AEC Liberalisation and Electricity Sector Reform in Thailand

A review of approach to setting regulated tariffs in Thailand's Electricity Supply Industry

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slEconomics is a boutique consulting firm - established in 2004 specializing in economics, strategy and finance in utilities and infrastructure. Our consultants have advised major corporations, governments and regulators in Australia, Africa , Asia and North America .

Preface

- Thailand is a signatory to the ambitious blueprint for ASEAN economic integration which is meant to be rolled out during 2015. While the complete implementation of ASEAN Economic Community (AEC) may take longer than originally called for, it remains a motivating factor in domestic and regional policy development.

- In the energy sector AEC liberalisation is expected to have a significant impact on the structure of domestic and regional electricity markets, which will in turn have implications for tariff controls pertaining to regulated components of the Thai ESI. Moreover, the competitive dynamics of AEC liberalisation make this an opportune time to refine existing regulatory frameworks and underlying tariff setting mechanisms so as to maintain the competitive position of the Thai ESI and provide customers reliable electricity supply at fair and cost reflective prices.

- With the above in mind, during 2014 Thailand's Ministry of Energy engaged slEconomics Pty Ltd (as part of an international consortium) to review tariff setting mechanisms within the context of AEC liberalisation. This Review summarises the approach utilised in undertaking our analysis and key recommendations as presented to a public forum held in Bangkok 30 June 2014.

Overview

- Under AEC liberalisation it is expected to drive reforms in Thailand's energy sector with 3rd party access to transmission and distribution networks and competition for defined retail segments envisioned for the short to medium term. Unbundling of tariffs within the electricity supply chain is seen as a pre-condition for implementation of effective 3rd party access.

- The unbundling of tariffs necessitates a re-assessment of the forms of tariff regulation best applied to each activity in the electricity supply chain and the methodologies employed in setting regulated tariffs. The research summarised here focuses on unbundling of tariffs under AEC and the concomitant design and implementation of tariff setting mechanisms needed to enable effective 3rd party access.

- The structure of our report as follows:

  - In section I. we reference key government policy drivers and objectives under which tariff setting mechanisms would be developed and briefly summarise the more prominent assumptions utilised in our analysis.

  - In section II. we then explain the methodology employed in evaluation of the various options and the recommended tariff setting mechanisms resulting from our analysis.

  - A brief summary of some of the more significant implementation issues is provided in section III.

- We have also provided an annexure that outlines our recommendations on how allowed returns and associated financial metrics could be used in setting tariff levels on the basis of financial sustainability.

Contents

Section I. Overview of approach

- Key working assumptions
- Methodology for assessing unbundled tariff setting mechanisms

Key working assumptions on market structure

- Optimal design of tariff setting mechanisms is dependent on the market structure to which it is applied. With the proposed structure of the Thai ESI being evaluated in a separate study for the Ministry of Energy, we have relied on a set of working assumptions under which our recommendations would apply.
- In particular, the scenarios envisioned over the short to medium term provide for 3rd party access to transmission and distribution networks, and competition for defined retail segments. With this in mind we have examined three possible scenarios under which tariffs would be set (i.e. to facilitate 3rd party access).

Scenario 1

- EGAT Generation / Transmission and System Operator, System Planner, Single Buyer
- MEA Distribution &Retail supply.
- PEA Distribution & Retail Supply.

Scenario 2

- EGAT Generation
- EGAT Transmission & System Operator, System Planner, Single Buyer
- MEA Distribution & Retail supply.
- PEA Distribution & Retail Supply.

Scenario 3*

- EGAT Generation
- EGAT Transmission & System Operator
- EGAT System Planner, Single Buyer
- MEA Distribution
- MEA Retail supply.
- PEA Distribution
- PEA Retail Supply.

Unbundled tariff controls

- In consideration of the preceding three market scenarios our analysis sets as a working assumption that ring-fenced regulatory accounts and tariff setting mechanisms would apply to the following entities over the short to medium term (i.e. scenario 3).
  - EGAT Generation (i.e. EGAT self generation only)
  - EGAT Transmission & System Operator
  - EGAT Single Buyer
  - MEA Distribution
  - PEA Distribution
  - MEA Retail Supply
  - PEA Retail Supply
- ***NB**. We wish to emphasize that these working assumptions are likely to diverge from what eventuates in fact . We have undertaken our analysis having consideration of this policy uncertainty and have aimed to provide recommendations that are largely robust to a range of market scenarios.*

Key objectives and criteria

- In undertaking our analysis we have been mindful of fundamental aspects of legislation and policy that would determine the overall objectives and criteria under which tariffs are to be set in Thailand. Sections 64 and 65 of the "Energy Industry Act, B.E. 2550" are of particular relevance in that:

- ***Section 64*** *The Minister shall, with consent of the National Energy Policy Council, establish the policy and guidelines for setting of tariff on energy industry operation.*

- ***Section 65*** *Subject to the policy and guidelines approved by the NEPC, the Commission shall establish the criteria for setting of tariffs of licensees of each category, based on the following guidelines:*

  1) should reflect the actual cost and take into account the reasonable return on investment of efficient energy industry operation;

  (2) should be at the level ensuring efficient and adequate energy procurement to meet energy demand of the country;

  (3) should incentivise licensees to improve efficiency in energy industry operation;

  (4) take into account fairness to both energy consumers and licensees;

  (5) take into account the assistance to the underprivileged power consumers or the electricity supply to decentralize development to provincial areas;

  (6) have a clear and transparent tariff calculation and make it public: and

  (7) constitute no unjust discrimination against energy consumers or those who wish to use energy.

Starting with these key energy policy objectives and criteria our recommendations have been formulated having regard to:

•Relevant policies of the Royal Thai Government (as across).

•Existing tariff setting mechanisms applied to EGAT, MEA and PEA

•International experience and best practice tariff setting

•The context of Thailand's participation in AEC liberalisation initiatives.

Regulatory design principles

Three fundamental principles of regulatory design guide our evaluation of tariff mechanisms:

1. Design of control mechanisms **aligned to the underlying cost structure of the activity.**

2. Determination of scope and role of efficiency incentives and pass though arrangements based on **efficient allocation of risks:**

    1. Targeting incentives to areas in which management has direct control, and where efficiency benefits can be measured.

    2. Limiting windfall gains and losses due to external events.

    1. Allocating residual risks to the party that can best manage them.

3. Design of **'fit for purpose'** tariff mechanisms where administrative costs are commensurate with regulatory benefits achieved.

<u>These principles play an important role in areas such as:</u>

- **Form of regulation** (e.g. Return on Assets; CPI – X; Cost plus margin, etc)

- **Duration** of the tariff control period.

- Application of **cost adjustment** mechanisms.

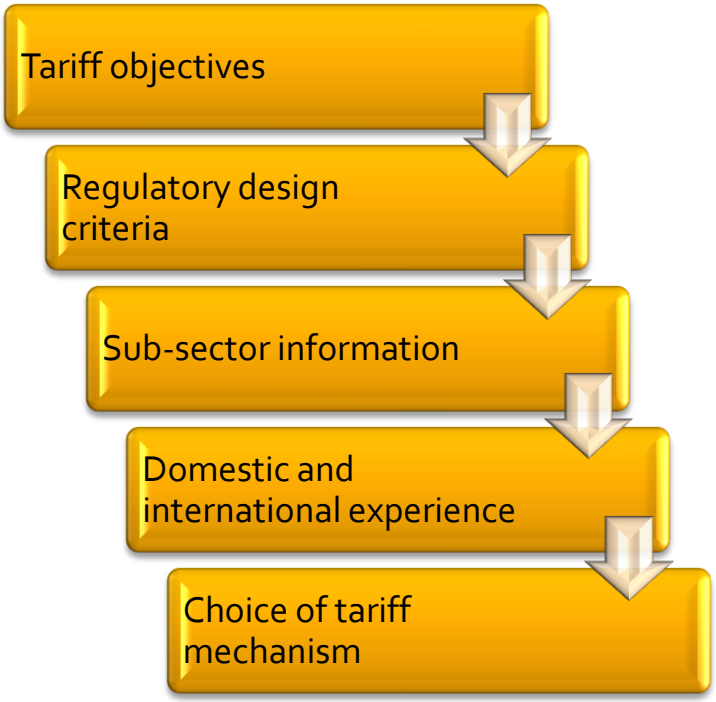
- Scope and role of **efficiency incentives .**

- Use of ex post **expenditure reviews.**

- Cost of capital, asset valuation, and **return on investment**.

Choice of tariff setting mechanisms

- With fundamental regulatory objectives and criteria established *regulatory design matrices* provide a compact representation of the regulated sub-sector.
- These matrices are then mapped to associated tariff setting mechanisms for each sub-sector.
- Domestic and International experience is utilised to define a workable set of options.
- Tariff mechanisms are identified for each sub-sector.



* For a detailed discussion of our regulatory design methodology see Stephen Labson, *Regulatory Design Toolkit for Essential Infrastructure*, for the Essential Services Commission South Australia.

Operational characteristics and optimal regulatory design

- Regulatory design matrices highlighting key characteristics of each unbundled activity as they relate to the design of regulatory controls were assessed. Key characteristics considered included:
  - Level of capitalised assets
  - Cash flow and liquidity
  - Long term supply agreements / lease arrangements
  - Level of costs subject to material level of forecast error e.g fuel unit cost and volumes
  - Proportion of uncontrollable costs to total
  - O&M costs to total expenditures
  - Correlation of energy demand with economic growth
  - Regulatory accounting and reporting required for unbundled tariff controls
  - Governance and oversight issues
  - Legislation and institutions

Cost structure of operations

Regulatory Design Matrix A

Key characteristics	EGAT Generation	EGAT TSO	EGAT Single Buyer	MEA /PEA Distribution Networks	MEA / PEA Retail Supply
Capitalised assets	Asset intensive. Long lived, highly depreciated assets Large 'lumpy' investment profiles	Asset intensive Long lived, highly depreciated	Minor fixed assets	Asset intensive Long lived, highly depreciated	Modest fixed assets
Cash flow and liquidity	Stable cash flows / limited default payments	Stable cash flow NB Assuming TO / SO only	Counter party arrangements potentially lead to cash flow and liquidity constraints.	Stable cash flow (NB assuming ring-fenced network activities – not retail sales)	Subject to customer default
Long term supply agreements / lease arrangements	Fuel supply arrangements under long term contracts.	Ancillary Services agreements and some IT under licence	Portfolio of supply agreements and sales / purchases.	O&M and related agreements	Supply agreements for on-sale of power to end users

Predictability and controllability of costs

Regulatory Design Matrix B

EGAT Generation	EGAT TSO	EGAT Single Buyer	MEA /PEA Distribution Networks	MEA / PEA Retail Supply
Costs subject to material level of forecast error e.g fuel unit cost and volumes	Relatively predictable network costs Ancillary service costs s.t. forecast error	Costs subject to forecast error	Relatively predictable network costs	Subject to forecast error e.g. energy units purchased and Ft pass through
High proportion uncontrollable costs to total	Low proportion uncontrollable cost to total for network	High proportion uncontrollable costs to total	Low proportion uncontrollable cost to total	High proportion uncontrollable cost to total
O&M	Network O&M; SO procurement of Ancillary Services	Relatively limited ability to manage costs	Network O&M;	Labor and systems costs
Demand subject to economic growth	Relatively stable usage (based on maximum loads)	Driven by external factors	Dependent on charging system	End use variance s.t. demand drivers.

Establishment and administrative resourcing

Regulatory Design Matrix C

Cost characteristics	EGAT Generation	EGAT TSO	EGAT Single Buyer	MEA /PEA Distribution Networks	MEA / PEA Retail Supply
Regulatory accounting and reporting required for unbundled tariff controls	Cost separation and asset valuation for EGAT own generation direct costs- allocation of common costs	Cost separation and asset valuation for TO/SO direct costs - allocation of common costs	Cost separation direct costs. Allocation of common costs.	Cost separation and asset valuation for direct network costs - allocation of common costs	Cost separation and asset valuation for direct retail supply costs - allocation of common costs
Governance and oversight?	Establishment and administration of regulatory approach - EGAT Generation	Establishment and administration of regulatory approach - EGAT TO/SO	Internal /external governance structures to define controls	Establishment and administration of regulatory approach – networks only	Establishment and administration of regulatory approach – retail supply
Legislation and institutions	TBD – aim is for minimal change in legislation and institutions .	As across	As across	As across	As across

Form of tariff controls - short list of options

- As noted in previously, the evaluation process provided a short list of alternative tariff setting mechanisms based on local and global experience. The following broad forms of control were evaluated within the context of Thailand's policy objectives, local and global experience with these types of controls, and unique characteristics of the Thai ESI.
  - Rate of Return
  - Cost of service / return on assets
  - Incentive Based Regulation (e.g. RPI-X price or revenue caps)
  - Performance Based Regulation
  - Benchmarking (or 'yardstick') regulation
  - Regulation by contract

Caveats:

- In practice tariff mechanisms utilise a combination of approaches which have been considered in our analysis..
- There is not a 'one-size-fits-all' tariff mechanism, as each perform differently when applied to various sectors of the ESI

Section II. Summary of findings

- Proposed tariff setting mechanisms for:
  - EGAT Generation (i.e. EGAT self generation only)
  - EGAT TSO
  - MEA and PEA Distribution
  - MEA and PEA Retail Supply
  - EGAT Single Buyer

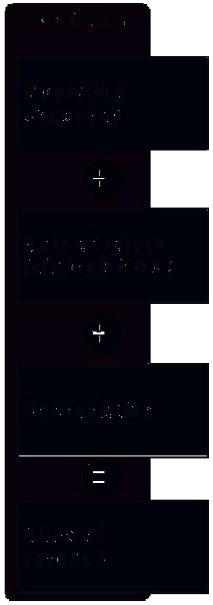
Summary of recommendations - Form of tariff mechanisms

- In transition to AEC liberalisation ring-fenced regulatory accounts would be maintained and separate tariff controls would apply to each of the following regulated sub-sectors of the ESI.
  - EGAT Generation (i.e. EGAT self generation only)
  - EGAT TSO
  - MEA and PEA Distribution
  - MEA and PEA Retail Supply
  - EGAT Single Buyer
- Our analysis suggests that a cost of service approach be applied to each of the five sub-sectors of the Thai ESI. Within this context our proposal is as follows:
  - **Hybrid IBR / Return on Assets** approach applied in setting annual revenue allowances and tariffs for EGAT Generation; EGAT TSO; and MEA and PEA Distribution networks.
  - **Cost pass through** mechanisms applied in setting allowed revenue and tariffs for EGAT SB; and MEA, PEA.

Generation, TSO and Distribution

- Utilising the evaluation approach we have recommended a cost of service approach to tariff setting for **generation, transmission and distribution networks**.

Cost of Service Building Blocks



Allowed revenue is determined on the basis of efficient cost of supply with the primary building blocks inclusive:

- Operating costs to be recovered for prudent cost of supply
- Return on Regulatory Asset Base (RAB) (i.e. RoA x RAB)
- Depreciation on regulated assets

(NB corporate tax expenditures recovered by use of pre tax return on assets, or enters as a separate cost item).

Tariffs set to achieve the revenue allowance based on forecast sales.

- Efficient cost of supply is determined building up from:
- opex;
- return on assets;
- regulatory depreciation;
- tax (or tax equivalents).
- These 'building blocks' make up the regulated entity's revenue allowance, which is then translated into tariffs.

Summary of tariff mechanisms – EGAT Generation; EGAT TSO; MEA and PEA Distribution

Tariff mechanisms	Recommendations
Form of tariff control	**Hybrid IBR / Return on Assets.** •Annual revenue allowance based on efficient cost of service. •Incentive mechanisms for controllable costs; cost adjustment mechanisms for variances in defined expenditures; and benchmarked rate of return on Regulatory Asset Base (RAB).
Efficiency incentives	•Incentive mechanisms based on fixed revenue allowance and consideration of efficiency carry-over to subsequent tariff control period. •**NB**. Relatively greater use of IBR mechanisms for Transmission and Distribution network activities (as compared to Generation) based on relative controllability of costs.
Expenditure review	Ex ante benchmarking of efficient costs in setting fixed revenue allowances with ex post review only in exceptional cases.
Cost adjustment mechanisms	Fuel cost adjustment on a periodic basis (i.e. during the tariff control period). Adjustments for variances in capital costs and other expenditures to be determined.
Duration of tariff control	Recommend 2-3 years to adjust to unanticipated events and allow for refinement of tariff mechanisms
Regulatory Asset Base (RAB)	Starting RAB based on depreciated cost of regulatory assets - rolled forward each year adjusting for capital additions, regulatory depreciation, and disposals.
Recognition of assets in the RAB	Allowed capital expenditure recognised in the RAB (as forecasted) on commissioning, adjusted to actual costs in the following control period subject to prudency review.
Return on Capital	Weighted Average Cost of Capital benchmarked to peer group comparators / risk adjusted basis
Tariff 'smoothing'	•Tariffs and charges set to achieve the annual revenue allowance based on forecast demand. Smoothed adjustments within the control period on NPV basis.

Retail supply

- Factors unique to retail supply require its own form of tariff control. E.g.:
  - **Relatively low levels of fixed assets** limiting the applicability of Return on Assets approaches to recovery of invested capital (e.g. invested capital might be in the form of IT and billing systems, processes, specialisied labour, prudential requirements, etc).
  - **Substantial aggregation of non-controllable ESI costs** - e.g. IPPs, SPPs, VSPPs and renewables (various programs); social balancing/subsidy scheme, National Uniform Tariff Policy, funding to Power Development Fund, etc.
  - Substantive **cash flow and liquidity risk** as compared to fixed assets and retained earnings
- We have recommended a **cost plus margin approach** for retail supply given that the fixed asset base does not well reflect capital invested in the sector.
- The specific **activities that would earn a margin would need to be determined,** and benchmarking of margin levels would need to be carried out.

Single buyer

What is generally referred to as a "Single Buyer" may in practice cover a range of functions: e.g.

- **Single Buyer** – where literally applied provides a statutory monopoly on the purchase and sale of power.

- **Central Buyer** – that might have significant power procurement responsibilities, but not a complete monopoly in regard to power purchase and on-sale.

- **Market aggregator** – e.g. aggregating bulk power supplies in sale to suppliers.

- **IPP trader / administrator -** responsible for trading and administration of pre-existing PPAs, and/or new power purchases.

<u>Establishing the Single Buyer as an ***unbundled activity*** will require:</u>

- Integration of legacy contracts

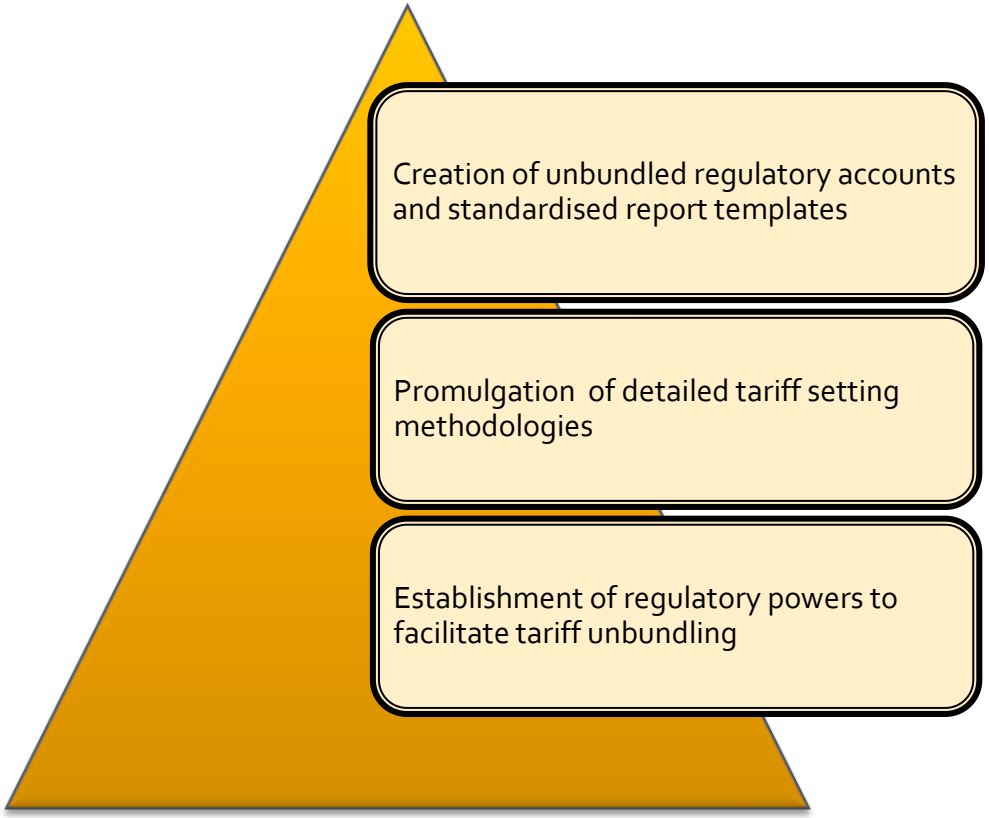
- Governance arrangements e.g. Board structure, directors fiduciary duties, etc.

- Funding arrangements e.g. cost recovery mechanisms; prudential requirements, reserve accounts; cross party liability; indemnity; guarantees.

Summary of tariff mechanisms – EGAT Single Buyer; MEA & PEA Retail Supply

Tariff mechanisms	Recommendations
Form of tariff control	**Cost pass through with performance based incentives** •For Single Buyer annual cost allowance based on approved budgets provided on defined activities (To be determined). Governance structures developed to ensure prudency in expenditures. •For MEA and PEA Retail Supply – Regulated revenue allowance / weighted average price cap with pass through of allowed costs.
Efficiency incentives	Performance, Service Quality, and Cost to Service incentive mechanisms to be determined.
Expenditure review	Ex ante benchmarking of efficient costs in approval of annual budgets and revenue proposals, with ex post reviews as needed.
Cost adjustment mechanisms	•Full cost pass through for prudent cost of services. •**NB** Consideration of short term cash requirements and use of related party transfers; intra-year adjustment mechanisms or banking facilities for variable cash flow requirements.
Duration of control period	Recommend 2-3 years for retail. Annual for Buyer.
Return	Benchmarked margin, peer group comparators / risk adjusted basis.

Section III. Implementation



Establishment of regulatory powers

- It is likely that legislative amendments will be required if implementing the recommendations set out in our review. In drafting such amendments a range of issues will ideally be considered such as:
  - Role and scope of regulatory powers
  - Level of independence provided to the regulator
  - Objectives of which the regulator is to have regard to in setting tariffs
  - Duties of the regulator, perhaps with prescribed conditions for tariff setting (i.e. requirements to consult with stakeholders, produce a tariff methodology, duration of tariff control periods, etc).
  - Defined powers (or limitations) of ministerial directive on components of the tariff setting process.
  - Appeal of regulatory decisions - e.g. use of overarching legislation pertaining to due process, establishment of special purpose appellate board emepowered to review the logic and basis of a regulatory decision, etc
  - Administration of duties - e.g. organisational and governanc
  - e structures, makeup of the regulator, budgets, regulators term, termination of officials, etc.
- The items listed above are illustrative of the types of legislative amendment that may be required to facilitate unbundled tariff setting. Of course the broader initiatives that might arise from AEC liberalisation pertaining to industry and market structure would likely call for more substantive legislative amendment, but are beyond the scope of this study.

Promulgation of tariff setting methodologies

- Our review has focused on the broad frameworks in which tariffs might be set – but stops well short of the detailed codification of rules that would be needed to implement these recommendations. A detailed tariff methodology would ideally be developed, comprised of guiding principles and explcit rules addressing matters such as:
  - the definitions and formulas used in setting the regulatory revenue allowance and tariffs;
  - how the annual revenue allowance and tariffs are to respond to changes in original estimates;
  - the criteria under which operational and capital expenditure is to be recovered through revenue;
  - how incentive mechanisms are to work; administrative rules for adjusting allowed revenue and tariffs during a tariff control period;
  - rules regarding re-opening of the determination; and rules regarding reporting to the regulator.
- It is common for regulators to develop and publish a tariff setting methodology to formalise the many rules of which it is comprised. In doing so the integrity of the regulatory process is enhanced by providing a transparent, objective and predictable basis under which regulated tariffs will be set.

Components of a tariff methodology

- Our review has focused on the broad frameworks in which tariffs are set, but stops well short of codifying the rules needed to implement these recommendations. For the cost of service frameworks recommended in our study the tariff setting methodology would typically address issues such as:*
  - Qualifying costs - including the criteria under expenditures are to be assessed in terms of efficient costs of supply; ex ante expenditure review, and conditions under which ex post expenditure reviews would be carried
  - Cost adjustment mechanisms - inclusive the methodology for calculating allowed adjustments and administrative issues such as how and when tariff adjustments are to be made, review procedures, etc.
  - Regulatory assets – including criteria for qualifying assets (i.e. assets that enter the RAB) and conditions under which assets might be optimised out of the RAB; starting value of the RAB and methodology to be used in calculation; treatment of capital additions and method for depreciating regulatory assets.
  - Incentive mechanisms - with detailed discussion of approach, methodology and administration pertaining to each mechanism (e.g. carry-over of incentive benefits across tariff periods, benefit sharing between suppliers and customers, measurement, validation and reporting for service quality incentives; etc)
  - Return on capital – setting out the methodology to be used in calculation of the cost of capital and amounts to be recovered from tariffs.
  - Approach and working models used in calculating revenue allowances and tariffs inclusive assumptions on external parameters driving costs and revenue such as projected sales volumes, GDP, CPI, exchange rates, etc.
  - Duration of the tariff control period and conditions under which the tariff determination might be re-opened and the scope of such re-opener (i.e. specific expenditures items, or a review of the determination I its entirety).

***NB** *This is a short list of the more prominent matters that would be covered by the methodology which we have provided for ease of reference and is only indicative of the coverage we would recommend.*

Unbundled regulatory accounts

- Unbundled regulatory/financial accounts will be required for generation, transmission, distribution, retail, and buyer entities inclusive:
  - Comprehensive build-up of costs for regulated and non-regulated business activities (recent actuals and projected) and description of cost drivers.
  - Planned capital expenditures.
  - Forecast sales volumes (units) for services subject to tariff control.
  - Depreciated asset values to set the Regulatory Asset Base (RAB) for Generation, TSO, Distribution assets.
  - Weighted Average Cost of capital (by sub-sector)
- This requires a separate set of books. i.e. 'Regulatory Accounts' that are independently audited and reconciled to statutory financial reports.

Regulatory asset values

- For the purposes of regulatory accounting and tariff setting a valuation methodology will need to be established and uniform procedures applied inclusive:
  - Detailed valuation of capital assets (ideally supported by an asset register)
  - Assumed life of each asset group for the purpose of calculating the depreciated value.
  - Description of any averaging used in aggregating various depreciation schedules.
  - Methodology for capitalisation of costs (capitalisation policy).
  - Cost allocation methodology for tariff / non-tariff activities.
  - Valuation of starting asset base

For example:
•Historic cost
•Indexed historic cost
•Replacement value / modern equivalent
•Etc

Choice dependent on objective to reflect current market prices or original investment.

Cost allocation and cross-border costs

- For sales that are not subject to the basic tariff setting mechanism (e.g. cross-border sales) one could either :
  A. Treat them as part of the 'regulatory till' which is ultimately bundled with tariff based costs and revenues; or
  B. Ring-fence activities out of the regulatory till and calculate the revenue allowance from tariff sales on fully allocated costs.

- Under (A) tariff customers share the risk and return brought about by non-tariff activities, and there would be an argument for regulatory oversight to apply (although not an area regulators typically maintain a strong level of capacity in).
  - This option is better suited to situations where it is not feasible to fully dis-aggregate costs and where a high degree of regulatory oversight is not required (i.e. potential adverse outcomes to customers less than a given materiality standard).

- Under (B) costs are fully allocated between tariff and non-tariff activities, and risk and return on non-tariff activities is carried by the operator. There is not such a strong argument for regulatory oversight of non-tariff activities.
  - Option (B) is best employed where a high proportion of costs and benefits are *directly attributable* to the ring-fenced activity., and becomes less attractive significant common costs need to be allocated due to weaknesses inherent to the methodology.

- Where these matters can not be sufficiently resolved alternative forms of unbundling (e.g. Structural, legal, etc. may be warranted.)

Fuel cost adjustment mechanism

- Similar to Thailand's experience with the Ft, the broad trend globally has been to apply fuel cost adjustment mechanisms allowing for recovery of reasonable generation cost of supply.*
  - This is in recognition that fuel costs are to a large degree outside of the control of the utility, and often diverge from forecasts made at the on-set of a tariff control.
  - Where the reasonableness of costs has been established, periodic fuel cost adjustments are made that account for both variations in fuel prices and fuel mix in line with actual dispatch of various types of generating plant.
- In unbundling tariffs the Ft may need to be re-calibrated to recover fuel costs *directly accruing to EGAT generation*. At that stage a more general review of the Ft may be warranted with a focus on efficiency incentive mechanisms and risk allocation.
- Components of the Ft not directly related to EGAT generation costs would be recovered through the unbundled tariff to which it most directly accrues to.

** see slEconomics, Fuel Cost Adjustment – International Experience. Dec 2006*

Annexure

- *Allowed returns and financial criteria used to establish tariff levels:*
  - *Return on capital*
  - *Financial sustainability and tariff levels*

Return metrics used in tariff setting

- We understand that EPPO has previously considered both Return on Invested Capital (ROIC) and the Weighted Average Cost of Capital (WACC) in tariff setting While the two measures are broadly related to each other, there are some important differences.

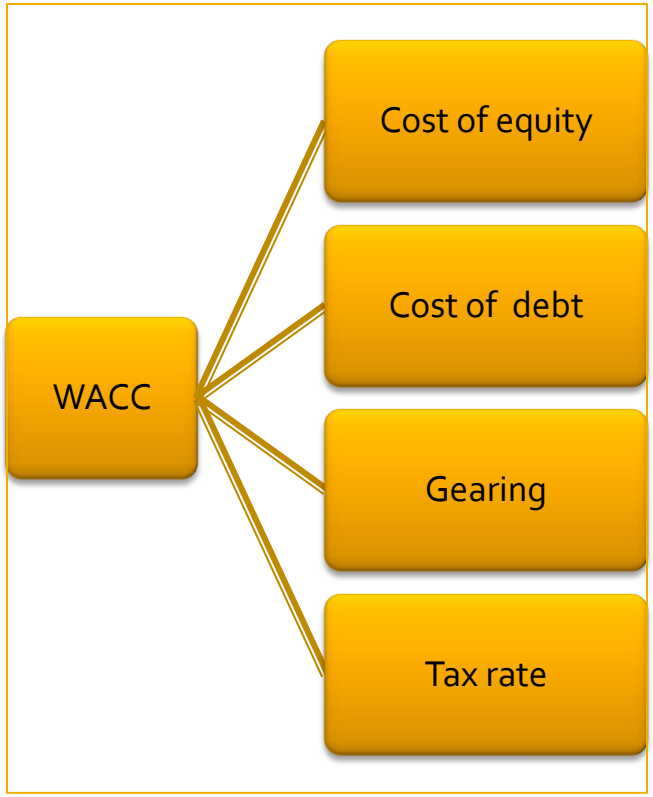
- **ROIC measures the efficiency of a firm in investing capital** in profitable investments, and is often used when *examining the financial performance of a firm*.

- However, **when setting the return on capital and tariffs** the **WACC provides several advantages** in that it:
  - Allows for disaggregation and benchmarking of its constituent components of the **cost of debt, cost of equity, and capital structure** (i.e. proportions of debt and equity).
  - Can be applied on a **pre-tax or post- tax** basis to accommodate various regulatory approaches.
  - Can be used for the various sub-sectors of the ESI by benchmarking to sub-sector comparators (i.e. **generation, transmission, and distribution networks).**

- **With the above in mind we recommend that the WACC be used in setting tariffs for the unbundled activities of generation, transmission and distribution***

Weighted Average Cost of Capital

The WACC allows for consistent a*pproach* to estimating the cost of capital while adjusting for *sector specific risk characteristics*.



Cost of equity – Capital Asset Pricing Model (CAPM) referenced to domestic macro-economic variables and international sector benchmarks.

Cost of debt – Benchmarked to Thai bond rates and mid-investment grade corporate borrowings 5-7 year maturity .

Gearing – Notional values based on efficient capital structure.

Tax rate - S*tatutory rate* of corporate tax.

Pre Tax WACC = [Rd x D] + [(Re/(1-t)) x E]

- Rd = pre tax cost of debt
- Re = post (company) tax cost of equity
- t = corporate tax rate
- E = proportion of equity (%of total value)
- D = proportion of debt (%of total value)

Risk adjusted return and unbundled tariffs

- Empirical and conceptual analysis suggests that the weighted average cost of capital varies between electricity generation, transmission and distribution activities given the differing risk characteristics generally attributed to these activities (thus risk and expected return).
- With the above in mind we recommend risk adjusted values be used in setting tariffs for the unbundled activities having regard for financial risk characteristics generally attributed to generation, transmission and distribution sectors.
- An illustration of benchmark values for generation, transmission and distribution is provided below:

Illustrative WACC values

- The values complied below are provided to illustrate the WACC approach . **NB.** They are not estimates or recommended values .

WACC parameters	Generation	Transmission	Distribution	*Comments*
Nominal risk free rate	3.76%	3.76%	3.76%	*Thai 10Y as of June 25 2014*
Debt premium	2.25%	2.25%	2.25%	*Thai Bond Market Association >5 year spread on BBB corporates*
Nominal cost of debt*	**6.0%**	**6.0%**	**6.0%**	Cost of debt = nominal risk free rate + debt premium
Asset Beta	0.50	0.32	0.38	*Indicative values from market and regulatory benchmarks*
Equity Beta	1.00	0.79	0.84	*Harris-Pringle transformation using benchmark gearing levels*
MRP	8.1%	8.1%	8.1%	*Deloitte, 2013 valuation report for emerging markets*
Nominal return on equity	**11.9%**	**10.1%**	**10.6%**	Return on equity = Risk free rate + (equity beta x MRP)
Gearing	50%	60%	55%	*Industry benchmarks*
Tax	20%	20%	20%	*CIT rate for 2014 KPMG Global Survey*
Inflation	2.60%	2.60%	2.60%	*Actual year on year May 2014*
Nominal pre tax WACC*	**10.4%**	**8.7%**	**9.3%**	[Debt% x Cost of Debt] + [Equity% x ((Cost of Equity / (1-tax))]
Real pre tax WACC*	**7.6%**	**5.9%**	**6.5%**	*Nominal pre tax WACC adjusted for inflation*

•Figures rounded
•Compiled by slEconomics Pty Ltd

Financial sustainability and tariff levels

- IPART, one of Australia's leading state based utility regulators describes the use of credit metrics in setting tariffs in terms of "financeability tests" as follows:
  - *"We use the financeability test as a check on the reasonableness of the proposed revenue or price path. We expect a utility will be financially sustainable over the life of the assets given that the building block model allows a utility to recover its efficient costs. However, in some circumstances a utility may encounter short term financial sustainability issues. This can be due to differences in the timing of the recognition of expenses and income."*
- And used in EPPO's 2000 and 2005 review of tariffs; e.g.

	2000			2005		
	EGAT	MEA	PEA	EGAT	MEA	PEA
Debt service coverage ratio	>1.3	>1.5	>1.5	>1.3	>1.5	>1.5
Debt/Equity	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5

Source: Electricity tariff restructuring reports, NEPO, 2001 and EPPO, October 2005. As reported by Sirasoontorn, op cit.

Evaluation of credit metrics

- The **ability to service debt** is central to the financeability of a business. **Interest coverage** is perhaps one of the more intrinsically significant and transparent indicators at hand.

- An often used indicator is **Funds From Operations** (FFO) **interest coverage.** This financial ratio is seen as a strong choice in testing for financeability in that it:
  - corresponds closely to cash multiples available for debt service;
  - is used extensively by practitioners in similar applications;
  - is reasonably straight forward to calculate; and
  - considerable data is at hand in which to benchmark threshold levels to comparator utilities.

- Three other indicators are also seen as helpful in application of the financeability test:
  - Short term liquidity
  - Repayment of principal
  - Ability to pay dividends

- A set of indicators is provided on the slide that follows:

Financial indicators for financeability tests

Indicator	Definition	Description	Threshold values*
FFO Interest Coverage	(Cash Flow from Operations – Changes in Working Capital + Interest Expense) / (Interest Expense + Capitalized Interest Expense)	Cash available to service interest payments.	>2.7
FFO to Gross Debt	(Cash Flow from Operations – Changes in Working Capital) / (Total debt + operating lease adjustment + underfunded pension liabilities + basket-adjusted hybrids + securitizations + guarantees + other debt-like items)	Cash available to pay down principal (after interest, before payment of dividend).	>13%
RCF to Gross Debt	(Cash Flow from Operations – Changes in Working Capital – Common and Preferred Dividends) / (Total debt + operating lease adjustment + under-funded pension liabilities + basket-adjusted hybrids + securitizations + guarantees + other debt-like items)	Cash available to pay down principal (after payment of interest and dividend).	>9%
FFO Dividend Coverage	(Cash Flow from Operations – Changes in Working Capital) / dividend payments	Cash available to service interest and pay dividend	>2.2

**Threshold values are illustrative values only based on investment grade credit ratings*
Definitions (except FFO dividend coverage) from Moody's Investor Services "Rating Methodology: Global Regulated Electric Utilities"

Methodology for applying financeability tests

With a workable set of financial indicators defined, our recommended methodology for use in evaluation of tariff levels is as follows:

1. **Determine threshold values** (or ranges) of financial indicators consistent with target credit ratings (i.e. stand-alone investment grade ratings).

2. **Apply projected cash flows** and balances for the tariff period into a set of notional financial statements, including profit and loss, balance sheet and cash flow statement.

3. **Calculate projected financial ratios** for each activity using the pro forma financial statements above.

4. Compare the results against threshold values to **assess the financial sustainability** of the operator given proposed tariff levels.

End of document

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