

Final Report on Ad-Hoc Consultancy for the Bhutan Electricity Authority (BEA) on RAB Determination

Prepared within the framework of Ad-Hoc Consultancy Project
by Tetra Tech

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A wide-angle photograph of a large electrical substation. In the foreground, a paved road curves from the left towards the center. To the right of the road is a green metal fence. Beyond the fence, the substation is filled with numerous tall, grey metal pylons and a complex network of high-voltage power lines. In the background, a long, low building with a red roof is visible, set against a backdrop of misty, forested hills.

Final Report

Adhoc Consultancy to Bhutan Electricity Authority on Regulatory Asset Based Tariff Determination

January 30, 2019

Submitted to:

**Bhutan Electricity Authority, Bhutan
Energy Regulator Regional Association, Budapest, Hungary**

Submitted By:

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1. INTRODUCTION

The Regulatory Asset Base (RAB) is an accounting number which is determined by the regulators to guarantee the value of investment which will be paid in future by the customers. The other advantages of RAB are reduction in capital cost, recycling of profits and encouragement for efficiency. There are two potential disadvantages - competition and customer affordability. Thus, from an investor's point of view, RAB based tariff has advantages over cost plus tariff, particularly in electric utilities. The investor gets secure payback and return on investment sufficient to service loans and generate profits. Additionally, they are stimulated to reduce their costs because unlike cost-plus pricing, the RAB system allows to retain the funds resulting from cost cutting. This results into new investment for improving customer services such as availability and reliability of power supply. Regulatory Asset Base technique was initially developed in the early 1990s for UK infrastructure industries by Ofwat during privatization of public sectors.

As cited on August 1, 2018 at Hydroworld.com, Bhutan has about 30GW of hydro potential, out of which approximately 5% has been harnessed so far. To exploit the balance, lot of investment is required. Regulatory uncertainty is one of the bottle necks in bringing investment and RAB is an assurance to address this uncertainty. Secondly, the present cost-plus tariff is not incentivizing the utilities to make prudent investment for better customer services and on the other hand customers are critical of passing the asset related cost into the tariff without scrutiny.

At present in Bhutan, Tariff Determination Regulations 2016, issued by Bhutan Electricity Authority (BEA) are based on cost plus methodology. However, the objectives No. 3 (b) and 3 (f) of Domestic Electricity Tariff Policy of Bhutan 2016, issued by Ministry of Economic Affairs, Royal Government of Bhutan states that,

- Ensure recovery of the actual cost of efficient business operation of electric utilities and enable investments in expansions and up-gradations;
- Promote sustainable economic and Industrial growth.

Thus, BEA decided to move towards RAB based tariff determination. As a starting case, BEA selected 720 MW Mangdechhu Hydro Power Plant (MHPP) which is near completion.

BEA is a member country of Energy Regulators Regional Association (ERRA) and requested ERRA for the development of RAB guidelines. ERRA selected Rakesh Kumar Goyal from Tetra Tech ES India Private Limited, through a global solicitation process, as a consultant for this assignment. ERRA is supporting BEA for this consultancy assignment. The consultant is expected to develop a reference guide to support BEA for developing a process and methodology for establishing a regulatory asset base of MHPP for determination of prudent electricity generation tariff. The detailed report should help BEA for determining tariffs in future similar activities by developing regulatory asset base model.

2. OBJECTIVES OF THE STUDY

The key objective of the assignment was “To develop a guideline on determination of RAB for Hydropower Projects using the case of 720 Megawatt (MW) Mangdechhu Hydroelectric Project in Bhutan which is scheduled to be commissioned in November 2018. The guideline will help the Bhutan Electricity Authority (BEA) to establish the true and efficient RAB of the utilities regulated by the BEA and thereby determine a fair tariff.”

The other key terms of the contract are provided in Annexure-1.

3. DEVELOPMENT OF DRAFT GUIDELINES

3.1 Kick Off Meeting and Review of the Documents

The assignment started with a kick off call, through skype, on September 10, 2018. Following are key points of discussion:

- Introduction of the team
- Expectations of BEA from this study
- Documents Request from the consultants
- Schedule for the Bhutan visit

The complete minutes of meeting are provided in Annexure-2.

The consultant reviewed the following documents received from BEA:

1. Regulations for filling tariff petition
2. Regulations for reviewing the tariff petition
3. License application filed by MHPP and the order of BEA
4. Application for operation filed by MHPP
5. Request of Government for determination of indicative tariff for MHPA
6. Latest annual and quarterly report submitted by MHPP
7. Previous tariff petition filed by any hydro generating company and BEA tariff order
8. Electricity Act, Tariff Policy and Tariff Regulations with all amendments

The consultant reviewed RAB guidelines in various countries particularly in UK, New Zealand, India and Australia. The consultant also studied what was favorably accepted by investor and what was liked by the customers. The consultant relied on following main documents: -

1. 'Cost Analysis for Hydro Power Plants'- International Renewable Energy Agency
2. 'Rolling Forward the Regulatory Asset Base of the Electricity and Gas Industries' - Independent Pricing and Regulatory Tribunal, New South Wales
3. 'A Methodology for the Valuation of the Regulatory Asset Base' - Port Regulators of South Africa.
4. 'Methodology for the Petroleum Pipeline industry to Determine an Estimated Starting Regulatory Asset Base' - National Energy Regulator of South Africa.
5. 'Tariff Filing guidelines for Hydro Power Plant' - Central Electricity Regulatory Commission, India.
6. Tariff Guidelines - Central Electricity Regulatory Commission, India.
7. 'Electricity Tariff Regulatory Implementation Guidelines' - Suruhanjaya Tenaga for Tamil Nadu State of India
8. Presentation on Regulatory Asset Base by Denise Parrish
9. Presentation on RPI-X Regulation by Nick Crafts
10. 'Utility Regulations, the RAB and the Cost of Capital' by Dieter Helm, University of Oxford.

All the above documents were available in public domain and cited by the consultant during September 2018 to November 2018.

3.2 Draft Guidelines

Based on above literature and consultant's own experience, a detailed power point presentation of 43 slides was developed. The PPT detailed on the following key questions:

- What is RAB?
- Why RAB?
- What are key elements of RAB?
- What are various options for each of the key elements?

Each option was provided with pros and cons. Following two aspects were covered specifically:

- Steps to determine RAB through actual cost, for instance, where historical cost record does not exist and determining cost of asset under cost overrun aspects.
- Steps to determine individual components of RAB such as depreciation, capital work in progress, capital contribution, return on working capital and investment for generation plant (MHPA) to be commissioned.

The full presentation is included in Annexure-3.

3.3 Visit to Bhutan

The consultant's visit to Bhutan was scheduled from October 21 to October 30, 2018. In the visit, the consultant covered MHPP and conducted meetings.

3.3.1 Meeting with BEA

Two formal meetings and several informal discussions were conducted with BEA and their staff. The consultant presented the draft guidelines to BEA with the help of the PPT, as included. The consultant presented the following items for inclusion in the RAB.

- Capital Valuation
- Depreciation
- Cash Working Capital
- Construction Work in Progress
- Customer Deposits
- Accumulated Deferred Taxes
- Plant held for Future Use,
- Prepayments
- Material and Supplies
- Gold plating
- Overcapitalization
- Acquisition Adjustment



Figure 1: Meeting with BEA

Each element as mentioned above was discussed thread bare. The consultant explained the objective, various methodologies for determination of each of the element with their pros and cons. For example,

for determination of Cash Working Capital, the consultant suggested three methods; 1) Formula Method, 2) Balance Sheet Method, and 3) Lead-Lag study. After detailed discussions, it was decided to use formula method based on lead lag study. Similarly, the consultant suggested following methods for capital valuation:

- Actual Cost (original Cost)-No subjective assessment except prudence
- Indexed Historic Cost-Original cost adjusted by Inflation or some other industry index.
- Indexing Incentive-Reduction or control on capital expenditure
- Replacement Cost-Does not include inefficiencies
- Depreciated Optimized Replacement Cost-Include inefficiencies
- Fair Market Value-Value that would be obtained by selling the asset in the market.
- Net Present Value-Discounted cash flow associated with each asset

After discussion it was decided to keep the first three methods only.

BEA suggested to drop 'Accumulated Deferred Tax', 'Prepayments' and 'Acquisition of Adjustment' from the draft guidelines, as they are not relevant for Bhutan.

Towards the end, a wrap up discussion was conducted to decide what is to be included and what is to be excluded from the draft RAB guidelines based on the feedback received from the MHPP staff and stakeholders.

3.3.2 Visit of MHPP

After visiting the plant on October 23rd forenoon, a meeting was arranged with the key staff members. The meeting started with the presentation by MHPP staff about the physical and financial progress of the MHPP and the challenges experienced by them.

Thereafter the consultant made the presentation to explain RAB and its significance. The consultant also threw light on the relevance of RAB to MHPP. This was followed by MHPP staff sharing their apprehensions and concerns about the same. Consultant and BEA staff catered to their queries and explained how their concerns would be taken care of in RAB Guidelines. The presentation made by the consultant is included in Annexure-4.



Figure 2: Turbine at MHPP



Figure 3: Visit of MHPP

3.3.3 Meeting with Stakeholders

BEA arranged a consultation with key stakeholders on October 26, 2018. Representatives from Government, and generation, transmission, and distribution companies participated. There was participation from financial institutions and customer forum as well. After introduction by the BEA, the consultant delivered a presentation on the key aspects of RAB. The presentation was followed by discussions, that focused on concerns regarding RAB.. The consultant clarified on the methodology for determination of the value of the RAB elements, using various examples.



Figure 4: Meeting with Stakeholders

The presentation made by the consultant is depicted in Annexure-5.

3.4 Development of the Draft Guidelines

Based on the discussions above and the learnings, the consultant developed the draft RAB guidelines and circulated the same via email to BEA and ERRA for their review, on November 14, 2018. The submitted draft guidelines are provided for reference in Annexure-6.

4. DEVELOPMENT OF RAB GUIDELINES

BEA and ERRA have sent their comments on draft guidelines via e-mail dated November 16, 2018 and November 19, 2018 respectively. The consultant tabulated all comments and recorded his response for each of the comments. There were few counter comments from BEA and ERRA on the responses of the consultant. The full table with comments and responses is provided at Annexure-7. Based on this table the consultant developed the final RAB guidelines and submitted for final review to BEA and ERRA on December 8, 2018. BEA submitted further comments on December 27, 2018 on clause 3.1.1 (Capital valuation), Clause 3.1.2.2 (Ex-ante assessment) and on Clause 3.4.2 (Capital Expenditure) which were responded by the consultant on January 7, 2019. To discuss the BEA comments and consultant response in more detail the ERRA arranged a conference call on January 22, 2019. Based on the discussions in the conference call the consultant re-submitted the final guidelines on January 24, 2019. On January 26, 2019 BEA suggested some changes in language which were accepted by the Consultant and ERRA. The final RAB guidelines developed out of this exercise are provided below.

BHUTAN ELECTRICITY AUTHORITY

Dated XXXXX 2018

NOTIFICATION

In exercise of powers conferred under Section 14 of the Electricity Act, 2001 and all other powers enabling it in this behalf, the Bhutan Electricity Authority hereby makes the following Guidelines, namely: Bhutan Electricity Authority Regulatory Asset Base Guidelines, 2018 (RAB Guidelines 2018).

CHAPTER – 1

PRELIMINARY

1.1 Title, Commencement and Scope

- This Guideline shall:
 - a. Be called the Bhutan Electricity Authority Regulatory Asset Base Guidelines, 2018 (RAB Guidelines 2018-herein after referred as Guidelines).
 - b. Come into force with effect from on such date as the Authority may notify.
 - c. Be applicable throughout Bhutan for determination of capital base on which return will be applicable for the business of Generation, Transmission, Distribution or System Operator of electricity.
 - d. Not be applicable to the businesses, where capital base has been established in the past for tariff determination by the Authority.

CHAPTER – 2 GENERAL

In exercise of its power contained in Section 14 of the Act and in accordance with of the Section 9 of the Tariff Determination Regulations 2016, the Authority hereby makes following Guidelines for determination of the capital asset base for fixing the tariff, for investment approvals or any other matter in which determination of the capital asset base is required.

2.1 Objective.

The Guidelines are being issued to remove uncertainty or risk perceived by the investors in power sector about the determination of the capital base by the Authority since the Regulatory Asset Base (RAB) will be key determinant for tariff that may be charged for regulated services. The RAB will have impact on the balance that the regulator strikes between the interest of the consumers and interest of the utility companies of the regulated services.

2.2 General Principles

For inclusion or exclusion of any asset into RAB following key principles shall be applied. These principles will have overriding effect for any interpretation of the Guidelines.

- (a). Asset should be included in the RAB if it is only providing the **regulated** services for which RAB is being determined.
- (b). The cost of asset should not be transferred/shared from unregulated to regulated service or between one regulated service to another regulated service.
- (c). This Guidelines shall be applicable for any new petition/application/New Investment approval (even in the existing projects/services) filed before the Authority.

2.1 RAB for Each Year.

For determination of the RAB, the Authority will determine the opening and closing value of the RAB from the information submitted by the utility companies as per the regulations issued by the Authority for each year of the asset/project/services life. The average of opening and closing value of the RAB will become representative value of the RAB for that year.

2.2 Net Approach in determining RAB.

The closing value of the RAB at the end of the year will be the opening value of the RAB for next year. The closing value of the RAB will be determined by opening value of the RAB for that year plus capital expenditures minus regulatory depreciation and asset disposals. It may also include any other capital expenditure incurred and claimed by the petitioner and found prudent by the Authority in that year. This value is then adjusted for the variation of the

working capital and the variation of capital contributions. This can be stated mathematically as for the year 't':-

Closing value of RAB in year 't' = Opening value of RAB in year 't' + capital expenditures in year 't' – Deprecation in year 't' – income from assets disposal for year 't' - annual change over year 't' in the value of assets funded by capital contributions + annual change over year 't' in the working capital

CHAPTER – 3

COMPONENTS OF REGULATORY ASSET BASE

3.1 Capital.

3.1.1 Capital Valuation

- Any asset submitted by the petitioner, whose cost has not been previously approved by the Authority for inclusion in RAB, the Authority shall decide to consider the asset in RAB. The Authority may decide to consider the same cost as presented by the petitioner supported by valid justifications but net off the depreciation and any grant that the petitioner got to acquire that asset. However, the Authority will have the option to verify the prudence of that cost of the asset by any one or any combination or all the following methods given below: -
 - (a) Indexed Historic Cost Method-Original cost adjusted by inflation or some other industry index.
 - (b) Indexing Incentive Method-Reduction or control on capital expenditure as per the market realities
 - (c) Net Present Value Method-Discounted cash flow that would be generated by the services of the asset during the life of the asset.

In case the Authority decide to do the prudence test, the cost determined through the prudence test shall be taken into the RAB by the Authority.

3.1.1.1 The Authority may allow acquisition adjustment in addition to the prudent cost determined by the Authority in Section 3.1.1, by stating the circumstances and the reasons for such adjustments.

3.1.2 New Investment

The Authority shall consider either of the following type of investment for the inclusion in the RAB during the life of the project. Their capital value will be determined as per the methodology mentioned in Section 3.1.1 of the Guidelines.

- (a) **Extension Investments:** The Authority shall consider all investments needed for meeting the change in the service requirements for example increase in the demand, requirement of higher generation, higher transmission/distribution network etc.
- (b) **Replacements Investments:** The Authority shall consider all investments related to replacement of aged (technically or economically) equipment's. The petitioner need

to obtain approval from the Authority for replacement of the asset before procurement of the asset.

- (c) **Exceptional Investments:** The Authority shall consider investment resulting from e.g. new legal obligations, new service requirements or any other need approved by the Authority for providing the services.

3.1.2.1 The Authority shall provide approval for purchase of new asset based on Ex-ante assessment. For Ex-ante assessment, the Authority may use any one, any combination of the following or all the methods: -

- (a) Invoice submitted by the petitioner
- (b) comparative studies,
- (c) benchmarking studies,
- (d) review by independent consultant, and/or
- (e) Prudency tests mentioned in Section 3.1.1. of the Guidelines.

3.1.2.2 If the ex-ante assessment is more than BTN 50 million and after putting the asset into service if the actual expenditure is higher or lower by more than 2%, the petitioner shall submit the revised investment proposal for truing up. The Authority shall use Ex-post assessment for truing up.

3.1.2.3 If the ex-ante assessment is less than or equal to BTN 50 million and after putting the asset into service if the actual expenditure is higher or lower by less than or equal to 10%, the petitioner shall submit the revised investment proposal and it will have deemed approval of the Authority.

3.1.2.4 If the ex-ante assessment is less than or equal to BTN 50 million and after putting the asset into service if the actual expenditure is higher or lower by more than 10%, the petitioner shall submit the revised investment proposal for truing up. The Authority shall use Ex-post assessment for truing up.

3.1.2.5 In the true up order, the Authority will specify how the true up cost should be reflected in the books of account.

3.2 Depreciation.

The Authority shall follow in general the straight-line methodology for determination of the depreciation. The Authority may consider other methodologies for determination of depreciation but by recording the reasons for the deviation from straight-line methodology.

3.3 Working Capital.

The Authority shall use formula method for determination of the working capital requirement based on Lead-Lag study.

3.3.1 The petitioner shall submit the measurement of the time between the petitioner's out-of-pocket payment to expenses compared to the collection of revenues from the service. This result will be multiplied **by** the average daily balance of operating expenses.

3.3.2 After doing the prudency check of the details submitted by the petitioner as per Section 3.3.1 of the Guidelines, the Authority shall determine the working capital.

3.4 Capital Work in Progress.

3.4.1 The Authority shall not include the capital expenditure in RAB if the asset are not operationalized within the tariff period. However, the Authority may consider asset which could become operational within the first year of the tariff period considering the prudent need of the investment.

The Authority may consider interest during construction for the capital work in progress of the asset.

Asset Held for Future Use

The Authority may allow capital expenditure in RAB for the **Assets** which are purchased for future purposes, provided,

- (a) The period is less than **3 6** months in purchase and use of the asset, or
- (b) There is financial advantage in comparison to purchase when the asset is to be used.

3.5 Inventory

Th Authority shall approve the inventory in terms of percentage of the capital cost based on industry practice for inclusion in the RAB. The Authority may approve higher/lower percentage than industry practice by recording the reasons for higher/lower percentage approval.

3.6 Grant/Customer Deposits.

Any grant in cash or kind received by the petitioner, from any source including Royal Government of Bhutan for the project/services and any customer deposit for the project/services under consideration, shall be deducted from the RAB. (we rephrased the sentence).

3.7 Gold Plating and Overcapitalization.

The Authority shall ensure that the new investments for the project/services for which RAB is under consideration are reliable and adequate. There should not be any gold plating, overcapitalization, extravagant or extreme in the cost of asset which is considered in RAB.

CHAPTER – 4 MISCELLANEOUS

4.1 Power to Relax.

The Authority, for reasons to be recorded in writing, may relax any of the provisions of these Guidelines on its own motion or on an application made before it by an affected person to remove the hardship arising out of the operation of the Guidelines, applicable to a class of persons.

4.2 Power to Remove Difficulty.

If any difficulty arises in giving effect to the provisions of these Guidelines, the Authority may, on its own motion or on an application made before it by any other person, by order, make such provision not inconsistent with the Section 14 of the Act or provisions of other regulations specified by the Authority, as may appear to be necessary for removing the difficulty in giving effect to the objectives of these Guidelines.

4.3 Repeals and Savings.

These Guidelines will repeal all regulations/Guidelines and any provisions made there under for the development of the capital asset base for determining the tariff, investment approvals or any other services in which the determination of the capital asset base is required.

4.4 Definitions and Interpretations.

In these Guidelines, unless the context otherwise requires-

- (1) **‘Act’** means the Electricity Act of Bhutan, 2001
- (2) **‘Authority’** means the Bhutan Electricity Authority;
- (3) **‘BTN’** means Bhutanese ngultrum, the currency of the Bhutan
- (4) **‘Construction Period’** means the period from which at least 5% expenditure of the cost approved by the Authority has been made till the asset becomes fully operational.

- (5) **‘Depreciation’** means a systematic allocation of the cost of an asset to the accounting periods in which the asset provides benefits to the regulated company.
- (6) **‘Ex-ante Assessment’** means assessment made before the event has occurred.
- (7) **‘Ex-Post Assessment’** means assessment made after the event has occurred.
- (8) **‘IDC’** means interest during construction.
- (9) **‘Net Approach’** means the closing value (value at the end of the year) of the Regulatory Asset Base (RAB) is set equal to the opening value (value at the beginning of the year which is equal to the value at the end of the previous year) of the regulatory assets plus capital expenditures minus regulatory depreciation and minus asset disposals.
- (10) **‘Mid-Year RAB’** means simple average of the expected opening and closing values of the RAB for that year.
- (11) **‘Prudency Check’** means scrutiny of reasonableness of capital expenditure incurred or proposed to be incurred.
- (12) **‘RAB’** means Regulatory Asset Base. The RAB is an accounting number which is determined by the regulators to guarantee the value of investment which will be paid in future by the customers. The value of the RAB can be expressed as

$$\text{Gross Current Cost of the Assets} + \text{Provision for Depreciation} = \text{Net Book Value}$$
- (13) **‘Tariff’** means price of electricity per unit or kilowatt hour (kWh).
- (14) **‘Regulated Services’** means services which are regulated by the Authority for the generation, transmission and distribution of electricity in the Bhutan.
- (15) **‘Petitioner’** means the one who has submitted application/petition to the Authority for determination of the tariff or an investment proposal.

5. WAY FORWARD

Following further steps are recommended for BEA: -

1. This RAB guidelines be circulated to all stakeholders and to the public for their comments as draft RAB guidelines. The BEA should publish a notice to this effect in newspapers for the attention of the public.
2. The BEA should make the draft guidelines available at its website.
3. The comments should be accepted by email or by post.
4. A time of about 4 weeks should be given for comments. In between BEA should held one/two public meeting inviting all stakeholders and public at large for sharing the draft guidelines and obtaining their comments.
5. After 4 weeks, the BEA staff should compile all comments, write response, and put up to the Board of BEA for their approval.

After approval by BEA board a gazette notification of the RAB guidelines be issued.

Annexures

ANNEXURE-1 KEY TERMS OF THE CONTRACT

a. Purpose:

To develop a guideline on determination of RAB for Hydropower Projects using the case of 720 Megawatt (MW) Mangdechhu Hydroelectric Project in Bhutan which is scheduled to be commissioned in November 2018. The guideline will help the Bhutan Electricity Authority (BEA) to establish the true and efficient RAB of the utilities regulated by the BEA and thereby determine a fair tariff.

b. Expected Output

Development of guidelines to determine the RAB incorporating the best regulatory practices.

- Steps to determine RAB through actual cost for instance where historical cost record does not exist and determining cost of asset under cost overrun aspects.
- Steps to determine individual components of RAB such as depreciation, capital work in progress, capital contribution, return on working capital and investment for generation plant (MHPA) to be commissioned.
- Highlights of importance of regulatory accounting system.
- The guideline should be in-line with the Tariff Determination Regulation (TDR) 2016 of BEA and Domestic Electricity Tariff Policy (DETP) 2016 of Royal Government of Bhutan (RGoB).
- RAB guideline should incorporate the best regulatory practices.

c. Final Deliverables

- **Guideline:** The purpose of this guideline would be to provide a process, methodology and reference guide for the Bhutan Electricity Authority (BEA) to establish effective regulatory asset base of Mangdechhu Hydroelectric Project (licensed electricity generating company) for determining fair electricity generation tariff.
- The **Final Report** on development of guideline for determination of RAB that will assist future development of similar activities such as guidelines and regulations to be used by BEA. Annexes of the Final Report cannot exceed the main body of the Report, thus the main content should be elaborated within the report and not in the annexes.

The results of the research can also be used by other members of ERRA.

Timeline. –The Subcontractor shall provide electronic copies of all preparatory and final documents to ERRA for this project.

Date	Activities
17-30 September 2018	Review and studying related materials.
30 September – 14 October, 2018	Development of RAB Guidelines.
15 – 30 October 2018	<u>Visit Bhutan (5 days)</u> <ul style="list-style-type: none"> a) Visit to Mangdechhu Hydroelectric Project Authority(MHPA)and consultation meeting with MHPA,

	<ul style="list-style-type: none"> b) Internal meeting between Consultant and BEA on the Draft Guidelines, c) Stakeholder consultation meeting with Department of Hydropower and Power Systems (DHPS), Druk Green Power Corporation Limited (DGPC), Bhutan Power Corporation Limited (BPC) & BEA, d) Knowledge sharing between Consultant and BEA and wrapup of meeting, e) Visit to near by power plant (if time permits).
5 November, 2018	Submission of the Preliminary Draft Guideline.
15 November 2018	Comments received from BEA and ERRA.
16 – 30 November, 2018	Finalization of the guideline by incorporating the comments and suggestions received from from BEA and ERRA.
15 December 2018	Submission of Final Report to ERRA along with the approved guideline.
30 December, 2018	Approval of Final Report by ERRA.

ANNEXURE-2- MINUTES OF MEETING DATED SEPTEMBER 10, 2018



Meeting Minutes

Kick off Meeting for “Adhoc Consultancy to BEA” between Bhutan Electricity Authority and Tetra Tech ES India Private Limited was held through skype on Monday, September 10, 2018.

Attendees

Attendees included

Sl. No.	Bhutan Electricity Authority	Tetra Tech ES India
1	Mr. Gaseb Dorji, Chief Economic Research Division	Dr. Rakesh Kumar Goyal, Consultant Tetra Tech
2	Ms. Mindu Wangmo, Nodal person and Tariff Officer	Mr. Shahab Alam, Analyst
3	Mr. Pema Wangchen, Sr. Analyst	
4	Ms. Nermin, Tariff Division	

Points of Discussion

Following points were discussed between representatives of Bhutan Electricity Authority and Tetra Tech.

1. Introduction to the team

- The meeting started with introduction of the attendees as indicted in the above table. Mr. Dorji briefed Tetra Tech that Tariff Division, Economic Department of BEA will be the nodal department and at present, Mr. Dorji is heading this department also. Ms. Mindu will be the nodal officer for this assignment. Other participants also introduced themselves.
- Tetra Tech introduced that they are US based consulting firm. Dr. Goyal will be the principal consultant for this study and he will be supported by Mr. Shahab Alam in this assignment.

2. Expectations from the consultancy assignment and Status of Hydro Plant

- BEA explained to Tetra Tech that current practice of determination of generation tariff is based on cost plus methodology. In this assignment BEA requires consultant to provided guidelines for development of regulatory asset base for 720 MW

Mangdechhu Hydroelectric Project Authority (MHPA). Out of 720 MW about 100-150 MW is proposed to be used as a firm power for which the tariff is to be determined. Balance power will be exported to India under bilateral treaty. The export tariff is not under scope of this assignment. BEA informed that a license to construct MHPA has already been awarded by BEA and application to operate MHPA has also applied for operation license and the application is under review of BEA. The project is expected to be completed by December 2018.

- Once plant is in operation, MHPA will submit an application to BEA for fixing the tariff. BEA proposed to decide the tariff within four months of filing of petition by MHPA. Government of Bhutan has requested BEA to determine the indicative tariff for MHPA.
- BEA has laid down regulations for determination of the tariff.

3. Documents to be shared by BEA

- Tetra Tech requested BEA to share following documents. Tetra Tech requested to share them in a week's time
 - b. Regulations for filling tariff petition
 - c. Regulations for reviewing the tariff petition
 - d. License application filed by MHP and the order of BEA
 - e. Application for operation filed by MHPA
 - f. Request of Government for determination of indicative tariff for MHPA
 - g. Latest annual and quarterly report submitted by MHPA
 - h. Previous tariff petition filed by any hydro generating company and BEA order for tariff.
 - i. Electricity Act, Tariff Policy and Tariff Regulations with all amendments.

4. Schedule for Bhutan visit

Day 1 - October 20, 2018	Travel from New Delhi to Thimphu, Bhutan
Day 2 - October 21, 2018	Travel from Thimphu to MHPA (8 hours' drive)
Day 3 - October 22, 2018	Visit to MHPA
	Meeting with MHPA officials and other stakeholders
Day 4 - October 23, 2018	Travel back to Thimphu
Day 5 - October 24, 2018	Meeting with CEO of BEA and presentation of Draft RAB guidelines
Day 6 - October 25, 2018	Meeting with stakeholders
Day 7 - October 26, 2018	Wrap-up meeting with BEA officials
Day 8 - October 27, 2018	Site Visits (Night stay in Paro)

Day 9- October 28, 2018	Return from Paro to New Delhi
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ANNEXURE-3 PRESENTATION MADE TO BEA

Guidelines for Regulatory Asset Base

Bhutan

October 2018

Session Structure

- A About Tetra Tech
- B What and Why RAB
- C Development of RAB
- D Next Step

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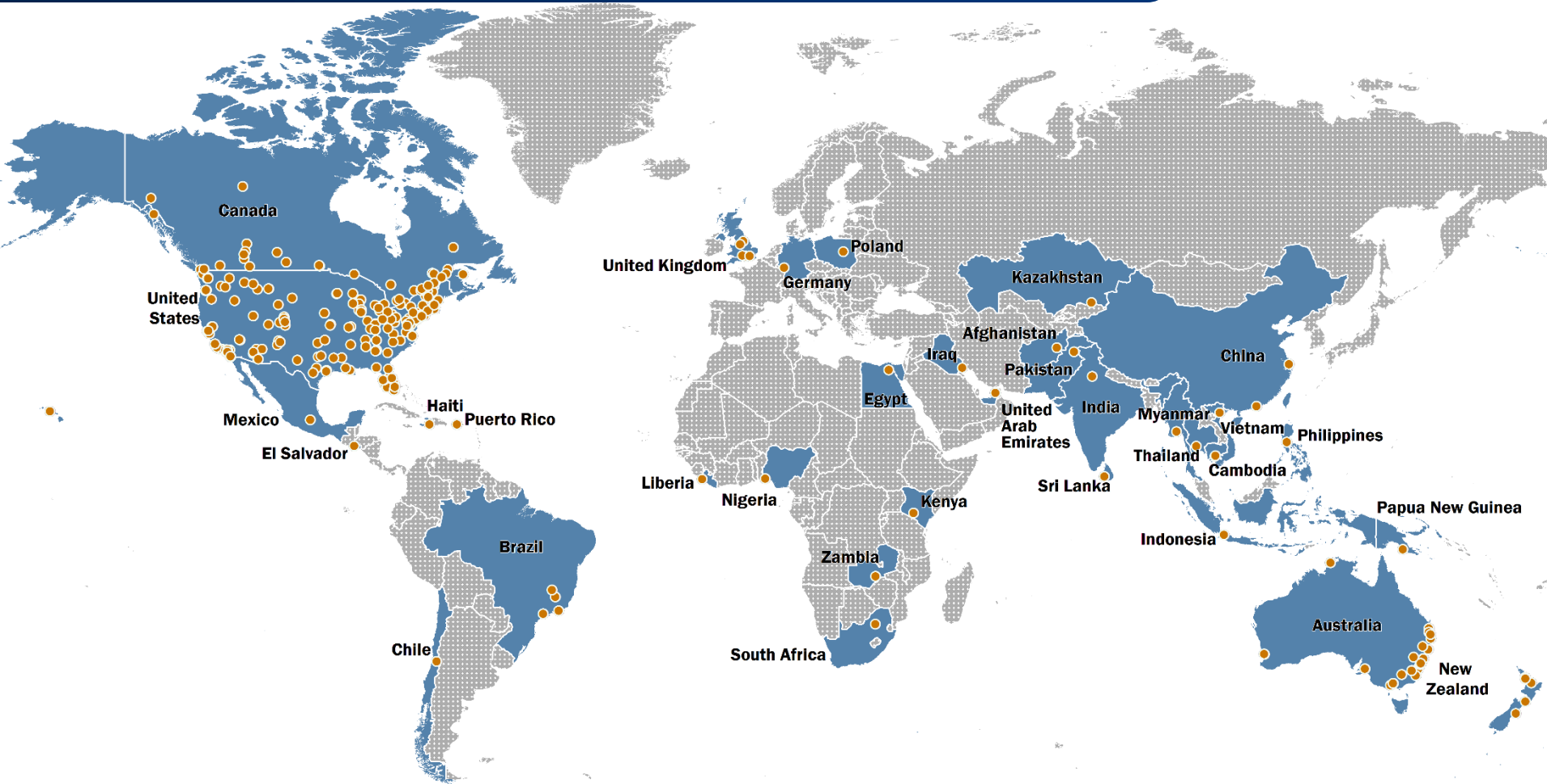
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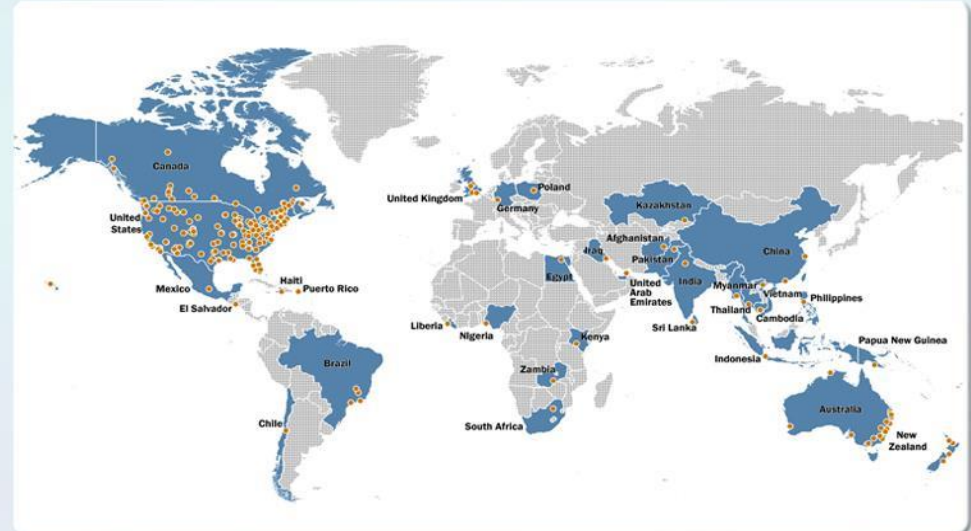
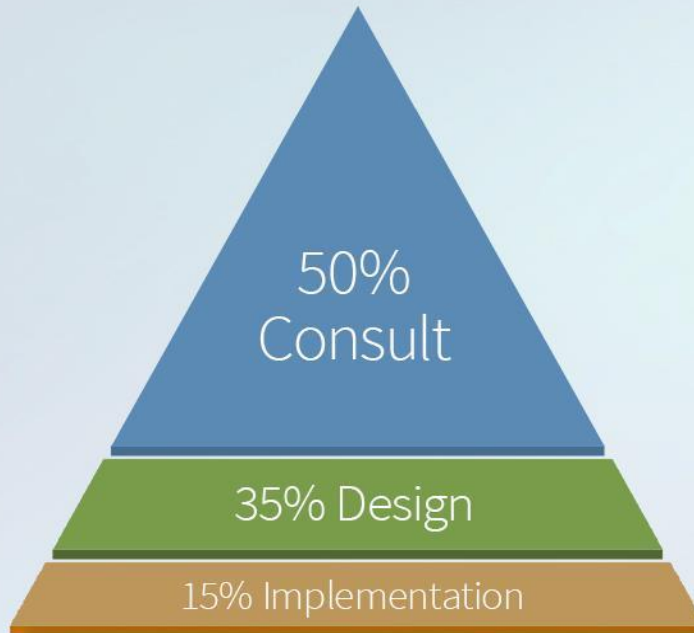
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How is Tariff Determined ?

$$R=O+M+A+C+R$$

Where,

- R = Revenue Requirement

Non capital Cost

- O= Operational Expenses
- M= Maintenance Expenses
- A= Administrative Expenses

Capital Cost

- C= Return of Capital
- R= Return on Capital

Price Control Models

Rate-of-Return regulation-

Prices / revenues based on operating costs plus “fair” return

Price Cap and Revenue Cap regulation

- Upper limit (cap) on prices or revenues
- Efficiency targets
 - Regulatory period (3-5 years)
- Price reviews

Legal Framework

- Section 14 of The electricity Act empowers BEA to regulate tariffs for generation not regulated by power purchase agreement;
- Domestic Tariff Policy section 7 states for cost plus tariff.
- Section 9 of Tariff Determination Regulations 2016,

"The Authority shall determine tariffs according to the following principles, in accordance with Section 14.1 of the Electricity Act:

- (1) Fairness to both service customers and service providers;
- (2) No unjust discrimination against service providers or those who wish to use the services;
- (3) Reflect the actual cost of efficient business operation;
- (4) Conducive to efficiency improvement in business operation;
- (5) Enhance efficient and adequate supply to satisfy the domestic demand; and
- (6) Transparency in the determination and presentation of tariffs.

Why Regulatory Asset Base (RAB)

- Regulatory Asset Base (RAB) technique were initially developed in the early 1990s for UK infrastructure industries by Ofwat during privatization of public sectors.
- The RAB is an accounting number which is determined by the regulators to guarantee the value of investment which will be paid in future by the customers.
- The advantages of RAB are reduction in capital cost, profits are recycled and encourages efficiency.
- There are two potential disadvantages competition and customers affordability. Thus, from investors point of view RAB based tariff has advantages over cost plus tariff particularly in electric utilities.

What is RAB ?

- Return on Regulatory asset Base-Suppliers
- Tariff-Consumer
- RAB
 - Tangible Assets
 - Return on Capital
 - Depreciation Allowance
 - Expenditures for operation of the business

RAB- Key Consideration

- Asset should not include which is not providing regulated services.
- Cost is not transferred from unregulated to regulated service or between regulated services

The RAB is determined for each year of the regulatory period. There are two main approaches:

Net Approach

According to the net approach the closing value (value at the end of the year) of the RAB is set equal to the opening value (value at the beginning of the year which is equal to the value at the end of the previous year) of the regulatory assets plus capital expenditures minus regulatory depreciation and minus asset disposals. This value is then adjusted for the variation of the working capital and the variation of capital contributions

Gross Approach

According to the gross approach the closing value of the RAB (for a year of the regulatory period) is determined by the closing value of fixed assets minus the closing value of capital contributions minus the closing value of working capital.

RAB-Net Approach

The regulatory asset base is calculated according to the following formula:

$$CRAB = ORAB + Invest - D - AD - DCAPC + DWC$$

Where,

ORAB- opening value of regulatory assets for year t of the regulatory period;

Invest- investment (capital expenditures) for year t of the regulatory period;

D- depreciation for year t of regulatory period;

AD- assets disposal for year t of regulatory period;

DCAPC- annual change over year t in the value of assets funded by capital contributions;

DWC -annual change over year t in working capital; and

CRAB- closing value of regulatory assets for year t of regulatory period.

RAB-Gross Approach

According to the gross approach the closing value of the RAB for year t of regulatory period might be expressed by the following formula:

$$CRAB = CFA - CCAPC - CWC$$

Where,

CRAB- closing value of regulatory assets for year t of regulatory period;

CFA- closing value of fixed assets for year t of regulatory period;

CCAPC- closing value of capital contribution;

CWC- closing value of working capital;

MiD Year RAB

When calculating the revenue requirements, it is common practice to use a mid-year RAB, i.e. the simple average of the expected opening and closing values of the RAB for that year.

$$RAB = ORAB + CRAB$$

Where,

RAB- the RAB used in the calculation of the regulated revenue in year *t*;

ORAB- opening RAB for year *t*; and

CRAB- closing RAB for year *t*.

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Development of RAB

- Capital Valuation
- Depreciation
- Cash Working Capital
- Construction Work in Progress
- Customer Deposits
- Accumulated Deferred Taxes
- Plant held for Future Use,
- Prepayments
- Material and Supplies
- Gold plating
- Overcapitalization
- Acquisition Adjustment

Development of RAB Capital

Valuation Methods

- Actual Cost (original Cost)-No subjective assessment except prudence
- Indexed Historic Cost-Original cost adjusted by Inflation or some other industry index.
- Indexing Incentive-Reduction or control on capital expenditure
- Replacement Cost-Does not include inefficiencies
- Depreciated Optimized Replacement Cost-Include inefficiencies
- Fair Market Value-Value that would be obtained by selling the asset in the market.
- Net Present Value-Discounted cash flow associated with each asset

New Investment

An investment is incurred when a business spends money either to buy fixed assets or to add to the value of an existing fixed asset.

Three types of investments may be considered:

- Extension investments: all investments needed for meeting the change of load and generation patterns in the future;
- Replacements investments: all investments related to replacement of aged (technically or economically) equipment;
- Exceptional investments: investment resulting from e.g. new legal obligations. For example, if new labor safety rules require safety measures in substations or high voltage pylons, this probably leads to investments. These investments neither lead to more capacity nor replace aged components.

Capital Expenditure

- The main issue to be considered in relation to the inclusion of capital expenditure is what measure of new assets is appropriate to incorporate into the asset base at the beginning of the regulatory period.
- Ex-ante Assessment
- EX-Post Assessment

Ex-ante Assessment

Ex-ante the regulator may conduct an assessment of the accordance and efficiency of a company's proposed investment program for the forthcoming regulatory period considering future demand growth, asset configuration and any other relevant information.

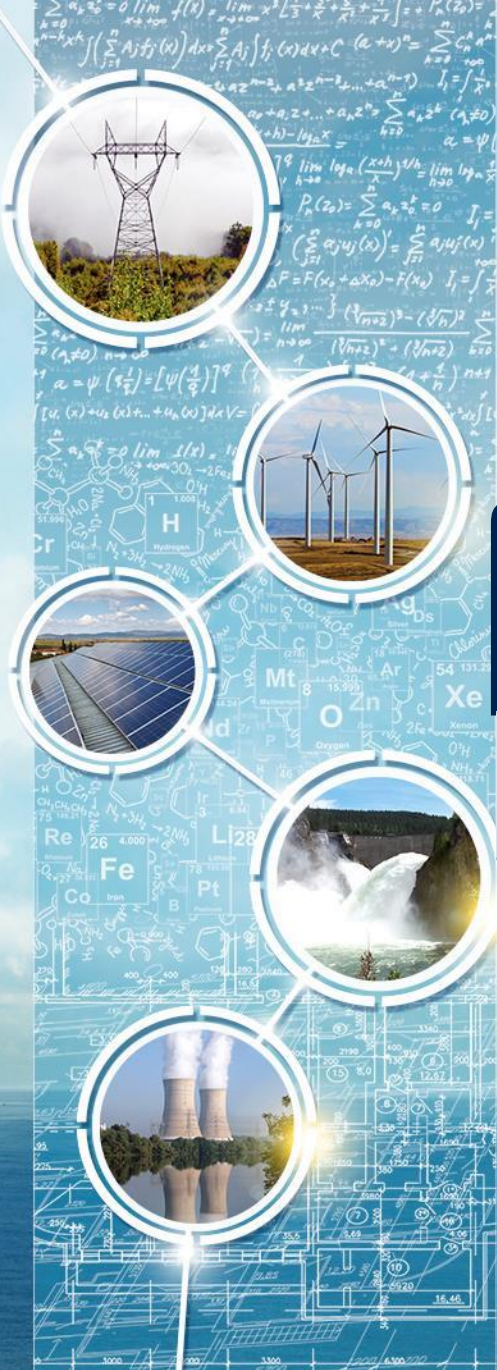
- Extension expenditure;
- Asset replacement expenditure;
- Exceptional investments, e.g. resulting from new legal obligations.

Depending on the approach the regulator may also apply techniques such as: comparative analysis supported by benchmarking studies; reviews by independent consultants and prudency tests

EX-Post Assessment

- Ex-post assessment may be undertaken to supplement the ex-ante investment reviews. In this way regulators aim to identify differences between the capital expenditures allowed in the ex-ante review and the actual investments undertaken by the regulated company.
- The transparency of the regulatory ex-post tests is an essential factor for the overall credibility of the regulatory regime. Ex-post assessment tests with a high degree of regulatory discretion would increase the regulatory risks and probably discourage even prudent investments. In contrast, formalised and transparent rules on how to carry out the ex-post tests would strengthen the credibility of the regulatory regime and support investment activities.

Development of RAB Depreciation



Depreciation

- The term ‘depreciation’ means a systematic allocation of the cost of an asset to the accounting periods in which the asset provides benefits to the regulated company.
- This allocation is designed to mirror the consumption of the service potential or economic benefits associated with an asset over its useful life, resulting from both use (wear and tear) and obsolescence.
- The revenue requirements of regulated companies normally include an allowance for depreciation. Such an allowance recognizes the need to recoup the outlays involved in the purchase of the asset over its useful life.
- The total net revenue earned from the regulated assets consists of a depreciation charge and the allowed return on assets.

Type of Depreciation

- Based on historic cost – usually straight line or sometimes accelerated depreciation.
- Based on replacement cost estimates – again, straight line or sometimes accelerated depreciation; and
- More flexible arrangements whereby depreciation is adjusted to complement other components of return so that the revenue stream mirrors the behavior of an annuity.

Depreciation

Depreciation on initial assets.

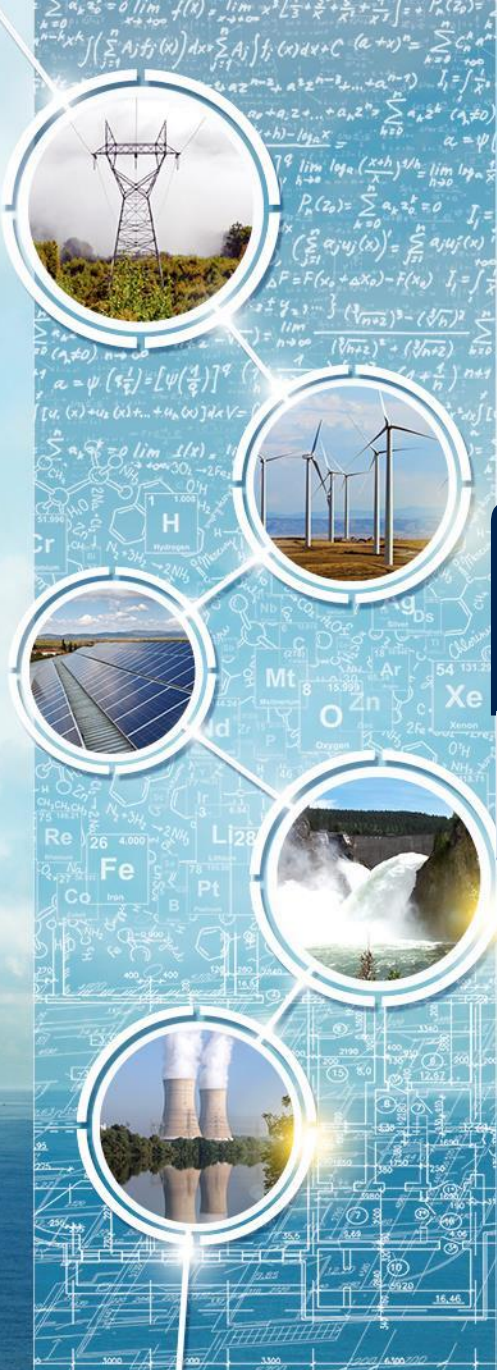
This could be done on the basis that: (1) these assets are a single asset which, at the time point of introduction of regulatory cap control, had a remaining life equal to the deemed average remaining life of assets in existence at that time; or (2) these assets consists of asset groups that are depreciated on the basis of their individual assets life;

Depreciation on assets acquired during the regulatory period.

This will be done: (1) either by dividing each successive year's investment by a deemed average life for the company's assets; (2) or dividing each successive year's investment components (asset group contained in the investment) by the useful life of these assets groups and consequently aggregating the individual asset groups depreciation.

Development of RAB

Working Capital



- A return on the working capital similar to the requirement for a return on capital assets. In both cases, for example investors commit funds at a certain point in time, have their funds returned at some time in the future, and in the meantime require a return on those funds to compensate for the opportunity cost. The only difference between the treatment of working capital and capital expenditures is the length of time during which the funds are tied up within the regulated company.
 - Formula Method
 - Balance Sheet Method
 - Lead-Lag Study
- Measure of investor funding of daily expenditures and a variety of non-plant investments that are necessary to sustain on-going operations of the utility until those expenditures can be recovered through revenues.

Cash Working Capital

- **Formula Method**

45/365 of operating costs

- **Balance Sheet Method**

Current and accrued assets compared to current and accrued liabilities

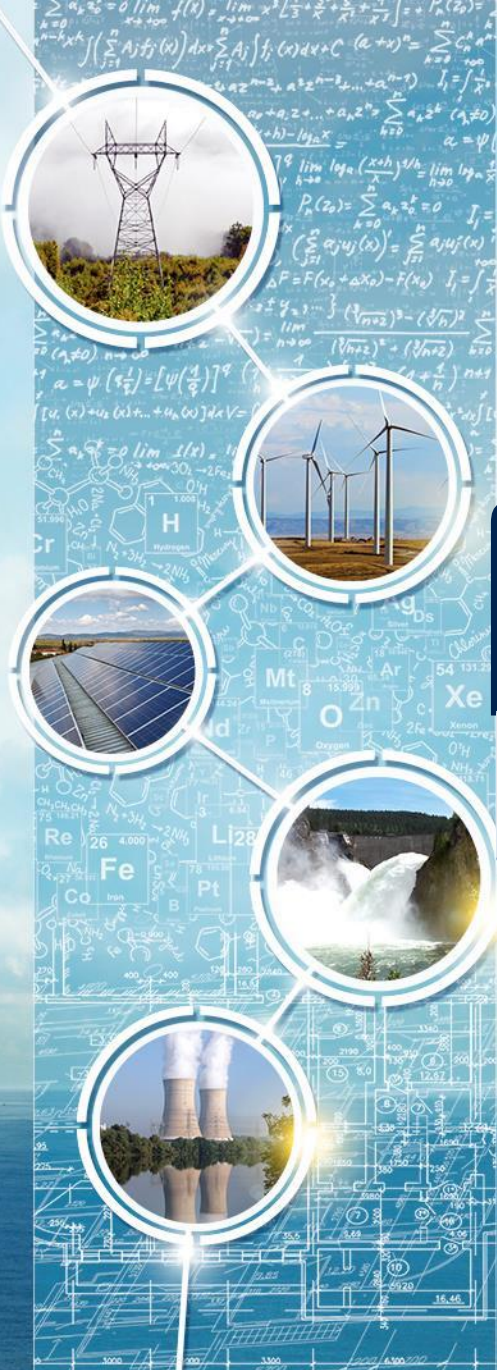
Compare rate base to the return bearing capitalization – if capitalization exceeds rate base, the difference is cash working capital – if capitalization less than rate base, difference is cost free source of capital

- **Lead-Lag Study**

Measurement of the time between a utility's out-of-pocket payment to expenses compared to the collection of revenues for a service. Result is multiplied times the average daily balance of operating expenses

Development of RAB

Work in Progress



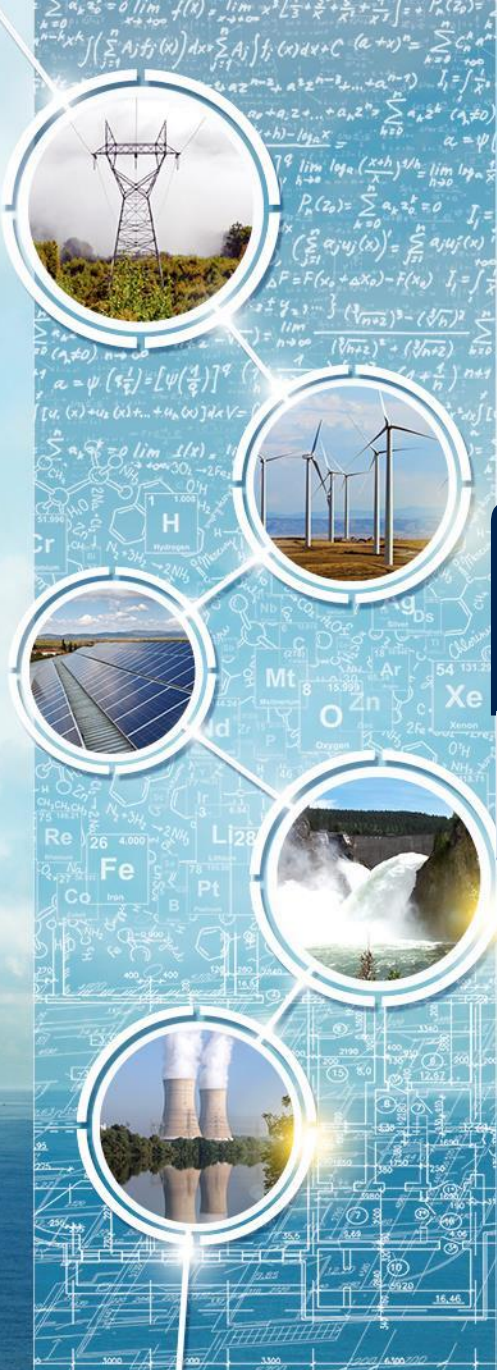
Construction Work in Progress

One view is that new capital expenditure should be introduced in the RAB on the basis of actual costs incurred up to the point at which the assets become operational. There seems little point in introducing investments to the asset base until it becomes operational as there are no customers to support associated revenues and the burden would fall to users who are, at least to that stage, not receiving any of the benefits. This raises the question of how the regulated companies should be compensated for expenditure on partially completed assets. One option is to simply add “bridging” finance costs to the eventual value of the asset. However, this may not appropriately compensate for the risks involved. Another option is to roll forward expenditures already incurred with an accumulated rate of return equal to that for operational assets to reflect final cost. The accumulated amount would be the amount added to the RAB when the assets become operational.

- Construction period is short
- Significant amount
- Investment is for regulated service

Development of RAB

Other Considerations



- **Customer Deposits**

Reduction to Rate Base or Zero Cost Capital since Customer Supplied Capital

- Customer Advances/ Contributions-in-Aid of Construction

Reduction to Rate Base since Customer Supplied Capital

- **Accumulated Deferred Income Taxes**

Balance of accumulated difference between level of taxes allowed in rates and level of taxes paid to government.

Balances caused by expense/depreciation timing differences or allowances

- **Plant Held for Future Use**

Plant that is owned and held for a future purpose, and not yet in active service.

Many regulators include in rate base if there is a definite, near-term plan for using this equipment.

- **Prepayments**

May want to use a monthly average to smooth out lumpiness

- **Materials and Supplies**

May want to keep material and supplies on monthly basis to smooth out lumpiness

Goldplating and Overcapitalization

What to watch for

- **Goldplating**

Facilities should be reliable and adequate but should not be extravagant or extreme

- **Overcapitalization**

Some theorize that utilities tend to overcapitalize in order to earn a return on that capital (Averch-Johnson effect)

Acquisition Adjustment

- Acquisition Adjustment (Goodwill)

The difference between the original cost of the plant and the purchase price.

- Case-by-case in many jurisdictions as to whether to include in rate base.
- What benefits are being received by customers due to the purchase at higher than original net book value?

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Next Step

- Capital Valuation
- Depreciation
- Cash Working Capital
- Construction Work in Progress
- Customer Deposits
- Accumulated Deferred Taxes
- Plant held for Future Use,
- Prepayments
- Material and Supplies
- Gold plating
- Overcapitalization
- Acquisition Adjustment

Thank You

ANNEXURE-4-PRESENTATION MADE TO MHPP STAFF

Regulatory Asset Base

MHPP Bhutan

October 23 2018



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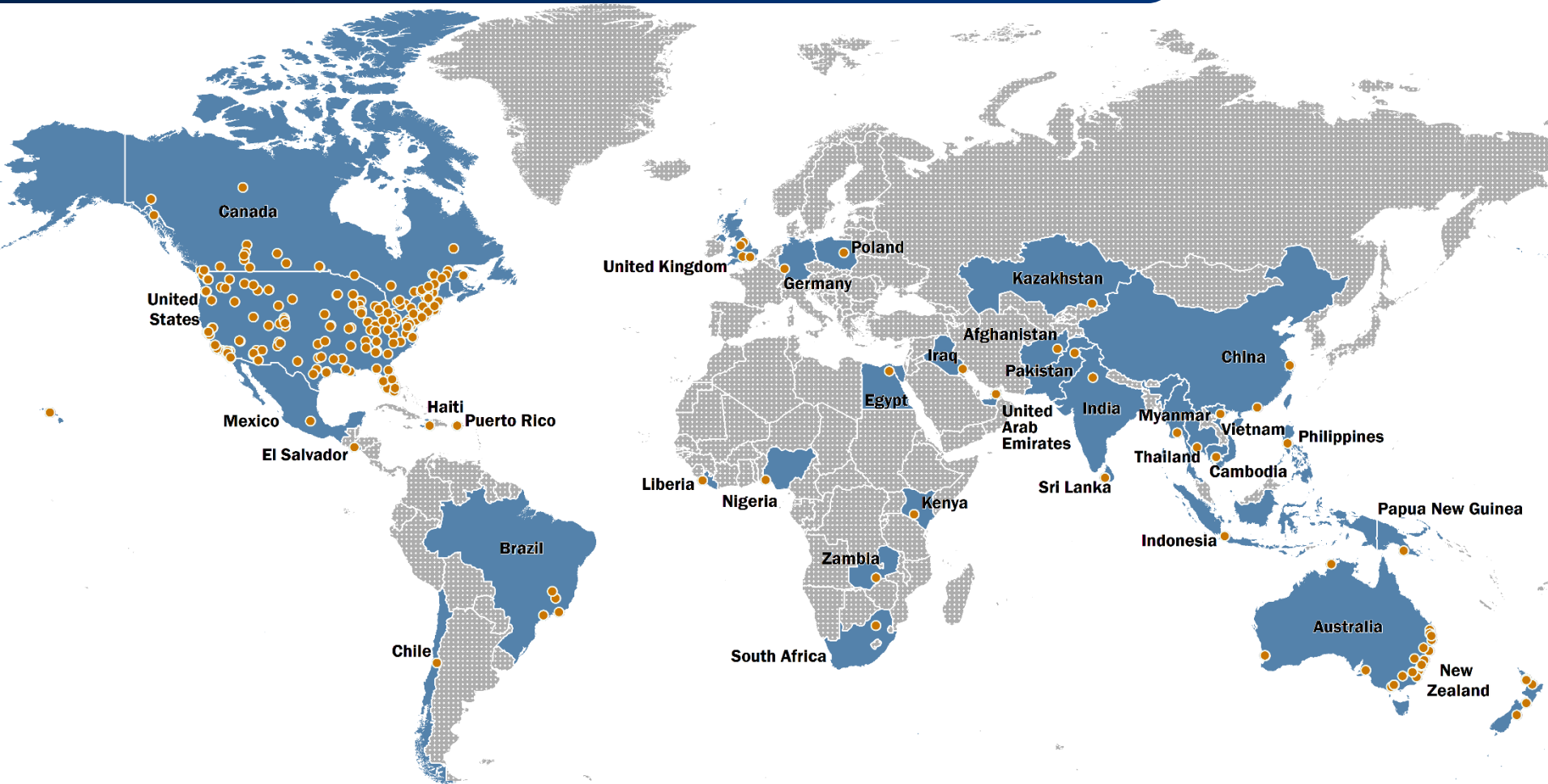
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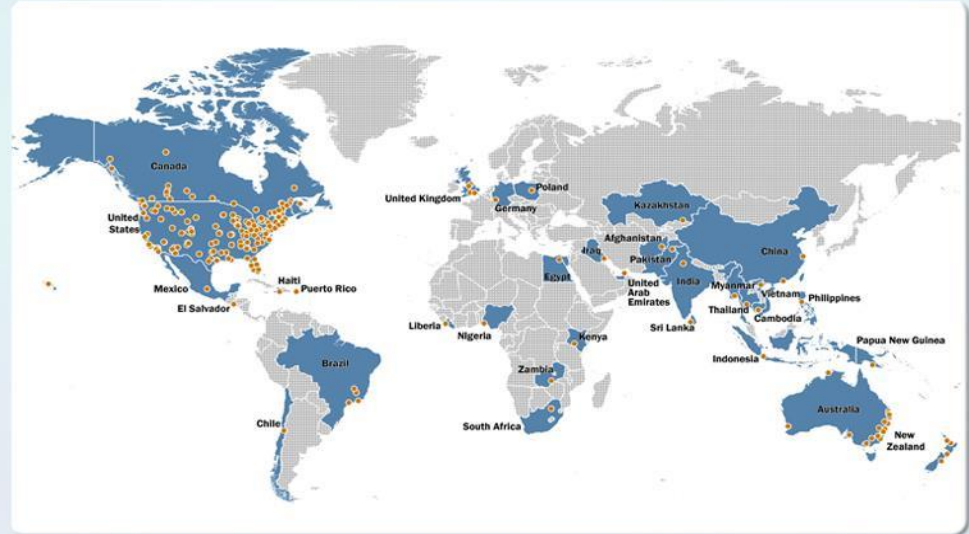
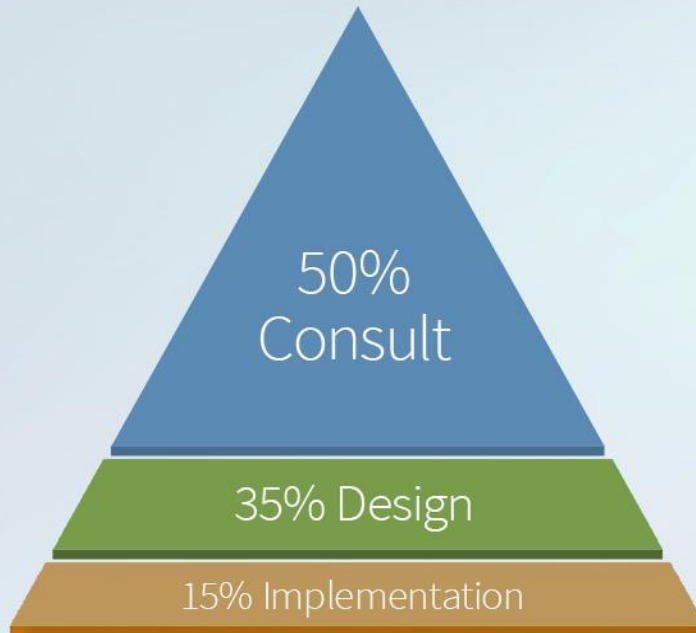
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Where,

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Non capital Cost

- O= Operational Expenses
- M= Maintenance Expenses
- A= Administrative Expenses

Capital Cost

- C= Return of Capital
- R= Return on Capital

Why Regulatory Asset Base (RAB)

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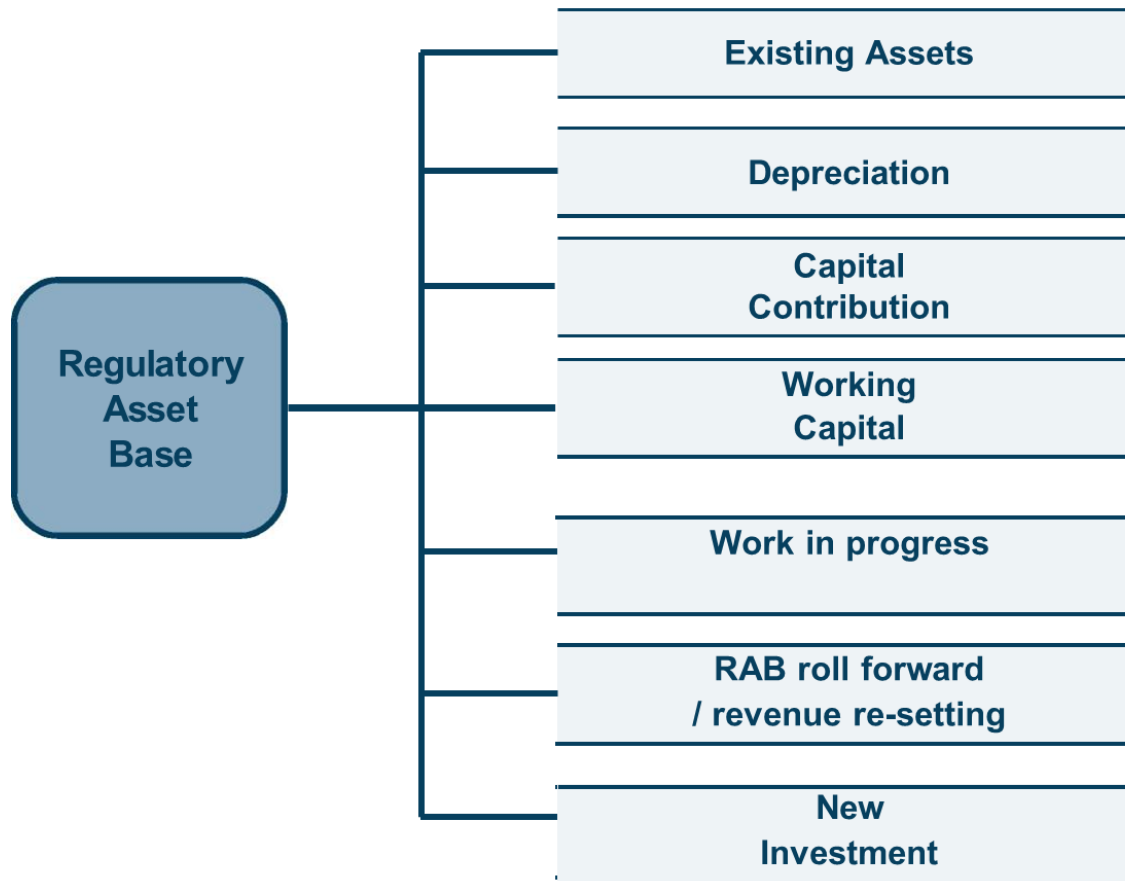
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RAB- Key Consideration

- Asset should not include which is not providing regulated services.
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Component of RAB



RAB Closing Value =
 RAB Opening Value
 + Investments
 – Depreciation
 – Asset Disposal
 +/- Change of Working
 Capital
 +/-Change of Capital
 Contribution

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Thank You

ANNEXURE-5 PRESENTATION MADE IN THE STAKEHOLDERS MEETING



TETRA TECH



Regulatory Asset Base

Stakeholders Meeting at Bhutan

October, 26 2018

Session Structure

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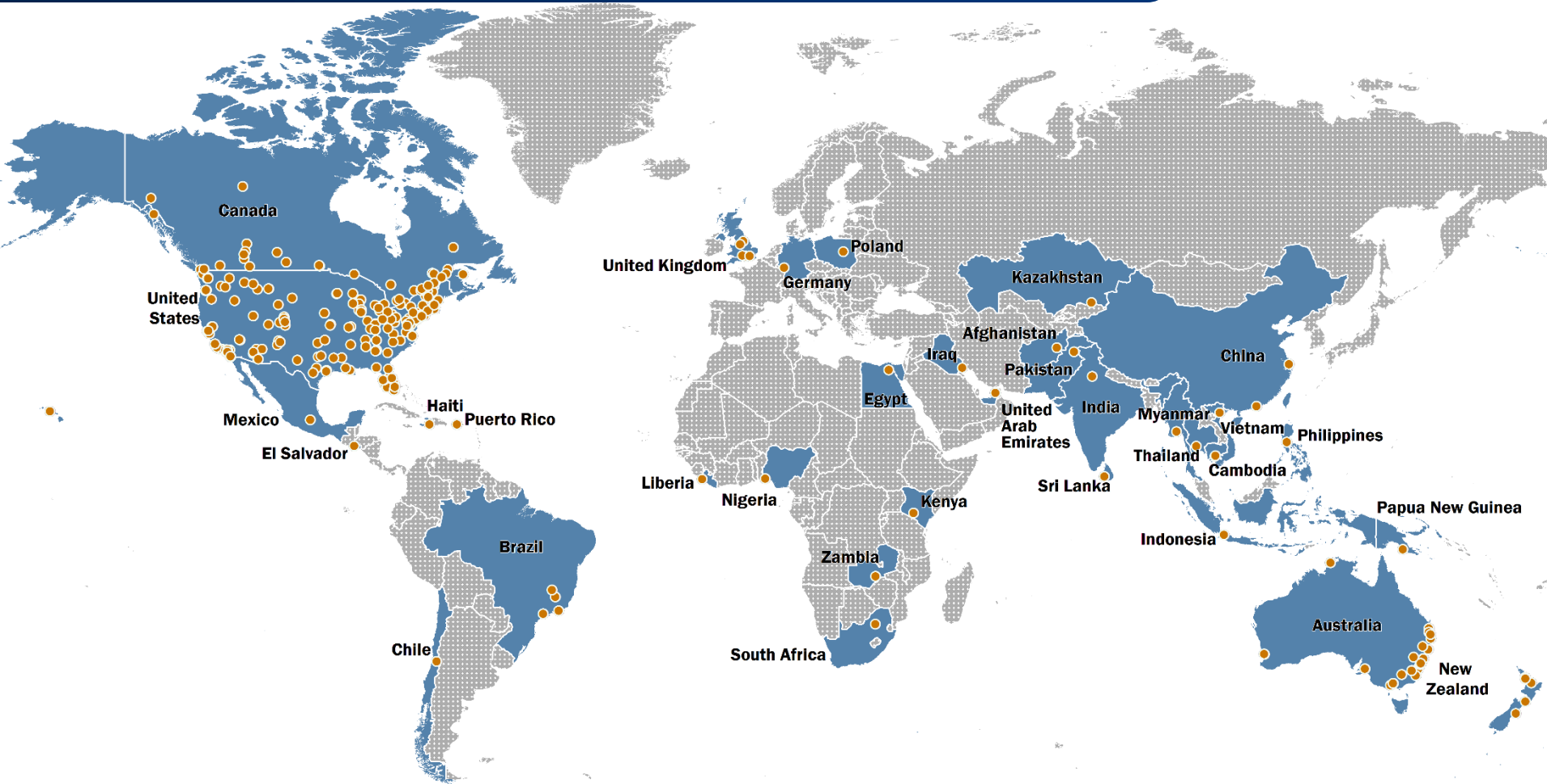
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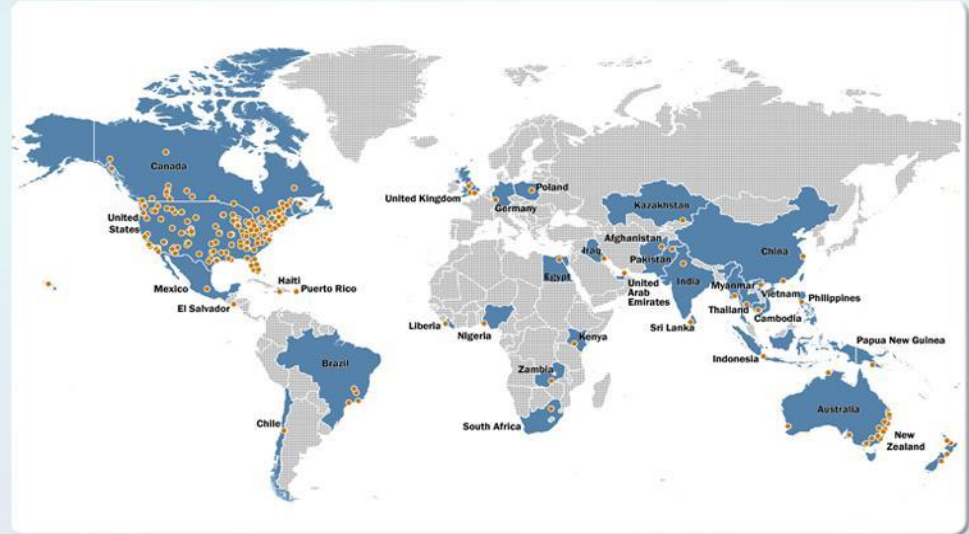
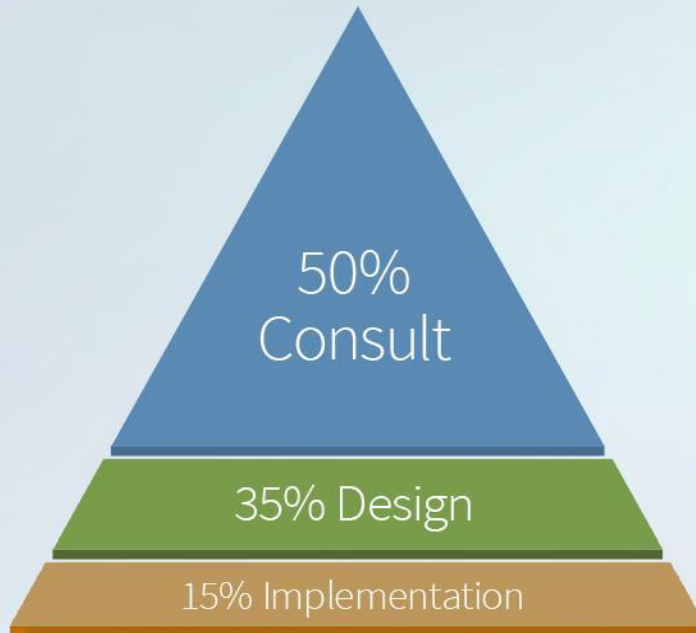
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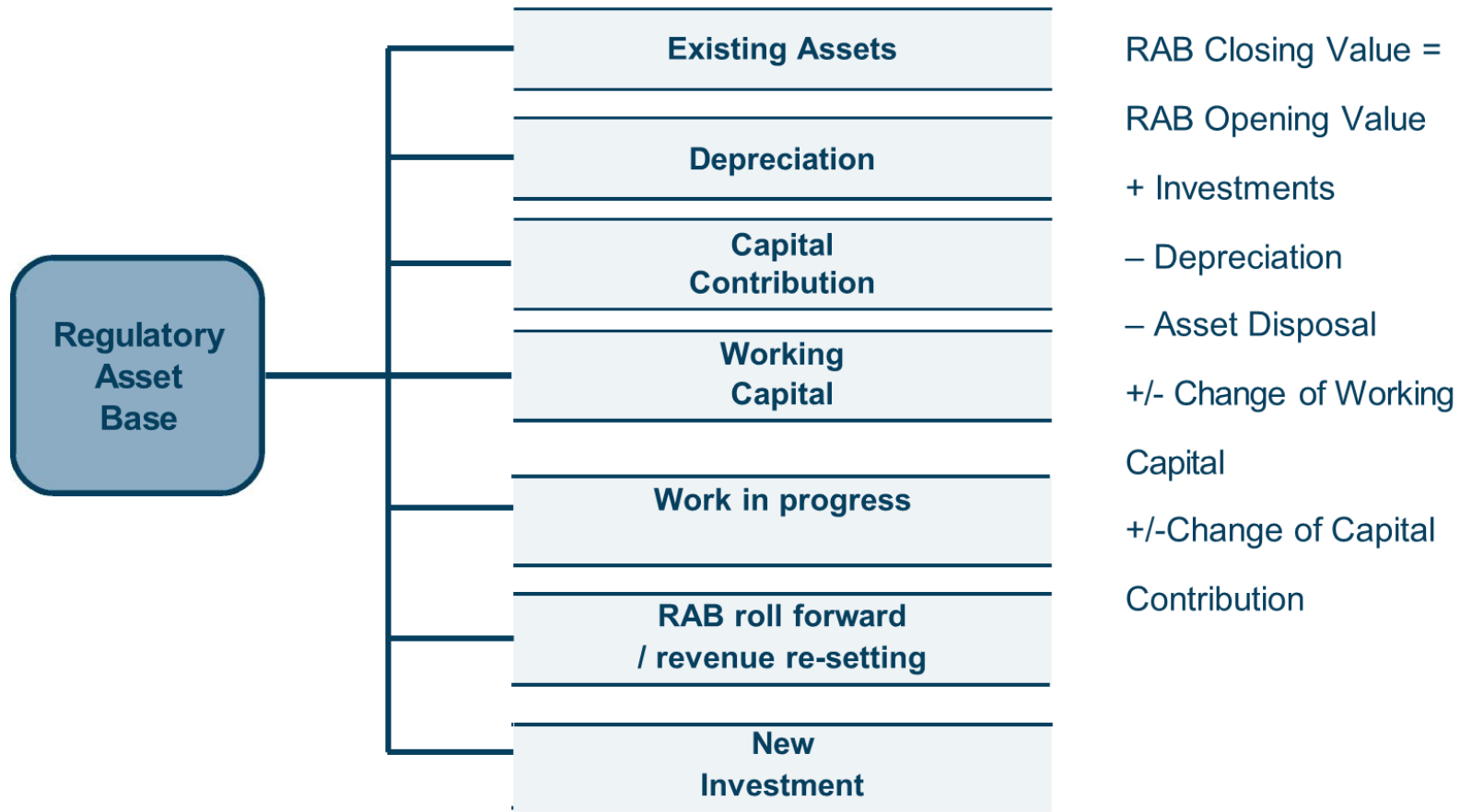


TETRA TECH

Session Structure

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Development of RAB



<http://www.leonardoenergy.org/training> module electricity market regulation

Development of RAB Asset Valuation Method

Asset Valuation Methods

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- Indexing Incentive-Reduction or control on capital expenditure
- Net Present Value-Discounted cash flow associated with each asset

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Capital Expenditure

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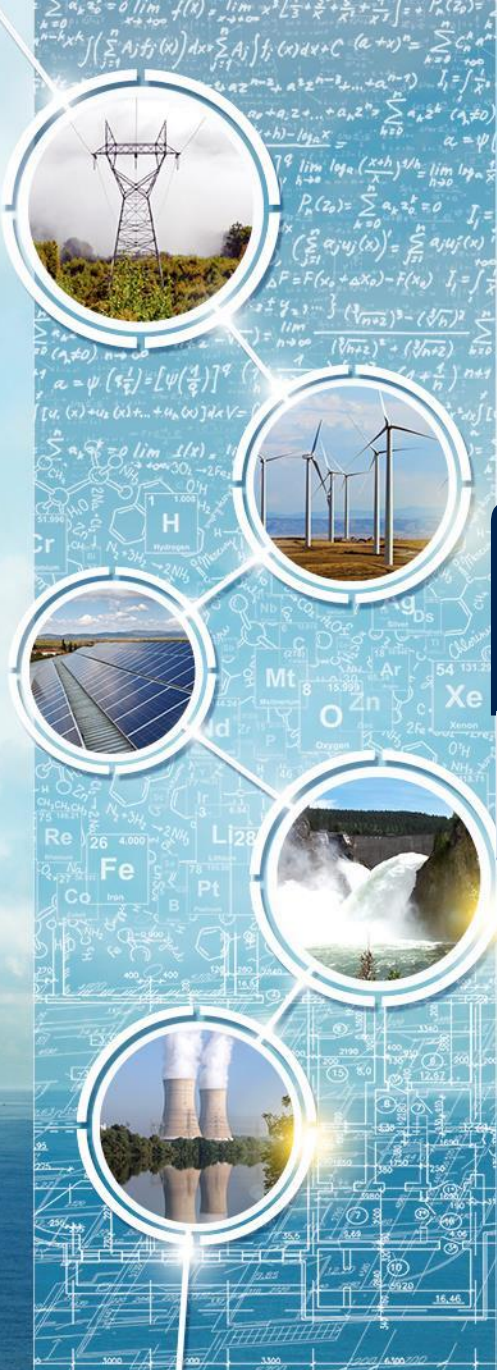
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Development of RAB

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Cash Working Capital

- **Formula Method**

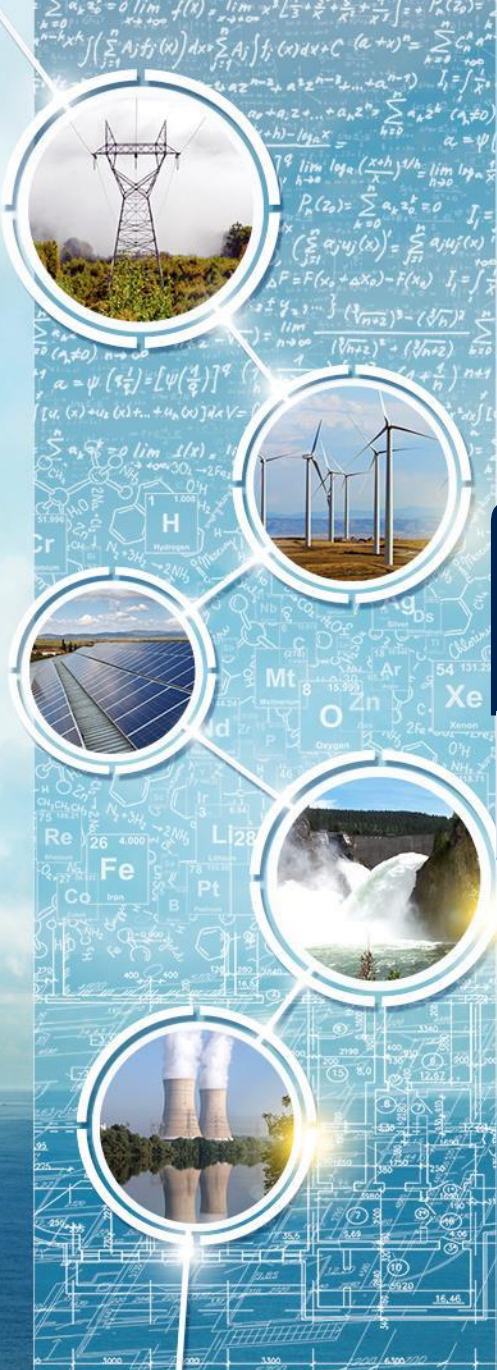
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Development of RAB

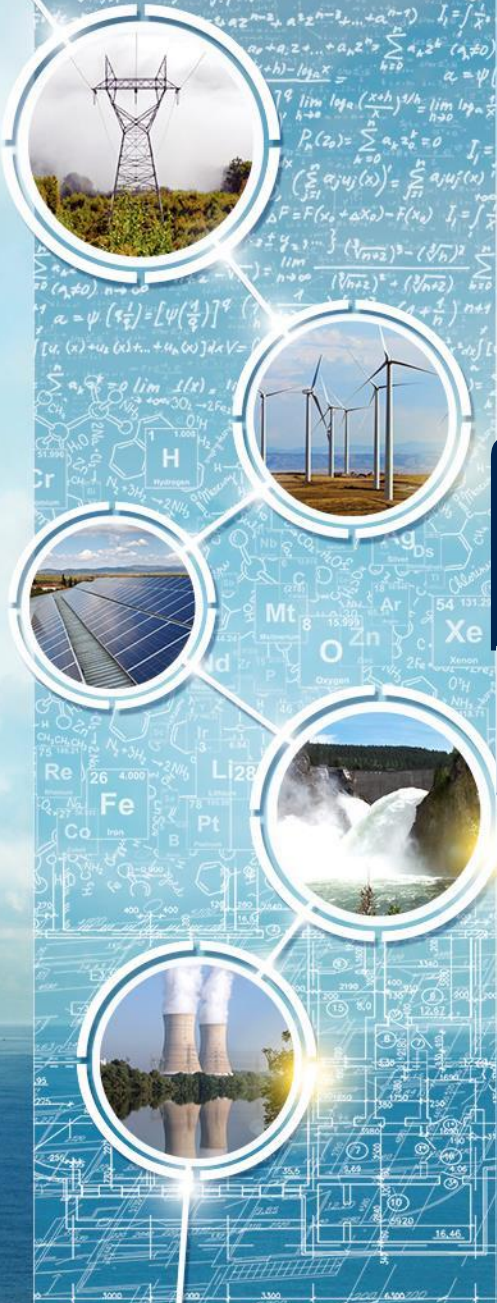
Work in Progress



Construction Work in Progress

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- Construction period is short
- Significant amount
- Investment is for regulated service



Development of RAB

Other Considerations

- **Grant from Govt. or any other Source**

Any grant or donation in cash or kind should be subtracted from the RAB

- **Asset Held for Future Use**

Plant that is owned and held for a future purpose, and not yet in active service.

Many regulators include in rate base if there is a definite, near-term plan for using this equipment.

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May want to keep material and supplies on monthly basis to smooth out lumpiness

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Thank You



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