows them to share the experience and best practices employed by their members and seek advice in various areas of their activities.

1.5.3 Selected Case Studies from Countries Using Different Governance Models

Germany

Bundesnetzagentur, the power and energy authority in Germany, performs "cost examination" – a routine practice to determine an up-to-date CoS before each regulatory period.[9] Cost data for three years prior to the start of the new regulatory period are considered. The regulator verifies the operational necessity of the declared costs for specific business activity (electricity operations) using annual audited financial statements, prepared in accordance with German commercial law and adapted for cost verification purposes. Financial statements are published annually in the electronic Federal Gazette.

The carrying costs and contingent costs of operating the network can only be recognized to the extent that they correspond to the costs of an efficient and structurally comparable network operator. Using an income statement, a report on the implied cost is prepared to determine network costs. All costs incurred based on cause or amount are included, since the goal is to avoid cross-subsidization of competing areas of network operation, such as manufacturing and selling energy.

As for the cost of losses, since losses depend on the general trend in electricity prices, this cost element is currently regulated by its own cost adjustment mechanism called "volatile costs." The regulator discloses the applicable reference price annually. Cost is also included in efficiency benchmarking.

1.5.4 Recommended Approach for Kazakhstan and Uzbekistan

In developed countries, the regulatory body for the power and energy sector is usually independent and its management is appointed for a fixed term. As a rule, this body regulates the entire industry cycle, including the generation, transmission, and distribution of power.

Kazakhstan has two regulatory bodies: The Ministry of Energy and the Committee for the Regulation of Natural Monopolies under the Ministry of National Economy, which causes certain contradictions and difficulties with the implementation of policy in the industry as a whole. In Uzbekistan, the Interagency Tariff Commission (ITC) under the Cabinet of Ministers acts as a regulator, which is also not an independent body. Transferring decision-making power to a single independent authority can have a positive effect on the functioning of the sector. Also, the majority of independent regulators are appointed by lawmaking powers of the state.

Increasing the transparency of regulatory activities by the mandatory disclosure of key regulatory documentation, for instance, can be beneficial for both utilities and consumers. A detailed and clear procedure for including utilities' prudent costs in tariffs can improve transparency for companies. The itemization of cost is not advised, as it can result in a significant administrative expense burden. Overall, regulators should control the size of the base cost, and not necessarily each cost item. Grouping expenses and a further analysis of subtotal cost can reduce the complexity and administrative burden of a regulator's prudence responsibility.

[9] "Cost examination." Bundesnetzagentur, https://www.bundesnetzagentur.de/EN/RulingChambers/Chamber8/RC8_05_Revenue%20caps_revenue%20regulation/52_Cost%20examination/Cost%20examination.html

1.6 Benefits and Challenges in Determining Revenue Requirement

Most widespread mechanisms and techniques used in tariff regulation, are the RAB, cost-plus, revenue cap, and price cap. In practice, a combination of these methods is often employed. In Europe, the revenue cap method and the RAB methodology are the most common. The CIS countries are still predominantly using the cost-plus method, and some have begun to implement RAB regulation.

1.6.1 Existing International Practices

Table 23: Determining revenue requirement methods in different countries

Country	Revenue cap	Price cap	Cost-Plus	RAB	Mixed model
Europe					
Czech Republic	✓			✓	
Estonia				✓	
Germany	✓				
Latvia			✓	✓	
Lithuania	✓	✓		✓	✓
Moldova	✓				
Poland	✓				
Russia	✓		✓	✓	
Slovakia		✓			
Sweden	✓				
United Kingdom	✓			✓	✓
Caspian					
Armenia	✓		✓	✓	
Azerbaijan			✓		
Georgia	✓		✓	✓	
Kazakhstan	✓		✓	✓	
Uzbekistan			✓	✓	
South and Western Asia					
Turkey	✓				
India			✓		
Pakistan					✓
South America					
Peru		✓			✓
Africa					
Nigeria		✓			

Sources: ECA, "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020; CEER, "Report on Regulatory Frameworks for European Energy Networks 2020." 2021; Decree of the Government of the Russian Federation of December 29, 2011 N 1178 "On pricing in the field of regulated prices (tariffs) in the electric power industry." 2011; Georgian National Energy and Water Supply Regulatory Commission Resolution N 14 of July 30, 2014 "On approving Electricity Tariff Calculation Methodologies;" CERC, "Annual Report 2019-20." 2020.

1.6.2 Tariff Regulation Regimes

Methods of tariff regulation that are most used in international practice are described in the following sections.

1.6.2.1 Revenue Cap

The revenue cap mechanism limits a utility's maximum income. Revenue requirement is determined before each regulation period using projected costs. In case of a decrease in electricity supply, tariffs may increase to comply with the revenue cap. Vice versa, with an increase in volume, the tariff decreases. Generally, a utility can price its services at its own discretion, if revenues do not exceed the cap. This mechanism can be used by the regulator in combination with other methods.

1.6.2.2 Price Cap

The price cap sets a limit on the maximum tariff rate suppliers can charge for each unit of electricity. Utility revenues and electricity volumes are estimated before each regulation period based on projected costs. Given that regulation is less dependent on the actual volume of electricity supplied, the price cap provides more consistency from a social point of view. On the other hand, utilities are interested in increasing the volume of energy supply, which may be in opposition to the goal of increasing energy efficiency.

If an economically justified tariff does not fit into the price cap, the regulator can use a smoothing method. Tariff excess is then carried over future periods, including changes in the value of money over time. If the excess is significant, the transfer will not solve the problem; therefore, this method is used for small overshoots. As with the revenue cap, the utility has the right to set the price if it does not exceed the cap. Also, it is often used by regulators in combination with other methods.

1.6.2.3 Cost-Plus

The cost-plus structure is an example of prescriptive regulation. The "cost +" scheme entails setting a tariff for service at the level of economically justified costs and profits (cost base). The more stringent approach can also exclude the profit component of the required revenue. The cost-plus structure has the following properties:

- Relative simplicity of calculation is the main advantage
- Profitability is dependent on the cost base, which creates motivation for utilities to overestimate CoS with no material incentive to improve efficiency
- The regulator usually lacks information about the future costs of the entity, and the entity has the ability to manipulate information provided
- Balance depreciation does not always reflect a company's real need for investment, especially in countries where accounting standards are less accurate

1.6.2.4 RAB

Under the RAB methodology, a guaranteed income is accrued on the invested capital (the RAB) at the RoR specified by regulator. In practice, RAB has many derivations that allow for redistributing value toward existing or new investors, which along with other incentive mechanisms can help achieve regulatory objectives. The application of RAB regulation can be effective when the goal is to raise massive investment in the industry quickly. At the same time, the transition to RAB requires thorough preparation for the adoption phase. The RAB scheme has the following properties:

It considers the interests of both utilities and investors:

- By compensating fair operational costs of utility's service
- By compensating the capital investments of existing and potential new investors
- By raising significant investment and offering an attractive return for the new investors
- By providing a guaranteed return on invested capital, which allows investors to actively use leverage and increase investment in the industry

- By encouraging utilities to become more efficient, as savings from energy efficiency gains usually remain at the disposal of the company
- By setting a tariff for a long-term period, usually three to five years, which ensures predictability of utility's budget planning

It considers interests of consumers by:

- Helping to improve the physical condition of fixed assets in the industry and reduce losses, and as a result, improve socially significant indicators such as reducing the frequency and duration of energy interruptions
- Providing incentives for utility companies to increase cost-efficiency, leading to tariff reductions in future periods

From the government standpoint, the RAB is an effective method to stimulate private investment in the energy infrastructure, incentivize energy efficiency, affordability and to decrease CO2 emissions. Lower risk and stable cashflows of such projects help to attract long-term institutional investors, such as pension funds, sovereign wealth funds, and insurance companies.

1.6.2.5 Mixed Models

In international practice, there is no clear division between specific tariff models, and very often countries use some combination of various regulation methods. Regulators are advised to apply a unified methodology for all regulated entities, which is important to provide a common base for comparing results of their operating, financing, and investment activities, as well as estimate the impact on the larger economy. This approach facilitates the strategic planning for the industry and helps manage the course of the regulated entities' development using common levers.

1.6.3 Selected Case Studies from Countries Using Different Tariff Regulation Regimes

Russia

Russia has a common Soviet past with Kazakhstan and Uzbekistan, a similar electric power complex structure, and sufficient resources for domestic electricity generation. In Russia, RAB regulation was introduced in 2009-2011 with pilot projects. Before 2009, the main regulation approach to electricity transmission tariffs was the cost-plus method. One of the main objectives of transitioning to RAB regulation was to raise long-term investment to upgrade the physical capacity of the industry and avoid sharp increases in tariffs.

According to the Ministry of Energy of the Russian Federation,[10] the average physical wear of equipment in the distribution grid network in 2009 was about 69%, while only 40.6% of the equipment was within the range of standard operating life, 52% of the equipment reached its standard life, and 7.4% of the equipment had two or more regulatory deadlines broken. Moral and technological obsolescence of the equipment was also an issue. The industry required large infusions of investment to upgrade capacity in a fairly short time.

In the 2000s, the electric power industry in Russia was reformed. RAO UES, a monopoly in the national market of energy generation and transmission, was reorganized into separate entities – electricity transmission retained a natural monopoly status and competitive services, generation, and distribution were privatized. Then the government moved on to raising investments.

To transition to RAB regulation, the necessary preparatory work was carried out: utilities' initial capital base was assessed, investment programs were agreed upon, and incentive instruments were laid down

[10] CRNM of the Ministry of national economy of the Republic of Kazakhstan. Official site. https://www.gov.kz/memleket/entities/krem

– the savings achieved were not to be withdrawn, but to remain at the disposal of the company. The return for the old capital was set at 6% in the first year of regulation, 9% in the second, and 12% in the third, while the Federal Tariff Service allowed the regional authorities to use higher rates.

In the Perm region in particular, the RoR was set at 12 % from the second year of regulation. The first "transitional" period of regulation was set at three years, the following period – 5 years. To avoid a sharp increase in tariffs for consumers, Russia used a "smoothing" mechanism – the excess of required revenue was redistributed to the following years within the regulation period. All the while, after the introduction of RAB regulation, despite the smoothing mechanism, a significant increase in tariff followed (more than 30% per annum).

Due to the global crisis in 2008-2009, energy consumption and the overall economy in Russia dropped significantly, companies increased financial debt, and rates of return did not correspond to current market conditions. A lack of financial resources, decreased consumer solvency, and the associated social factors have become the reasons for changes in investment programs. In view of these issues, tariff regulation has come to develop a forced method of "long-term tariff indexation," which has common features with the cost-plus method. Companies have become limited in their investment plans and investors cannot get the required return. At end of the day, due to several revisions of RAB parameters and piecemeal adoption (leading to uncertainties among participants) the regulatory approach has turned into quasi-RAB regulation.

Despite deteriorating economic conditions, Russia has had certain success with the RAB methodology. It experienced unprecedented investment growth in the industry over a short span of time, its physical capacity was updated, and energy efficiency and energy security were improved in the industry.

United Kingdom

The United Kingdom (UK) is a pioneer in electricity regulation and the birthplace of RAB regulation. Ofgem, the regulator in the UK, introduced a new performance-based model in 2010 known as RIIO (revenue using incentives to deliver innovation and outputs or revenue = incentives + innovation + outputs). The main objective of the framework was to use a set of rewards and penalties to increase energy efficiency in the industry and the fair price of investments. Another key factor was the UK's environmental agenda, which required companies to make significant investments in innovation.

RIIO-1, the first price control period, was set for the TSO in 2013 and for the DSO in 2015 for a period of eight years. Utilities were required to submit their business plans with specific performance targets. The achievement of those targets was encouraged by rewards, and violation led to fines and penalties. Thus, inefficient companies were penalized for underperformance, contributing to excess increases in the tariff. The relatively long regulatory period gave companies sufficient time to implement needed changes and innovation and provided for a fair distribution of investment between current and future consumers.

The regulator assumed that the implementation of RIIO would lead to a more efficient use of funds than if it had continued to use the old RPI-X approach. However, the principles of the previous regime have been partly retained – in particular, the price cap, return on the RAB, and adjustments for inflation. As a result, over the period of 2011 to 2017, investments per customer have increased by 30 percent.[11]

Under the RIIO model framework, six groups of results are specified that are stimulated by incentive mechanisms:

- Customer satisfaction

[11] "Hindsight is 2050 vision." KPMG. 2021, https://assets.kpmg/content/dam/kpmg/uk/pdf/2021/06/kpmg-sse-hindsight-2050-report.pdf

- Safety
- Reliability and availability
- Conditions for connections
- Environmental impact
- Social obligations

It is worth mentioning that RIIO is based on the TOTEX approach (i.e., savings are not discriminated between CAPEX and OPEX, which allows the company to choose the most efficient combination of resources, including less capital-intensive innovation spending). Ofgem is moving on to the second step of the RIIO framework – RIIO-2. This is a new set of price control measures aimed at providing clean energy without emissions and with improved service levels and reliability. This regulatory period will be five years: 2023-2028 for distribution and 2021-2026 for transmission.[12]

1.6.4 Recommended Approach for Kazakhstan and Uzbekistan

In view of significant wear on the power equipment in Kazakhstan (59%, 2021)[13] and Uzbekistan (more than 50%, 2020),[14] it may be the main objective to upgrade network capacity (most of which were built during the Soviet era) to ensure efficient energy supply and security in the future. In Kazakhstan, the cost-plus method is currently used as the main methodology for electricity tariffs, and some variation of the RAB is also introduced. To further develop the RAB in Kazakhstan, it is advisable to consider measures that increase the attractiveness of the industry for investors (i.e., dividend payments, fair RoR, etc.).

In Uzbekistan, a methodological framework for the RAB has already been prepared according to the Resolution of the Cabinet of Ministers dated April 13, 2019, No. 310. The start of the first regulatory period is expected in 2023, with a target net income profitability in the range of 10 to 20 percent. The profitability is determined by dividing the amount of total net profit by the amount of the total costs associated with the production, transmission, distribution, and sale of electricity. To successfully complete the transition to RAB regulation, it is important to ensure transparency and consistency when formulating general principles, which should make the process clear and predictable for investors.

In this light, the RAB method can be an effective solution for attracting necessary investment in the industry, if implemented with necessary discretion and learning from the rich experience of other countries, including adoption mistakes. RAB adoption requires careful preparation and consistency in actions. It is important to continuously evaluate various options, test them using models, and monitor consumer reactions. Regulators should request utilities' annual reports and conduct interim reviews during the regulation period, to help maintain control of the situation. Various scenarios and consequences of associated decisions should be modelled and considered in advance. That way, it is possible to foresee potential risks and quickly react to emerging difficulties.

Many countries have made mistakes when implementing RAB regulation, which is almost inevitable. Therefore, an iterative approach, correction of mistakes, and timely communication with stakeholders is important. It is advisable to pay proper attention to the social factor: aiming to avoid sharp hikes in tariffs, assess the impact of a high tariff on consumers, and maintain an adequate share of utility payments in the household budget. Smoothing mechanisms and subsidies for vulnerable categories of consumers can help avoid sharp increases in tariffs in the initial years of transition.

[12] Ofgem. Official site. https://www.ofgem.gov.uk

[13] "National energy report KAZENERGY 2021." KAZENERGY. 2021, https://www.kazenergy.com/upload/document/energy-report/NationalReport21_ru_2.pdf

[14] "Tasks for the transformation of enterprises in the electric power industry have been determined." Official website of the President of the Republic of Uzbekistan. 2020. https://president.uz/ru/lists/view/3915

References

1. ACER. "Practice Report on Transmission Tariff Methodologies in Europe." 2019. https://acer.europa.eu/Official_documents/Acts_of_the_Agency/Publication/ACER%20Practice%20report%20on%20transmission%20tariff%20methodologies%20in%20Europe.pdf
2. Armenia, law ed. 18.11.21 HO-364-N "About the public services regulatory body." 2021.
3. The Bundesnetzagentur of Germany. Official site. https://www.bundesnetzagentur.de
4. The Bundesnetzagentur, "Cost examination." https://www.bundesnetzagentur.de/EN/RulingChambers/Chamber8/RC8_05_Revenue%20caps_revenue%20regulation/52_Cost%20examination/Cost%20examination.html
5. CEER. "CEER Report on Investment Conditions in European Countries." 2017. https://www.ceer.eu/documents/104400/-/-/fbd6a80e-5825-d1f3-fe35-bb3682b40c98
6. CEER. "Report on Regulatory Frameworks for European Energy Networks 2020." 2021. https://www.ceer.eu/documents/104400/-/-/5947b3af-5643-1411-02c9-b5d009b7b748
7. Central Electricity Regulatory Commission. "Terms and Conditions of Tariff No. L-1/144/2013/CERC." 2014. https://cercind.gov.in/2016/regulation/1.pdf
8. CERC. "Annual Report 2019-20." 2020. https://cercind.gov.in/2021/annual_report/Annual_Report_2019-20_Eng.pdf
9. CRNM of the Ministry of national economy of the Republic of Kazakhstan. Official site. https://www.gov.kz/memleket/entities/krem
10. Decree of the Government of the Russian Federation of April 30, 2018 N 533 "On the approval of the Rules for the consideration (settlement) of disputes and disagreements related to the establishment and (or) application of prices (tariffs), on the introduction of amendments to the Decree of the Government of the Russian Federation of January 9, 2009 N 14 and the invalidation of certain acts of the Government of the Russian Federation." 2018.
11. Decree of the Government of the Russian Federation of December 29, 2011, N 1178 "On pricing in the field of regulated prices (tariffs) in the electric power industry." 2011.
12. Decision of the Cabinet of Ministers of the Republic of Uzbekistan 03.12.2019 "On measures to organize the activities of the interdepartmental tariff commission under the Cabinet of Ministers of the Republic of Uzbekistan." 2019.
13. EC and INOGATE Technical Secretariat. "A Review of Energy Tariffs in INOGATE Partner Countries." 2015. http://www.inogate.org/activities/553?lang=en
14. ECA. "Study on Regulatory Approaches to Revenue Setting for Electricity Transmission and Distribution System Operators among ERRA Member Organizations." 2020. https://www.eca-uk.com/tso-dso-study_final/
15. Parliament of India. "The Electricity Act, 2003." India, 2003
16. Energimarknadsinspektionen of Sweden. Official site. https://www.ei.se/
17. Energy Regulatory Office (ERÚ) of the Czech Republic. Official site. https://www.eru.cz
18. ERRA. "Energy Regulatory Office (URE)." https://erranet.org/member/ure-poland/
19. Estonian Competition Authority. "Manual to Calculate Weighted Average Cost of Capital." 2019. https://www.konkurentsiamet.ee/sites/default/files/juhend_kaalutud_keskm_kapitali_hinna_ar_eng2019_1.pdf
20. Federal Ministry of Justice. "Electricity Tax Act (StromStG) of March 24, 1999: § 9a StromStG." https://www.gesetze-im-internet.de/stromstg/__9.html
21. GNERC. Resolution N 14 of July 30, 2014 "On approving Electricity Tariff Calculation Methodologies." https://gnerc.org/files/Legal%20Acts%20in%20english/Resolution%20N14%20Tariff%20Setting%20Methodology-28.01.2020.pdf
22. IEA. "Energy Prices." March 2022 edition. Database documentation. 2022.
23. IEA. "Slovak Republic 2018 Review." 2018. https://www.connaissancedesenergies.org/sites/default/files/pdf-actualites/energy_policies_of_iea_countries_slovak_republic_2018_review.pdf

24. KAZENERGY. "National energy report KAZENERGY 2021." 2021. https://www.kazenergy.com/upload/document/energy-report/NationalReport21_ru_2.pdf
25. KPMG. "Hindsight is 2050 vision." 2021. https://assets.kpmg/content/dam/kpmg/uk/pdf/2021/06/kpmg-sse-hindsight-2050-report.pdf
26. Law of the Republic of Kazakhstan dated December 27, 2018, No. 204-VI ZRK "On natural monopolies"
27. Ministry of Energy of the Republic of Kazakhstan. Official site. https://www.gov.kz/memleket/entities/energo
28. Ministry of Energy of Russian Federation, A.N. Shishkin, "Fuel and Energy Complex of Russia: A course to safety?" 2010. http://riskprom.ru/_ld/2/234_XEJ.pdf
29. Ministry of Power India. "The notification of the Government of India in the erstwhile Ministry of Power and Non-conventional Energy Sources, Department of Power, No. S.O. 92(E) dated the 23rd of January 1992." 1992.
30. The National Agency for Energy Regulation of the Republic of Moldova. Official site. https://www.anre.md
31. NEPRA, "National electric power regulatory authority guidelines for determination of consumer end tariff (methodology and process)." 2015. https://nepra.org.pk/Legislation/Guidelines/NOTIFICATION%20(S%20R%20O-34)%20%20NEPRA%20Guidelines%20for%20determination%20of%20Consumer%20End%20Tariff%20Methodology%20and%20Process%202015.pdf
32. Nigerian Electricity Regulatory Commission (NERC). Official site. http://nerc.gov.ng
33. Official website of the President of the Republic of Uzbekistan, "Tasks for the transformation of enterprises in the electric power industry have been determined." October 2020. https://president.uz/ru/lists/view/3915
34. Ofgem. Official site. https://www.ofgem.gov.uk
35. Ofgem. "Our structure and leadership." Official site. https://www.ofgem.gov.uk/about-us/our-structure-and-leadership
36. Ofgem. "Renewables Obligation (RO)." Official site. https://www.ofgem.gov.uk/environmental-and-social-schemes/renewables-obligation-ro
37. Order of the FAS of Russia n 457/16 dated 15.04.2016 "On approval of the regulations on the power industry regulation department of the Federal antimonopoly service." 2016. https://fas.gov.ru/documents/688424
38. Order of the Federal Tariff Service No. 228-e, "On approval of Methodological Guidelines on tariff Regulation using the method of return on invested capital." 2012. https://base.garant.ru/70160168/53f89421bbdaf741eb2d1ecc4ddb4c33/;
39. Order of the Minister of Energy of the Republic of Kazakhstan No. 205 "On approval of the Methodology for determining the rate of return taken into account when approving marginal tariffs for electricity, as well as a fixed profit for balancing, taken into account when approving marginal tariffs for balancing electricity." 2020. https://www.gov.kz/memleket/entities/energo/documents/details/adilet/V2000020700?lang=ru
40. The Regulatory Office for Network Industries of the Slovak Republic (URSO). Official site. https://www.urso.gov.sk
41. Republic of Estonia Competition Authority. Official site. https://www.konkurentsiamet.ee
42. Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 310 "On measures to further improve the tariff policy in the electric power industry." 2019. https://lex.uz/ru/docs/4289882#4296515
43. Statista. "Household electricity prices in select countries worldwide in 2019." https://www.statista.com/statistics/1123031/household-electricity-prices-select-country-by-component/
44. USAID and NARUC. "Promoting Transparency and Public Participation in Energy Regulation: A Communications Primer for Utility Regulators." 2019. https://pdf.usaid.gov/pdf_docs/PA00X2PT.pdf
45. USAID and NARUC. "Depreciation expense: A primer for utility regulators." 2021. https://pubs.naruc.org/pub.cfm?id=6ADEB9EF-1866-DAAC-99FB-DBB28B7DF4FB

46. The World Bank, "Carbon Pricing Dashboard."

For questions regarding this publication, please contact
Meghan Riley (mriley@naruc.org)
Erin Hammel (ehammel@naruc.org).

National Association of Regulatory Utility Commissioners (NARUC)
1101 Vermont Ave, NW, Suite 200
Washington, DC 20005 USA
Tel: +1-202-898-2210
www.naruc.org