

Methodologies and parameters used to determine the allowed revenue of gas transmission system operators (TSOs)

Stakeholder event
Brussels

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ECONOMIC
CONSULTING
ASSOCIATES

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Agenda

- ▶ **Introduction**
- ▶ **Part I: Purpose and scope of the study**
- ▶ **Part II: Study progress to date**
 - *Lunch break* -
- ▶ **Part III: Stakeholder presentations**
 - *Coffee break* -
- ▶ **Part IV: Conceptual framework
(initial thoughts)**

Introduction

Part I: Purpose and scope of the study

Part II: Study progress to date

Part III: Stakeholder presentations

Part IV: Conceptual framework

Who is ECA?

Infrastructure economic consultants specialising in energy and water

ECA provides economic consulting advice in infrastructure services for governments, regulators, and investors worldwide

20 years
in business

60+
assignments
annually

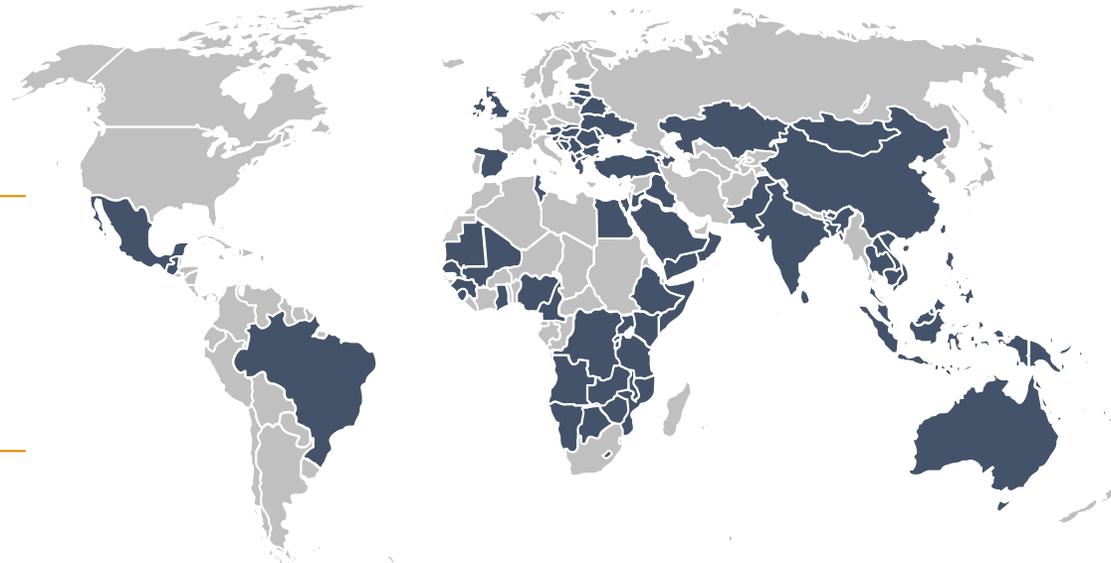
15+ years
average
experience

20
Economists

100%
Employee
owned

30+
Regulators
advised

3
Office locations

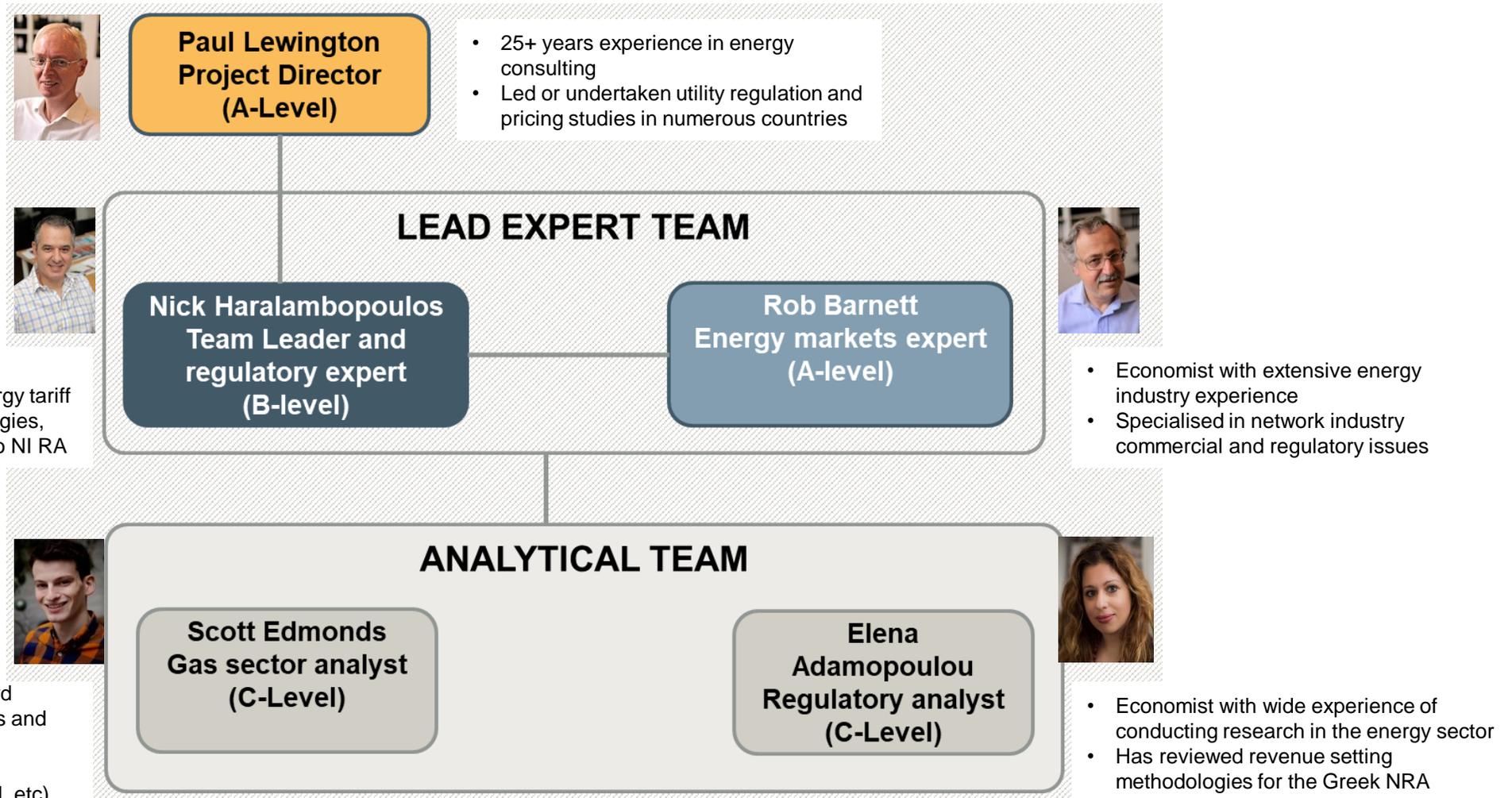


65+
Countries
worked in

15+
National utilities
advised

Who is on the study's consultancy team?

The work is being led by today's presenters, Nick and Rob



What do we wish to achieve today?

A common understanding of the study scope

► Explain study scope and tasks

- Objectives and subject matter
- Logistics
- Timeline

► Obtain stakeholder views on

- ***The study scope*** – which elements are ‘most important’ or need to be better understood? Is there anything that should be added or removed?
- ***Current practice*** – what works well, what needs improving, and why? What are the key issues from the stakeholder perspective?
- ***How to evaluate*** the relative effectiveness of different methodologies and approaches?

The study is NOT a review of the network code and will NOT consider tariff structure issues

Introduction

Part I: Purpose and scope of the study

Part II: Study progress to date

Part III: Stakeholder presentations

Part IV: Conceptual framework

Study purpose

The need for the study derives from the provisions of the Code

Our terms of reference

- ▶ “...the Contractor will undertake an assessment of **methodologies and parameters** used in EU Member States to determine the allowed or target revenue of gas transmission system operators” (emphasis added)
- ▶ The objective of the Study is to provide a **systematic analysis of the current practice** for setting the allowed or target revenue of gas Transmission System Operators (‘TSOs’) across the EU (emphasis added)

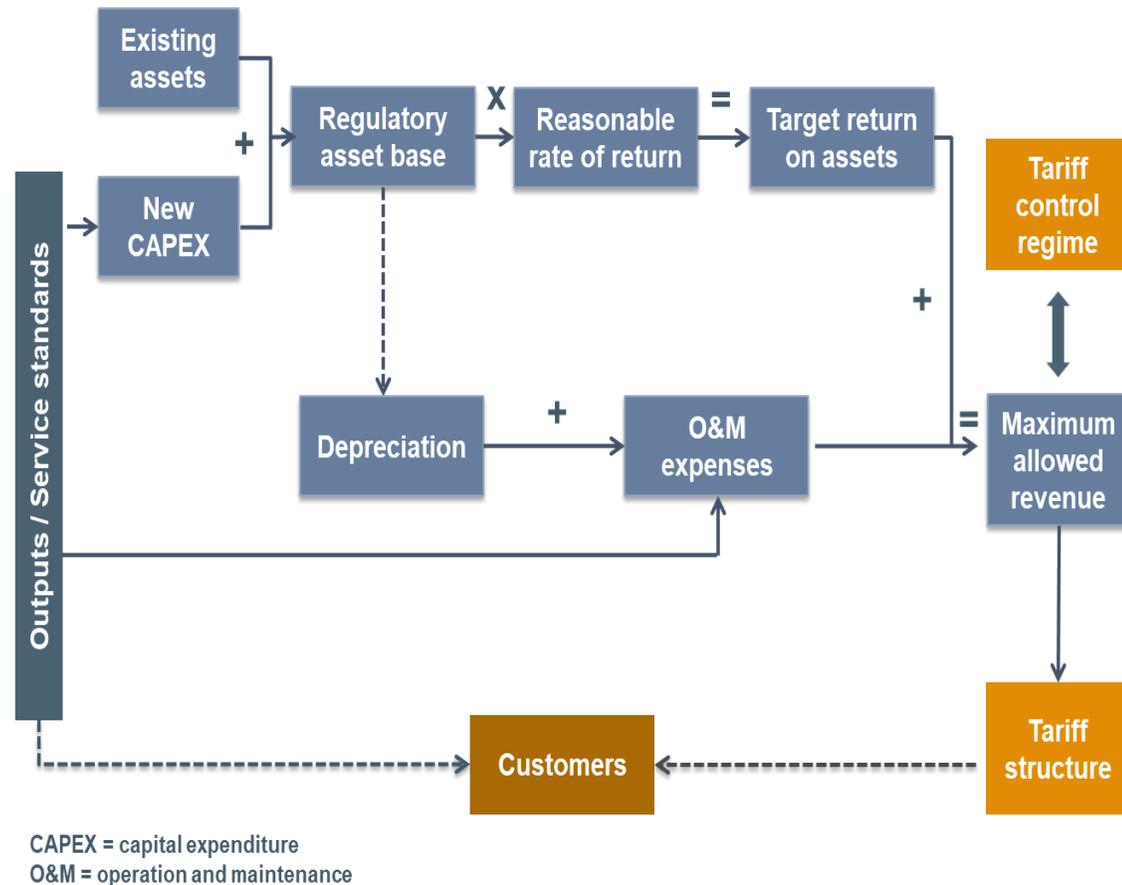
The network code

- ▶ “Before 6 April 2019, the Agency shall publish a report on the **methodologies and parameters** used to determine the allowed or target revenue of transmission system operators. The report shall be based on **at least** the parameters referred to in Article 30(1)(b)(iii).” (Article 34, emphasis added)

Article 30(1)(b)(iii) parameters

- (1) types of assets included in the **regulated asset base** and their aggregated value
- (2) **cost of capital** and its calculation methodology
- (3) **capital expenditures**, including:
 - (a) methodologies to determine the **initial value of the assets**
 - (b) methodologies to **re-evaluate the assets**
 - (c) explanations of the evolution of the value of the assets
 - (d) **depreciation** periods and amounts per asset type
- (4) **operational** expenditures
- (5) **incentive** mechanisms and **efficiency** targets
- (6) **inflation** indices

While the *broad approach* to building up the cost base is nearly *universal*, the determination and evolution of *each element* is not



- ▶ In brief, the **objective of the study** is twofold:
 - Assess **how the cost base is assembled** in the EU Member States
 - Clarify how **deviations between realised and forecast costs** are treated (the 'tariff control' regime)
- ▶ And, ultimately, **are there 'better' approaches** and room for harmonisation to facilitate internal market development?

Approach

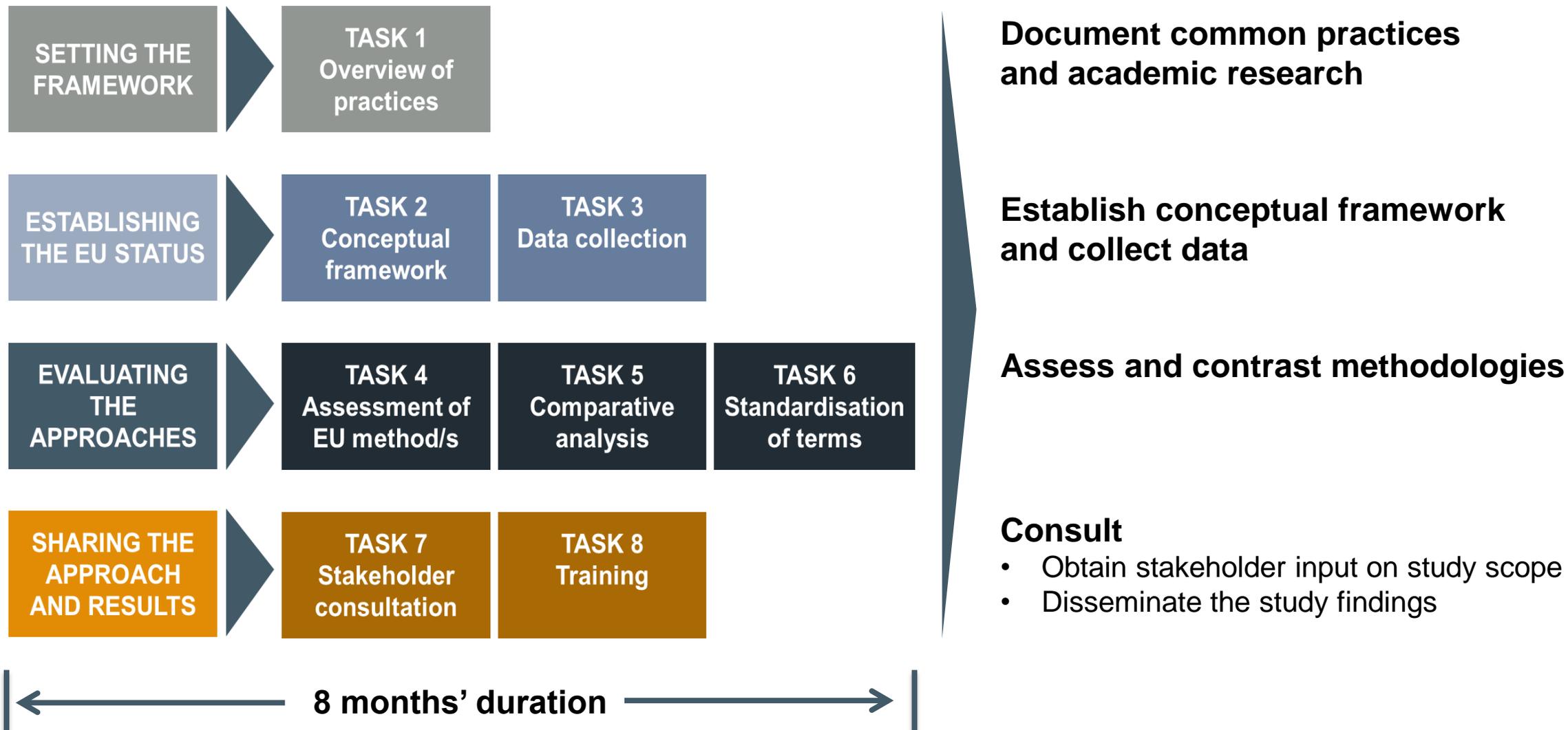
Key aims will be to establish a full dataset and a clear assessment framework

- ▶ **Comprehensive documentation** of current methodologies and approaches
 - Scope of required information (what to collect?)
 - Method of collection and presentation (how?)
 - Feed into the design of the questionnaire and reporting templates

- ▶ **Well-defined conceptual framework** for comparing and assessing the methodological approaches and regulatory practices
 - Descriptive comparison
 - Evaluation (qualitative)
 - What criteria? – certainty, incentives to pursue efficiencies, simplicity/complexity, transparency

Overview of scope

Project tasks



Study report

The report will mainly consist of two distinct but inter-related parts

Glossary, literature review, conceptual framework and questionnaire

1 Description of EU methodologies

- Structured summaries in the form of country fact sheets
- Detailed country reviews (with common headings to aid reading and comparisons)

2 Comparative analysis

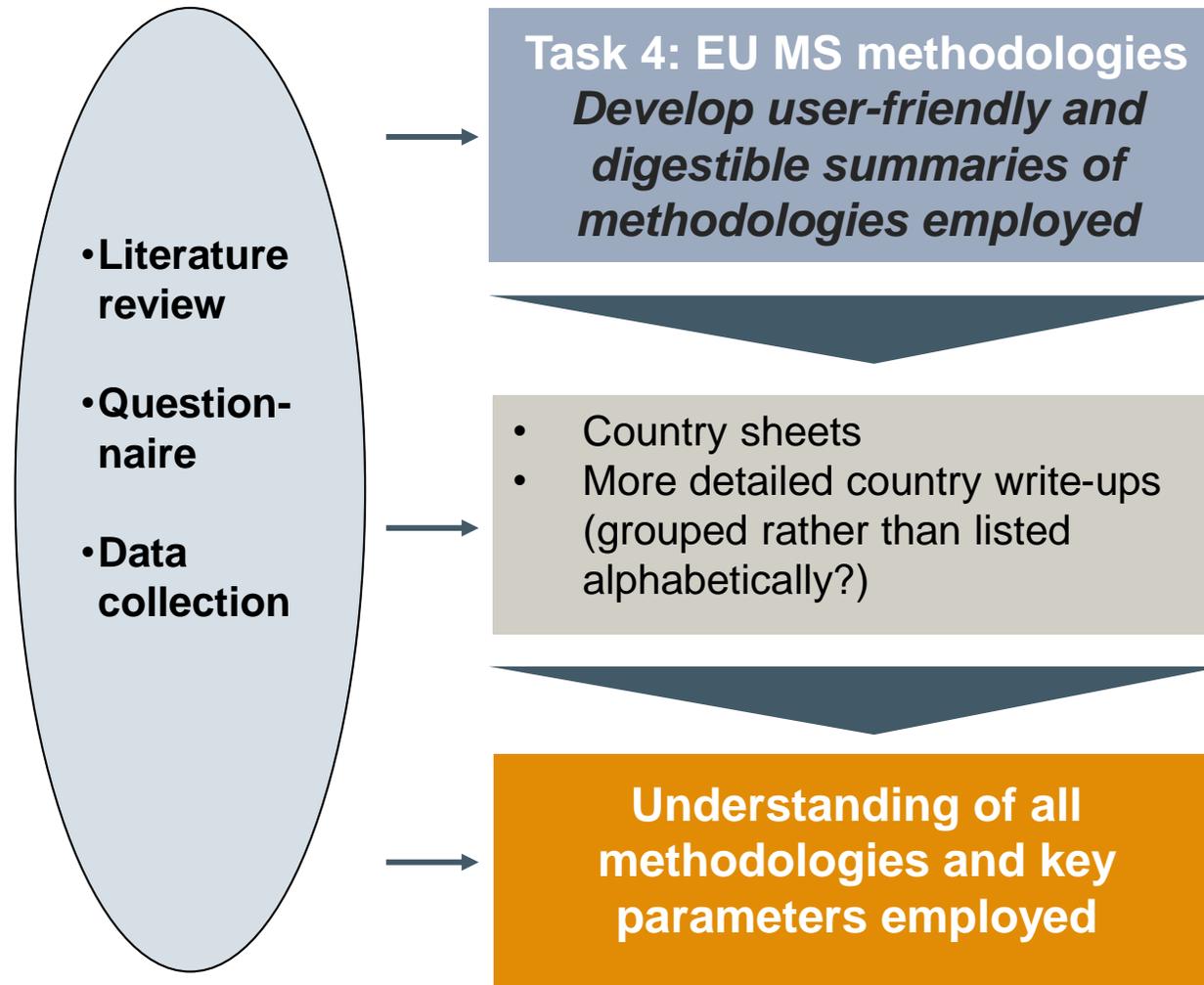
- Identification of common practices and differences
- Explanation of differences
- Evaluation of effectiveness (trade-offs)

Greater transparency and understanding of *methodologies*

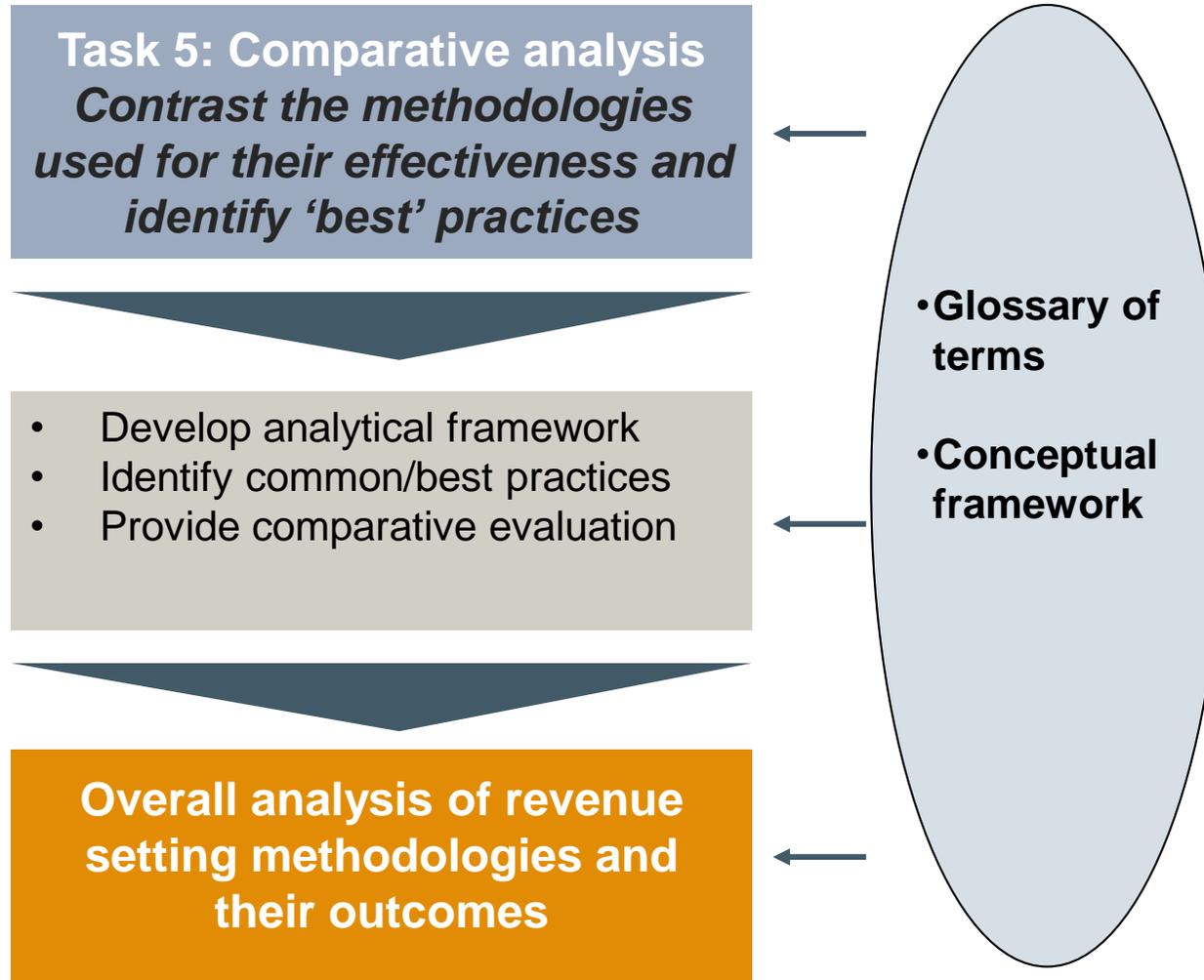
The is NOT a cost or tariff benchmarking exercise

COUNTRY NAME	
Regulatory and market framework	
<ul style="list-style-type: none"> • Name of regulator and TSO(s) • Unbundling regime - are the TSOs ownership unbundled (ITO vs ISO, etc.)? • Sector characteristics – customer demand (peak demand – number and time of year), customer mix • Network technical characteristics – pipe length, pipe capacity, transmitted volumes, average network age 	
Overall framework for setting allowed revenues	
Type of regulation	<ul style="list-style-type: none"> • Revenue cap, price cap, hybrid, pre or after-tax, real or nominal • Which inflation index is used for converting between nominal and real values?
Regulatory control period	Duration (in years)
Operating expenditure	
Setting of opex allowance	<ul style="list-style-type: none"> • Ex ante? How set (bottom-up, top-down)? Is benchmarking used? If so, what type? • Is there a distinction between controllable and uncontrollable costs (ie are there some costs that are passed through fully or partially)? • Are losses included?
Indicators	Evolution of opex over recent years (in absolute terms, as a proportion of allowed revenue)
Depreciation	
Method	Accounting vs economic, straight line, accelerated, etc?
Asset lives	Average asset lives for transmission assets by major asset grouping: <ul style="list-style-type: none"> • Pipelines • Cables, meter stations, compressors • Cables, telecom • Other
Treatment of regulatory assets	
Existing assets and valuation	<ul style="list-style-type: none"> • How was the opening asset value set? • Are the assets periodically revalued and, if so, how?
Composition of asset base	<ul style="list-style-type: none"> • Is working capital included (if so, what methodology is used)? • How are subsidies and capital contributions (if any) treated?
New investment	<ul style="list-style-type: none"> • How is new investment rolled into the RAB? When (at time of construction or when set into operation and, if the latter, are assets rolled up with interest or WACC)? • Any ex post prudency test? If so, is this limited to unforeseen capex or planned capex too? Is there a documented procedure for such reviews? Are they subject to a materiality threshold (if so, how is this set)?
Indicators	<ul style="list-style-type: none"> • Average RAB per TSO (over most recently concluded regulatory period and forecast for current regulatory period)
Capital expenditure	
Setting of capex allowance	<ul style="list-style-type: none"> • How set? Is benchmarking used (what type)?

The study is therefore largely centred on documenting *methodological* approaches in the EU...

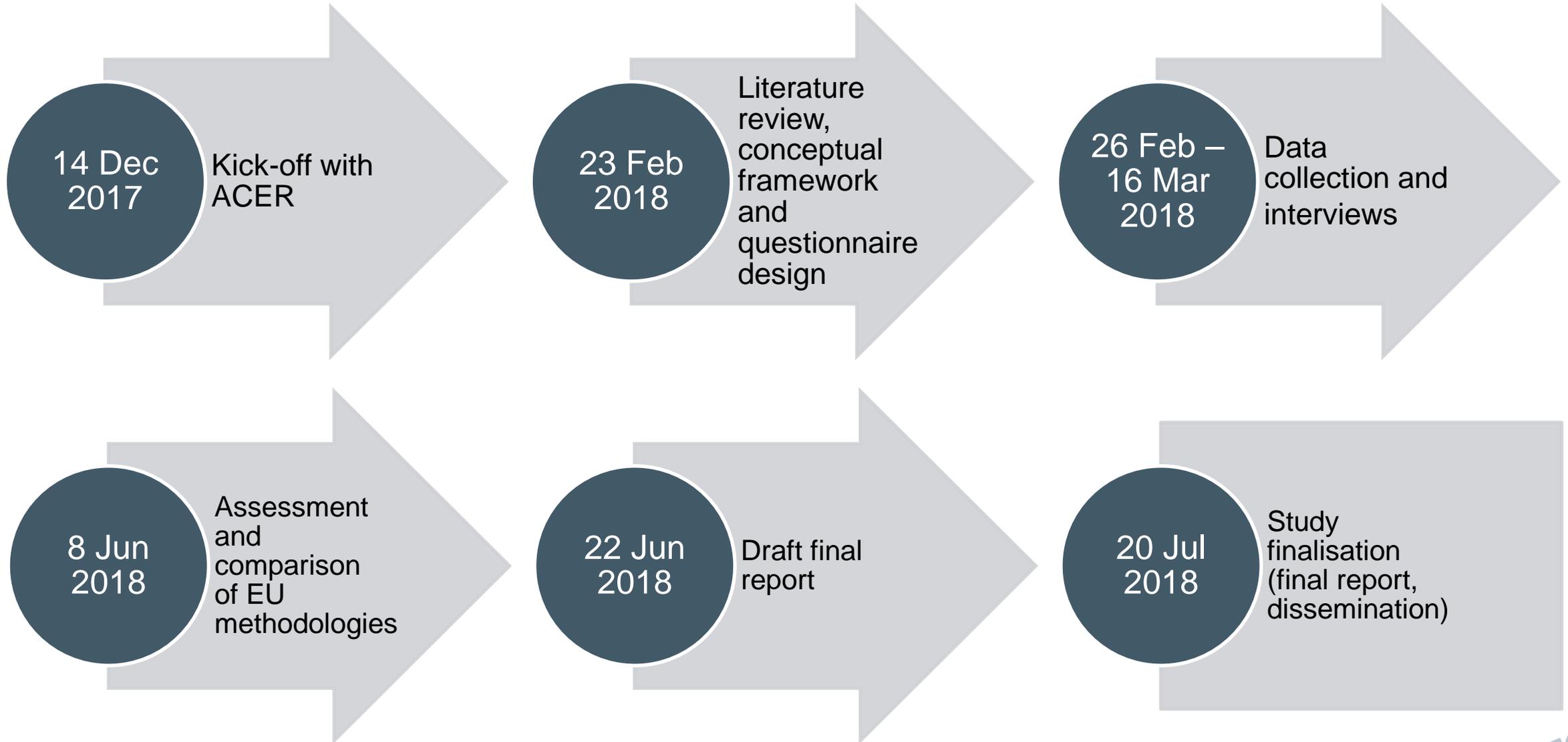


...and comparing them



Key project dates

Some interim milestones might be subject to change



Introduction

Part I: Purpose and scope of the study

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Part IV: Conceptual framework

Questionnaire / country sheets

Logistics and design

Questionnaire logistics

- ▶ ACER will provide ECA with a contact list for the NRAs/TSOs
- ▶ ECA will manage communication with NRAs/TSOs directly, but shall keep ACER informed
- ▶ The questionnaire is likely to be designed with pre-selected answer options and sent to NRAs/TSOs with a request that they provide written responses prior to the conduct of telephone meetings
- ▶ We expect that in many cases a follow-up call will be needed to clarify aspects of the methodologies employed

Questionnaire design

- ▶ Indicatively, the questionnaire is likely to consist of
 - Questions
 - Corresponding explanations
 - Pre-selected answers
 - Room for written comments
 - Potentially, a tailored section for issues that are relevant for the respective country/ NRA/ gas transmission system
 - Request for numerical parameters as established in the most recent revenue determinations

Questionnaire / country sheets

Indicative content (1/3)

Regulatory and market framework

- *Name of regulator and TSO(s)*
- *Unbundling regime - are the TSOs ownership unbundled (ITO vs ISO, etc)?*
- *Sector characteristics – customer demand (peak demand – number and time of year), customer mix*
- *Network technical characteristics – pipe length, pipe capacity, transmitted volumes, average network age*

Overall framework for setting allowed revenues

- | | |
|---------------------------|---|
| Type of regulation | <ul style="list-style-type: none">• <i>Revenue cap, price cap, rate of return, cost-plus, hybrid?</i> |
| Regulatory period | <ul style="list-style-type: none">• <i>Duration (in years)</i> |

Operating expenditure

- *Ex ante? How set (bottom-up, top-down)? Is benchmarking used? If so, what type?*
- *Is there a distinction between controllable and uncontrollable costs (ie are there some costs that are passed through fully or partially)?*
- *Are losses included?*

Capital expenditure

- *How set? Is benchmarking used (what type)?*
- *How does the capex allowance relate to system planning (ie the rolling network development plans)?*
- *Any ex post prudency test?*

Questionnaire / country sheets

Indicative content (2/3)

Regulatory asset base	
Existing assets and valuation	<ul style="list-style-type: none">• <i>How was the opening asset value set?</i>• <i>Are the assets periodically revalued and, if so, how?</i>
Composition of asset base	<ul style="list-style-type: none">• <i>Is working capital included (if so, what methodology is used)?</i>• <i>How are subsidies and capital contributions (if any) treated?</i>• <i>How is new investment rolled into the RAB? When (at time of construction or when set into operation and, if the latter, are assets rolled up with interest or WACC)?</i>

Depreciation	
Method	<i>Accounting vs economic, straight line, accelerated, etc?</i>
Asset lives	<i>Average asset lives for transmission assets by major asset grouping:</i> <ul style="list-style-type: none">• <i>Pipelines</i>• <i>Controllers, meter stations, compressors</i>• <i>SCADA, telecom</i>• <i>Other</i>

Questionnaire / country sheets

Indicative content (3/3)

Cost of capital		Revenue adjustments/ incentive mechanisms	
General	<ul style="list-style-type: none"> • <i>Pre-tax or post-tax?</i> • <i>Real or nominal?</i> 	Deviations between forecast (approved) and realised expenditure	<ul style="list-style-type: none"> • <i>How are expenditure deviations (b/w forecast and actual) treated?</i> • <i>Are these mechanisms symmetrical (ie do they apply to overspends and underspends) or asymmetrical?</i>
Cost of equity	<ul style="list-style-type: none"> • <i>What is the base methodology used - CAPM, or other methodology?</i> • <i>Are other methodologies (eg dividend growth model) used as cross-checks?</i> • <i>If CAPM, how are the risk-free rate, market risk premium and beta set?</i> 	Other incentive mechanisms	<ul style="list-style-type: none"> • <i>Are there other incentive mechanisms used? eg, for gas transmission system reliability (eg gas delivered as proportion of gas demanded), or security of supply (eg peak supply to peak demand)?</i> • <i>What about other parameters eg for accurate forecasting, for innovation, for 'strategic' investments?</i>
Cost of debt	<ul style="list-style-type: none"> • <i>How is the cost of debt set (pass-through, index, risk free rate plus debt premium, other)?</i> • <i>If market-based, what methodology/which comparators are used?</i> 		
Gearing	<ul style="list-style-type: none"> • <i>Is actual or notional gearing used?</i> 		

Literature review

Overview

▶ **Number and nature of documents**

- 20-30 documents (so far)
- Journal articles, books, research papers, reports (consultants and regulators), reference guides

▶ **Authors**

- Academics, consultants, regulators

▶ **Geographical coverage**

- No restriction – EU MSs, Australia, Canada, Japan, New Zealand, Norway, USA

▶ **Multi-utility scope**

- Gas, electricity, water
- Airports, post, rail, telecoms

▶ The review is largely grouped around the Code themes ie

- 1. Calculation of **allowed revenue**
- 2. Determining the **opening asset base**
- 3. Assessing efficient **financing costs**
- 4. Determining efficient **investment costs**
- 5. Setting efficient **operating costs**
- *(Use of **revenue adjustments and incentives**)*

▶ But, there could be other themes too, eg

- Regulatory vs commercial services
- Incremental capacity and economic test

▶ Attempt to include the **views of practitioners and stakeholders** on these issues and approaches, and suggestions aimed at addressing perceived weaknesses

1. Calculation of allowed revenue

What are allowed revenues?

$$\text{Allowed revenues} = \text{Allowed Costs} + \text{Allowed Profits}$$

Allowed costs may include

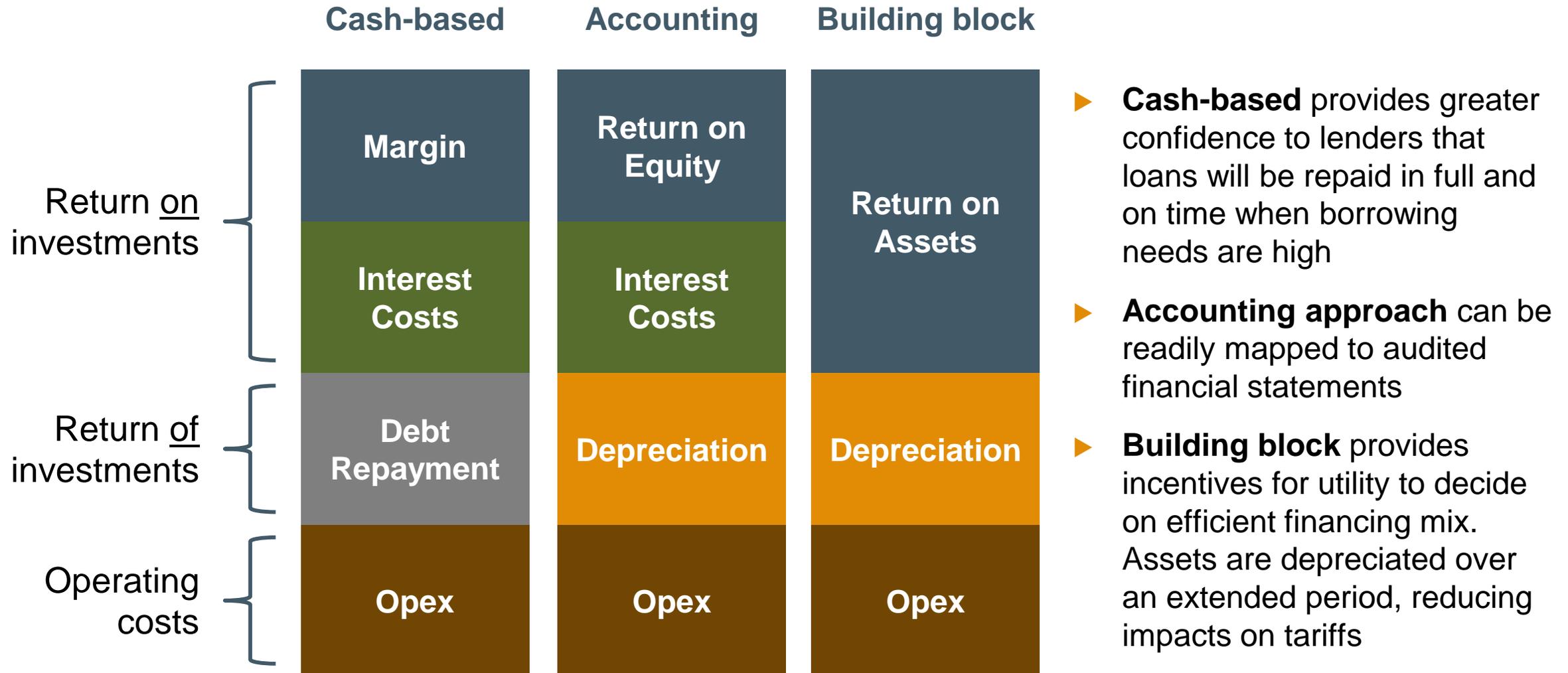
- ▶ Operating and maintenance expenditures ('opex' or 'O&M')
- ▶ Interest costs
- ▶ Loan repayment
- ▶ Charge for the 'consumption' of assets (depreciation)

Allowed profits may include

- ▶ Return on equity / capital employed
- ▶ Return on assets

1. Calculation of allowed revenue

There are alternative definitions, which then interlink with other parameters



1. Calculation of allowed revenue

The basic regulatory models for setting and adjusting allowed revenues

Cost-plus

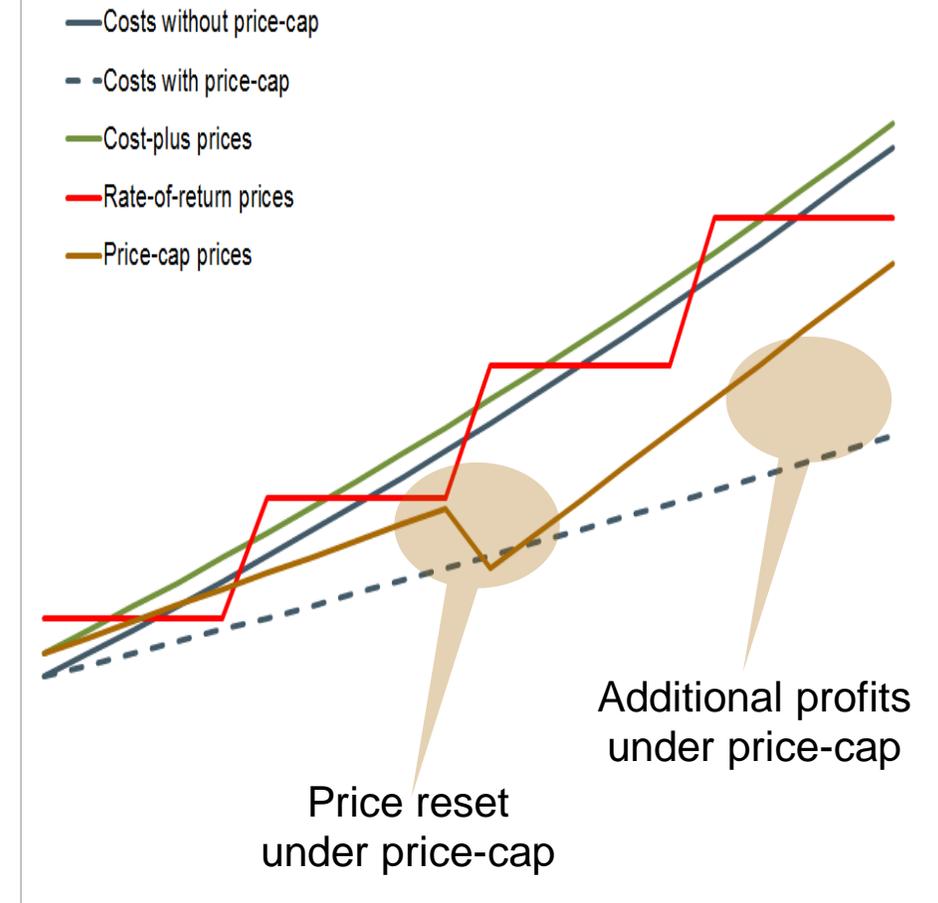
- Revenue is set equal to **historical** costs
- Revenues are **adjusted frequently** (eg annually) to equal actual costs

Rate of return

- Revenue is set equal to **historical** costs
- Revenues are **reset at irregular intervals**, as required, to maintain a reasonable allowed return

Price / revenue caps (incentive based)

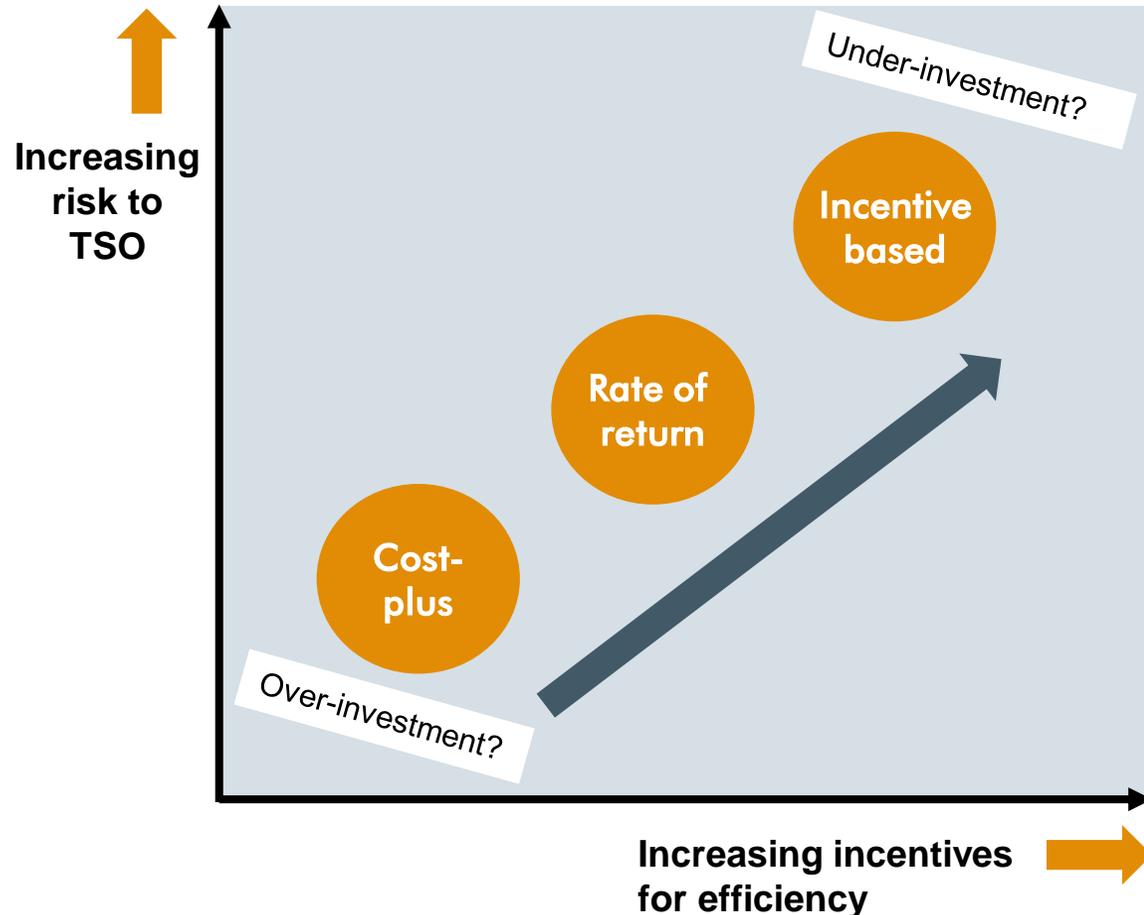
- Revenue is set equal to **forecast** costs
- Revenues are **reset at regular multi-year intervals**



The dividing lines are sometimes obscure and regulatory regimes can be characterised by a combination of models (eg hybrid schemes with RoR for investment costs and caps for opex)

1. Calculation of allowed revenue

Comparing the regulatory models



Moving to price / revenue caps

- ▶ Advantages
 - Strong incentives to improve efficiency and reduce costs
 - Greater predictability in pricing
- ▶ Disadvantages
 - Creates incentives to under-invest, potentially leading to falling quality
 - Regulated entities can make 'excess' profits for extended periods

1. Calculation of allowed revenue

What models do countries apply and why?

- ▶ The **regulatory spectrum** is even wider than described above
 - Price cap? Cost-plus? Rate of return? Revenue cap? Sliding scale? Yardstick? Menu regulation? NPV?
- ▶ **None** of these is generally applied **in their pure form**
 - Most (all?) countries sit somewhere on a spectrum
- ▶ Most countries **shift over time**
- ▶ Many **fail to explicitly align** their choice of regulation type **with their objectives**
 - How should then one assess the different approaches?

- ▶ So **what dictates the choice** of regulatory model?
 - Historical reasons
 - Legal constraints
 - Perceptions of risk and data reliability
 - Political acceptance of temporary mismatches between costs and prices
 - Relative importance placed on cost-recovery as against efficiency incentives
- ▶ In the EU, **revenue cap/incentive schemes appear to be the most prevalent in gas transmission** although combined RoR and price cap regimes are used in a few countries, while cost-plus and RoR are observed in one or two instances

2. Determining the opening asset base

Converting investment costs to allowed revenues

Regulatory Asset Base (RAB)

$$\begin{aligned} & \text{Opening RAB} \\ + & \text{ Approved additions} \\ & \text{(capital expenditure or commissioned assets)} \\ - & \text{ Depreciation} \\ - & \text{ Disposals} \\ = & \text{ Closing RAB} \end{aligned}$$

Capital costs included in the allowed revenues are

$$\text{Depreciation} + (\text{Cost of Capital} * \text{RAB})$$

Work-in-Progress (WIP) and working capital may or may not be included in the RAB

How to value the opening asset base?

- ▶ Most commonly, the choice is between valuing at historical cost and current cost
- ▶ **Historical cost** accounting
 - Value at the price paid for the assets (or approved at the time) when commissioned
- ▶ **Current cost** accounting
 - Value at the current cost of purchasing the assets, ignoring their historical cost
- ▶ **Other concepts**
 - Economic value
 - Deprival value
- ▶ **Mixed methods** also used in some instances

2. Determining the opening asset base

Two fundamentally different views of what the RAB represents



Historical costs

- ▶ Investors should recover and customers should pay the actual costs of the investment made
- ▶ This is represented by the historical cost of purchasing or constructing the assets



Current costs

- ▶ Economic efficiency requires that customers pay the costs of providing the service at this point in time
- ▶ Rapid cost and technology changes mean that historical costs of assets are a poor guide to their current costs



Historical cost accounting (with no indexation) is used in a minority of EU countries for gas transmission regulation



Which method?

- *Inflation indexation*
- *Replacement cost*
- *Modern equivalent asset*
- *Optimised replacement cost*

2. Determining the opening asset base

Setting the depreciation profile

- ▶ From a regulator's perspective, the depreciation allowance has two purposes
 - **Efficiency:** reflect the cost of consuming assets
 - Implies using the technical life
 - **Financeability:** generate sufficient cash to service debts
 - Implies using lives close to the term of loans used to fund the assets

- ▶ These may **conflict** with each other
 - Technical lives of assets can be very long
 - For many network assets, lives may be 40+ years
 - This is much longer than the term of most loans that will be available
 - Therefore, avoiding financial difficulties requires either shortening the asset life or increasing the use of equity financing

Other practical issues to consider too:

- ▶ *Depreciation method (straight line, declining balance, units-of-activity)*
- ▶ *Use of actual or forecast depreciation for rolling forward the asset base (affects incentives)*
- ▶ *Reconciliation with statutory accounts and interaction with other regulatory aspects (eg capital expenditure efficiency factors and prudence tests)*

3. Assessing efficient financing costs

What is the cost of capital?

General definition

- ▶ The cost of capital represents how much a utility needs to earn to pay its investors (shareholders and lenders)
- ▶ The **cost of equity cannot be directly measured**
 - Instead, it must be estimated from evidence of the returns earned by investors
- ▶ There is a close **correlation between risk and the cost of capital**
 - The more risky an investment is, the higher the return that investors will require to compensate for this risk

Equity versus debt financing

- ▶ **Equity**
 - Residual claim on the company's assets
 - Higher-risk and, therefore, higher cost
 - Requires up-front cash injections
- ▶ **Debt**
 - Higher priority for repayment than equity
 - Lower-risk and, therefore, lower financing cost
 - Tax advantages (interest is tax-deductible)
 - Creates risk of financial distress - temporary liquidity crises can lead to insolvency

3. Assessing efficient financing costs

The components of the cost of capital

$$WACC = g * R_{debt} + (1 - g) * R_{equity}$$

- ▶ Usually (but not always) expressed using the **weighted average cost of capital (WACC)**
 - An alternative is to multiply the cost of debt by the value of debt and the cost of equity by the value of equity (equivalent result)
- ▶ **Premiums** are sometimes applied to WACC to incentivise specific investments
- ▶ **Financeability** checks can ensure investments are feasible given WACC
- ▶ WACC is heavily **influenced by the regulatory regime** in place

- ▶ **What is the appropriate gearing to use?**
 - **Actual** - simple and transparent, allows recovery of historical financing costs
 - **Marginal** - ensures new investments can be financed, matches financing covenants
 - **Notional** - encourages efficient financing decisions
- ▶ **What is the cost of debt?**
 - **Embedded** (actual) interest costs eg Germany and Belgium - less risk but lower incentive to optimise financial structure
 - **Ex-ante notional cost** of debt eg Netherlands and France - greater incentive to optimise financial structure but more risk for TSO
 - **Intermediate** where the cost of debt is indexed to market values eg Britain

3. Assessing efficient financing costs

There is no consensus around how to estimate the cost of equity

The cost of equity is a 'known unknowable'

Many models are used, but none is perfect

- ▶ Capital Asset Pricing Model (CAPM)
- ▶ Dividend Growth Model (DGM)
- ▶ Multi-Factor Models
- ▶ Surveys of investors and analysts

CAPM is the most widely used model

- ▶ Conforms to efficient financial markets and so the most theoretically justifiable
- ▶ Widely used by regulators outside the USA (which prefers DGM)
- ▶ Not clear that other models have better predictive power
- ▶ The alternative models do not solve the fundamental problem of having to deal with limited market data

While the CAPM model is generally accepted, there is no consensus around input values - many hundreds of pages of expert analysis can be written at each price review in countries such as Australia or the UK (the final decision document alone on WACC for the 2015-2018 period by the Australian Energy Regulator for TransGrid ran to 549 pages!)

3. Assessing efficient financing costs

How does the Capital Asset Pricing Model work?

- ▶ The fundamental insight of the CAPM is that the return on any individual stock can be explained by just two components
 - **Market Risk Premium (MRP)** – the additional return required by an investor holding a representative portfolio of all firms in the economy over the risk-free rate
 - **Equity Beta (β_e)** – the non-diversifiable risk of an individual firm relative to that of the portfolio
- ▶ The MRP and β_e are generally estimated using stock markets as a proxy for practical reasons of obtaining data

$$R_e = R_f + \beta_e * MRP$$

R_f Risk-free rate

β_e Equity beta

MRP Market Risk Premium

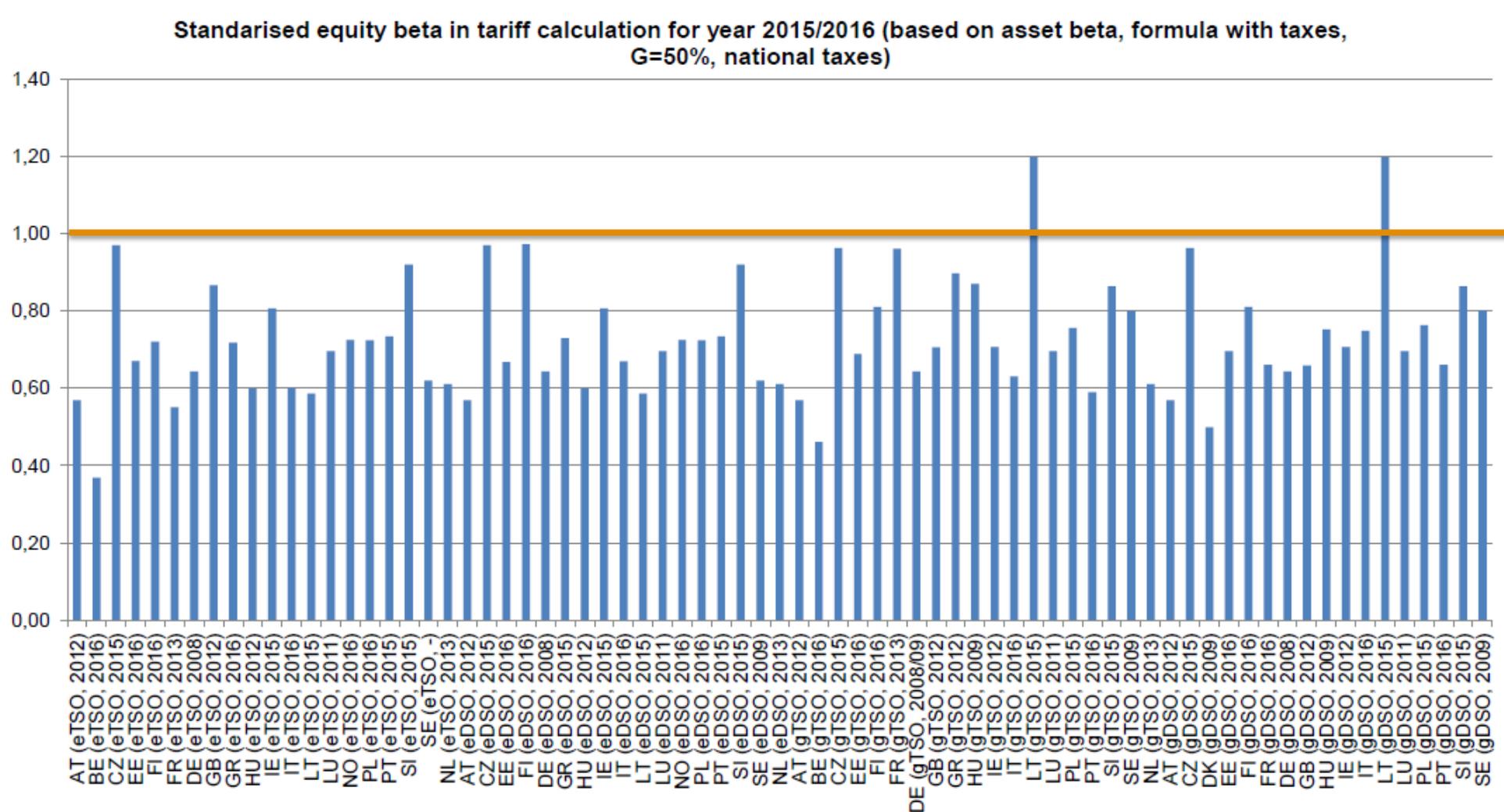
A beta of 1.0 implies the company's returns are as volatile (risky) as those of the entire market.

A beta of <1.0 implies less volatile returns

A beta >1.0 implies more volatile returns (eg, tech companies)

3. Assessing efficient financing costs

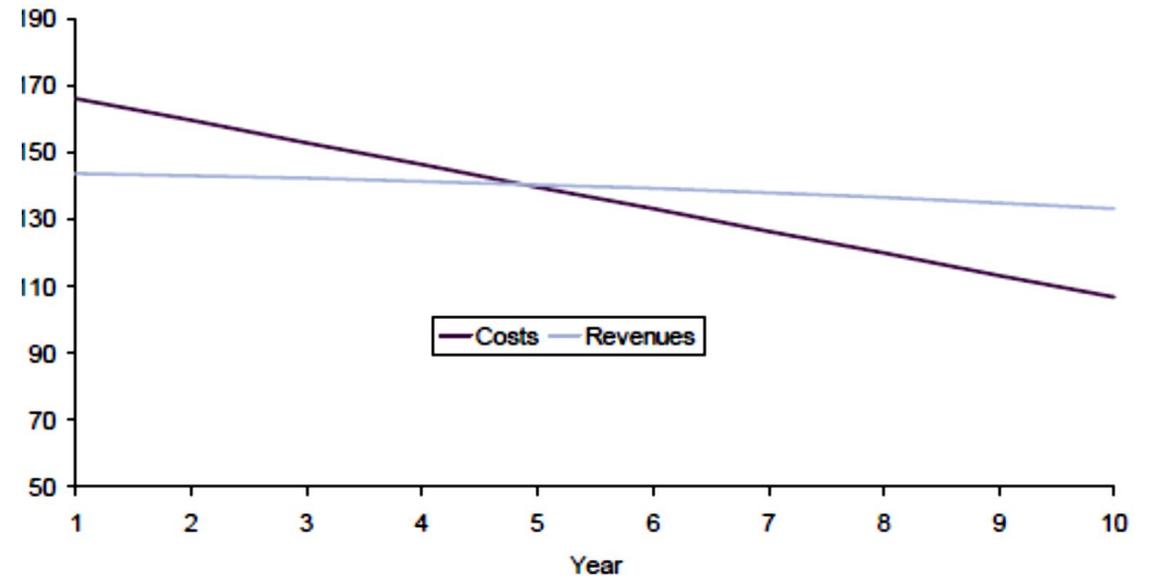
For regulated utilities, consensus appears to be that the β_e is generally <1.0



3. Assessing efficient financing costs

Real or nominal WACC?

- ▶ The key is to be **consistent** — ensuring that the utility is compensated for inflation but is only compensated once
 - If the asset base is **indexed** to inflation, then the WACC should be set in **real** terms
 - If the asset base is calculated using **historical/** nominal costs, then the WACC should be in **nominal** terms
- ▶ **Question: are both approaches equivalent?**
 - Debt is paid in nominal terms with no indexation of the principal – this means interest costs have a ‘front-end loaded’ profile
 - A real regime, results in a ‘back-end loaded’ profile – hence, the need in such regimes (eg UK) for financeability tests



- So, using indexing and real WACC may exacerbate the **difference between costs being incurred and revenues provided**
- On the other hand, depreciation is constant (assuming straight-line method), **so today's and tomorrow's customers pay an equal amount** for the asset

3. Assessing efficient financing costs

Pre-tax, post-tax or vanilla?

- ▶ Pre-tax is simpler to calculate but may create perverse incentives to minimise tax payments
- ▶ Post-tax or vanilla is more appropriate for managing uncertainty over tax (set explicit value and adjust for differences from actuals)

What's best?

It all depends...

- ▶ Use post-tax where interest rates or other variables are uncertain
- ▶ Can use pre-tax in other cases

Approach	WACC formula	Tax allowance in revenues
Pre-tax	$R_d + R_e / (1 - t)$	None
'Vanilla'	$R_d + R_e$	Calculated tax on profits (taking account of deductibility of interest costs)
Post-tax	$R_d * (1 - t) + R_e$	'Debt shield' accounted for in WACC, so no further tax deductibility assumed (to avoid double-counting)

4. Determining efficient investment costs

How to regulate investment costs?

Ex-ante review and approval of need and costs

- ▶ Greater certainty as it is known in advance whether the investment will be approved and what cost will be allowed
- ▶ Increases lead time to make investments and tends to result in rigid investment plans
- ▶ Risk to utility if unexpected cost increases during construction

Ex-post review and approval of need and costs

- ▶ Allows for quicker investment decisions and more flexibility in investment planning
- ▶ Increases risks to utilities as regulators may disallow recovery of investments that are already made
- ▶ Allows changes in costs outside the utility's control to be incorporated

Output-based regulation

- ▶ Set quality of service targets
- ▶ Penalise/reward utilities where service quality falls below/exceeds the target values
- ▶ Set penalty/reward rates equal to the value placed on service quality by customers
- ▶ The utility makes the decision on when and how much to invest to deliver the quality of service that customers want
- ▶ Significant practical problems
 - Under-investment now only reveals itself as low service quality many years into the future
 - There is no easy way of measuring the value that customers place on service quality
 - The values placed on service quality will differ between customers

4. Determining efficient investment costs

Evaluating investment *needs* requires an understanding of objectives

Long term system security

- Ensuring sufficient transmission capacity

System reliability and performance

- Medium- and short-term system development and operation

Customer connections

- Responding to connection requests

Safety

- Compliance with safety legislation

Environment

- Compliance with environmental legislation

4. Determining efficient investment costs

Assessing investment costs requires an understanding of cost drivers

Refurbishment and replacement	Network extension and reinforcement	New connections	Other capital expenditure
<ul style="list-style-type: none">• Incurred to address the deterioration of existing assets• Related to (or can be substituted by) maintenance opex, hence there may be trade-offs• Reasonableness assessed by:<ul style="list-style-type: none">○ Condition and risk assessments○ Comparison of forecast with historical○ Project and engineering reviews	<ul style="list-style-type: none">• Required to address changes in demand or to maintain and/or improve quality, reliability and SoS• Assessment typically involves<ul style="list-style-type: none">○ Examining the project governance framework○ Investigating the methodology, assumptions, inputs and calculations for projecting demand○ Examining the relationship between the demand forecasts and the proposed investment projects	<ul style="list-style-type: none">• Usually, very specific to the needs of the particular industrial user(s) of gas• Hence, cost assessment necessarily relies on reviewing the specific connection works with the assistance of technical consultants (if needed) to undertake a detailed project review• May be value in obtaining standardised information for similar connection types over time	<ul style="list-style-type: none">• Relates to activities that are indirectly associated with transmission• Typical subcategories are IT and communications (including SCADA and network control systems), vehicles, plant and equipment, buildings and property• Some of this is recurring expenditure and can be assessed against past revealed costs (trend analysis, etc)

5. Setting efficient operating costs

Operating expenditure types and distinctions

▶ Operating expenditure

- Input costs (purchased gas, materials)
- Staff costs and cost of employing third parties
- Administrative costs (including licence fees and regulatory costs)

▶ Maintenance expenditure

- Routine maintenance costs related to keeping assets in serviceable condition throughout their economic or useful life

Rehabilitation expenditures should be separately identified and capitalised (these increase an asset's capacity or life)

▶ Cost drivers

- Fixed costs
- Energy varying costs
- Capacity varying costs
- Customer varying costs

▶ Controllable?

- Controllable costs
 - *Incentives to manage*
- Partially controllable costs
 - *Partial pass-through*
- Uncontrollable costs
 - *Full pass-through*

5. Setting efficient operating costs

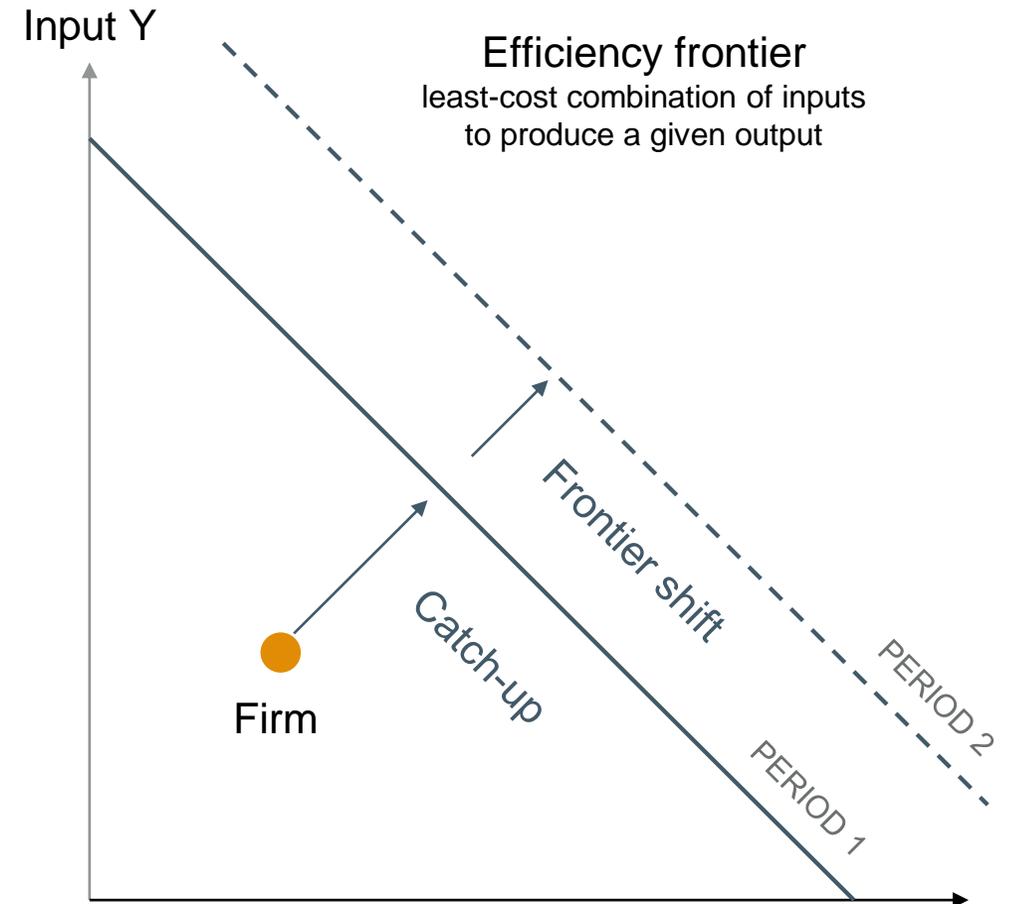
What are regulators interested in?

Productivity growth / 'frontier shift'

- ▶ How fast does an already-efficient firm improve productivity over time?

Inefficiency / 'catch-up'

- ▶ What is the difference between the individual firm's productivity and that of the most productive comparator firm?



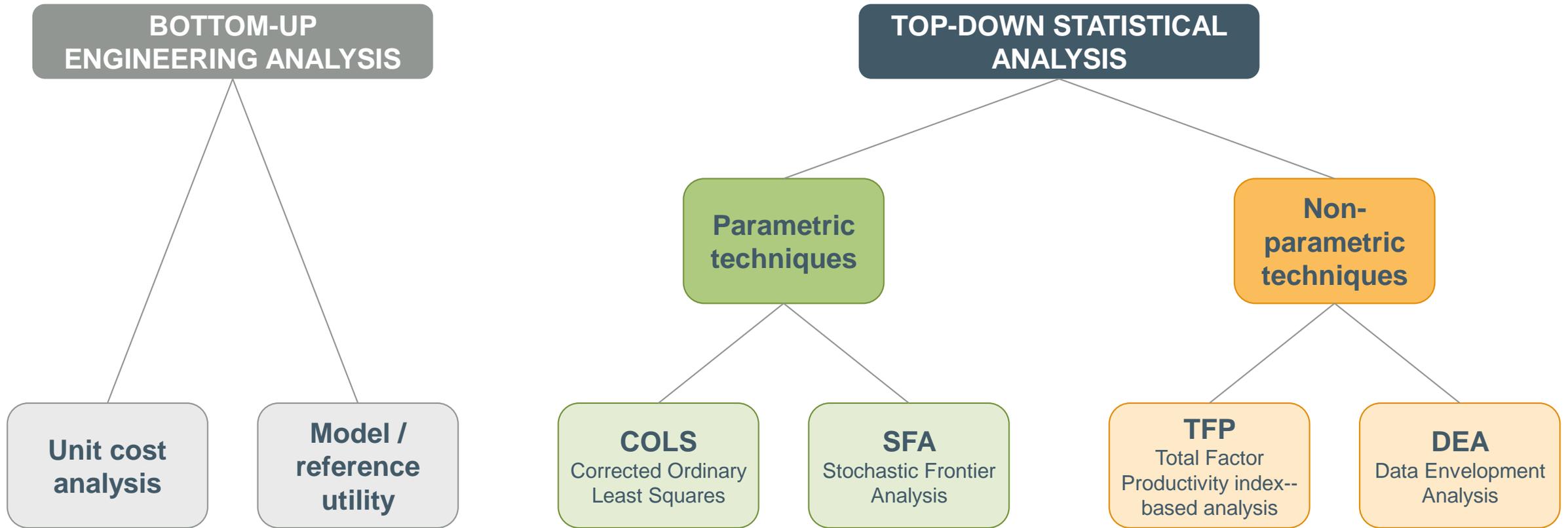
5. Setting efficient operating costs

How to assess whether costs are efficient?

How to compare?	What to compare?	Comments
'Top down' unit cost benchmarking	Unit costs (eg opex per pipeline length)	<ul style="list-style-type: none">• Simple to apply but can be very misleading
'Bottom-up' engineering and business process analysis	Activity costs (eg pipeline maintenance)	<ul style="list-style-type: none">• Requires access to detailed cost data, allocated by activity, and to databases of costs of similar utilities enabling comparisons to be made• As with all such comparisons, it is difficult to adjust across utilities in different countries, which face different relative costs and market characteristics
'Top down' statistical benchmarking	Total operating costs	<ul style="list-style-type: none">• Estimation of an efficiency frontier by comparing performance of multiple utilities• Various model forms can be used (DEA, OLS, etc)• Consistent data is critical - many data points (years / comparator utilities) are needed for reliable results (50+)• Benchmarking has been most successful (or at least become accepted) in countries with many <u>distributors</u> such as Austria, Germany, Norway and Switzerland

5. Setting efficient operating costs

Alternative benchmarking methodologies



A model / reference utility is where an optimal network and associated costs are designed to serve the same area and demand using engineering planning models

5. Setting efficient operating costs

Applying the results of benchmarking

- ▶ Multiple model specifications and methodologies are usually applied to see whether the relative and absolute efficiencies of firms are consistent across them
- ▶ If they are, then the regulator can be confident that the estimated efficiencies are robust
- ▶ If not, then it suggests that the results are not reliable
- ▶ Ideally this is resolved by increasing the size and reliability of the dataset and by capturing more environmental variables
- ▶ If this is not possible, then limits are placed on estimated inefficiencies and/or efficiency scores are calculated as the average of multiple modelling results
 - Germany: Selects the highest efficiency score from two SFA and two DEA models (minimum score of 60%)
 - Finland: Averages the scores from SFA and DEA models (now being replaced with a new methodology)
 - Austria: Weighted average of the scores from two DEA and one COLS model (minimum score of 74.76%)

5. Setting efficient operating costs

How to deal with the opex-capex trade-off?

The problem

- ▶ For many investments there are trade-offs between operating and capital costs
- ▶ If utilities consider that one of either opex or capex is regulated more stringently than the other, then they will tend to favour the type of cost that is less strictly regulated even if less efficient
- ▶ This can increase costs overall

The solution

- ▶ Measure the efficiency of total expenditures (***totex***)
- ▶ But, this requires imputing a capital cost on a consistent basis, which is not simple

The GB example

- ▶ Ofgem uses a variety of approaches to assess the efficiency of costs
- ▶ The final price control is expressed as an allowed totex, which is then split into 'slow' (depreciated) and 'fast' (expensed) components
- ▶ The split between fast and slow money is decided by Ofgem rather than being the actual capex / opex split

Introduction

Part I: Purpose and scope of the study

Part II: Study progress to date

Part III: Stakeholder presentations

Part IV: Conceptual framework

Introduction

Part I: Purpose and scope of the study

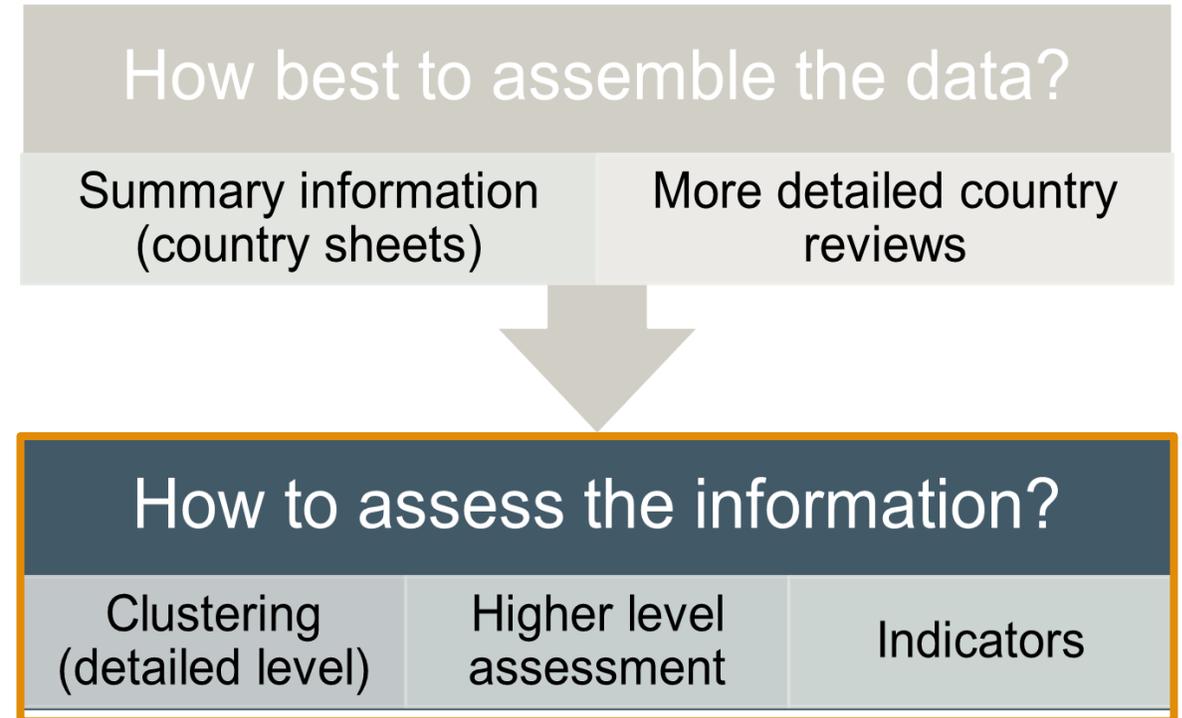
Part II: Study progress to date

Part III: Stakeholder presentations

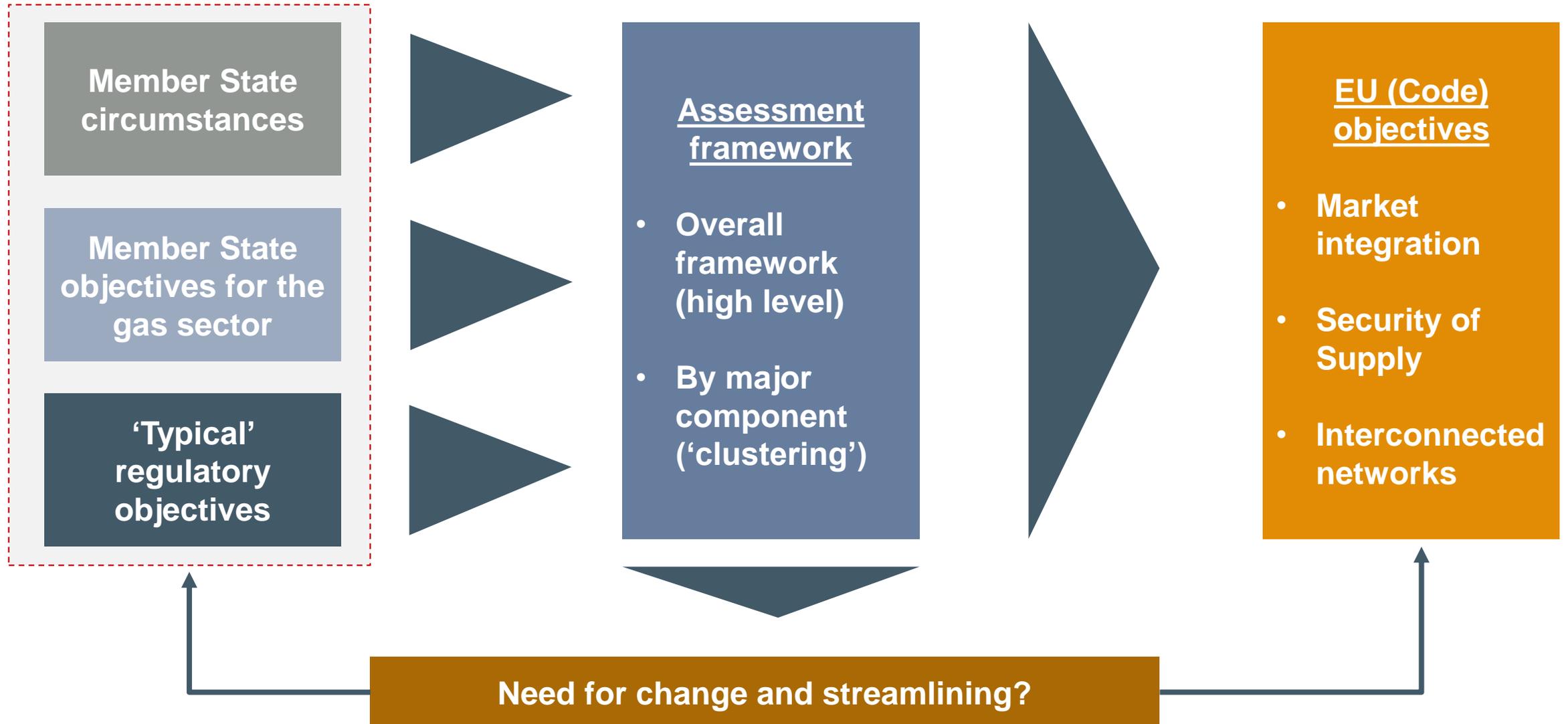
Part IV: Conceptual framework

Objectives of the conceptual framework

- ▶ Review of practices across the EU
 - Commonalities
 - Differences
- ▶ Aim for increased consistency?
- ▶ Justification for differences
- ▶ Facilitation of cross-border flows and coordinated network development
- ▶ **But, need to understand reasons for differences**



The assessment framework will need to consider the interplay of both sector conditions, and objectives on various levels



The assessment depends on national and utility circumstances

▶ Historical circumstances

- Stage of privatisation
- Legacy network and obligations
- Level of assumed efficiency

▶ Geography and sector characteristics

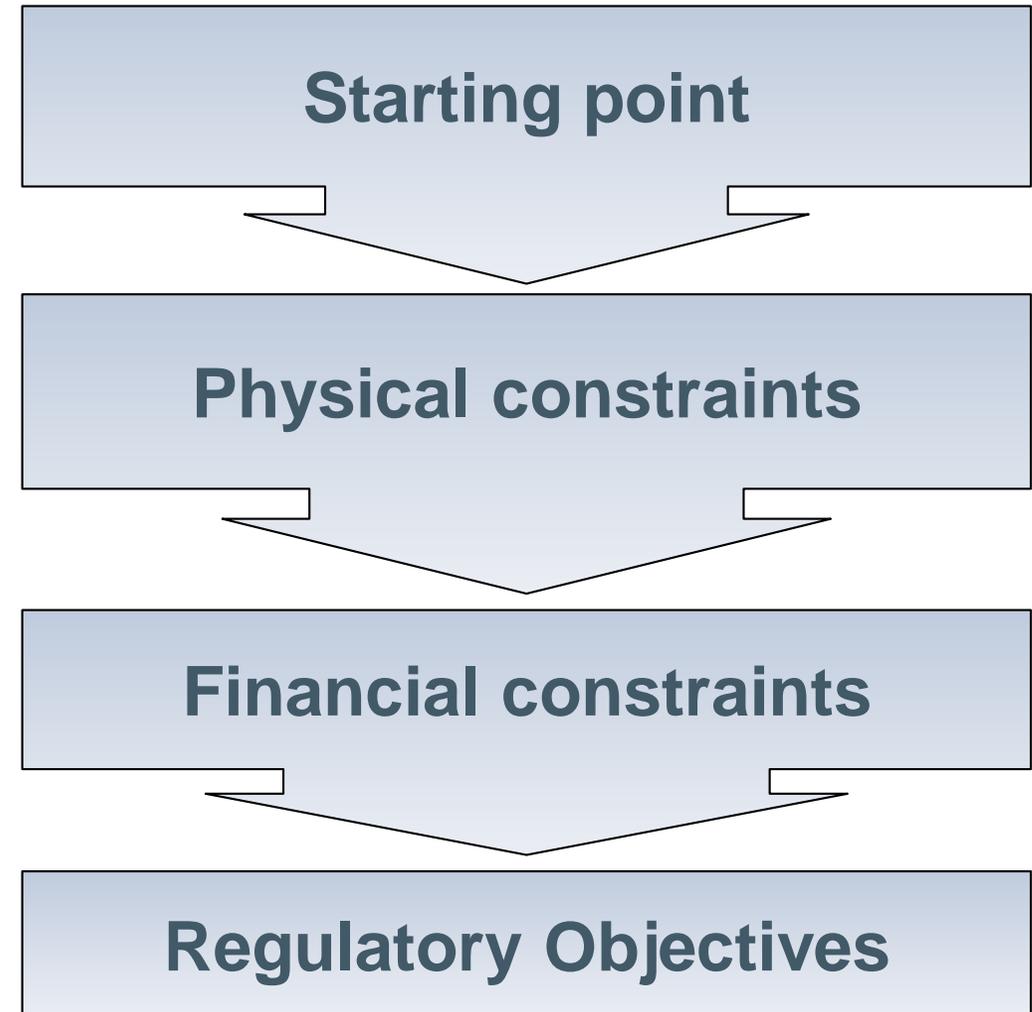
- Gas sources and storage options
- Consumption patterns
- Interconnectivity

▶ Economy

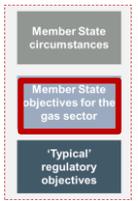
- Affects interest rates, etc

▶ Growth in demand

- Could be slow, fast or negative



Sector and regulatory objectives cover other issues as well



▶ Network development requirement

- Fast growth need?
- Industry or residential?

▶ Product to be delivered

- Quality of service
 - Is firm service needed or can interruptible supply be allowed?
- Security of supply
- Widening customer base?
- Other consumer services important?

▶ Social and economic objectives

- Price stability
- Affordability
- Consumer benefit expected but are there other constraints?

▶ Legal or other constraints

- Choice of funding models
- Target return on equity to be earned by state owned companies or given level of debt costs

The national circumstances and objectives can shape the form or emphasis of regulation and dictate regulatory choices (1/2)

Network growth

Cost saving

Approach	Forward looking	Historical view (more likely)
Utility risk	Higher	Lower
Rate of return	Higher	Lower
Stranded asset risk	Lower	Higher
Informational requirements	High	Variable

The national circumstances and objectives can shape the form or emphasis of regulation and dictate regulatory choices (2/2)

Cost control

Incentive approach

Approach	Cost specific	TOTEX view more likely
Utility risk and rate of return	Lower	Higher
Informational requirement	High	Variable
Network development	Static	More dynamic
Service level requirement	Minimum standard	Detailed targets

And there are criteria deriving from the typical regulatory objectives for transmission services



Strength of the incentives provided for cost minimisation and quality improvement

Degree of predictability and certainty in the regime

Simplicity or complexity of the regulatory system

Costs imposed on the regulator and the regulated entities

Facilitation of efficient investment

Transparency of the regime and its acceptability among stakeholders

The analytical framework will need to coherently account for all the foregoing inter-linked factors

1. What to assess?

- Overall framework?
- Framework elements?
- Probably both

2. How to group countries/TSOs?

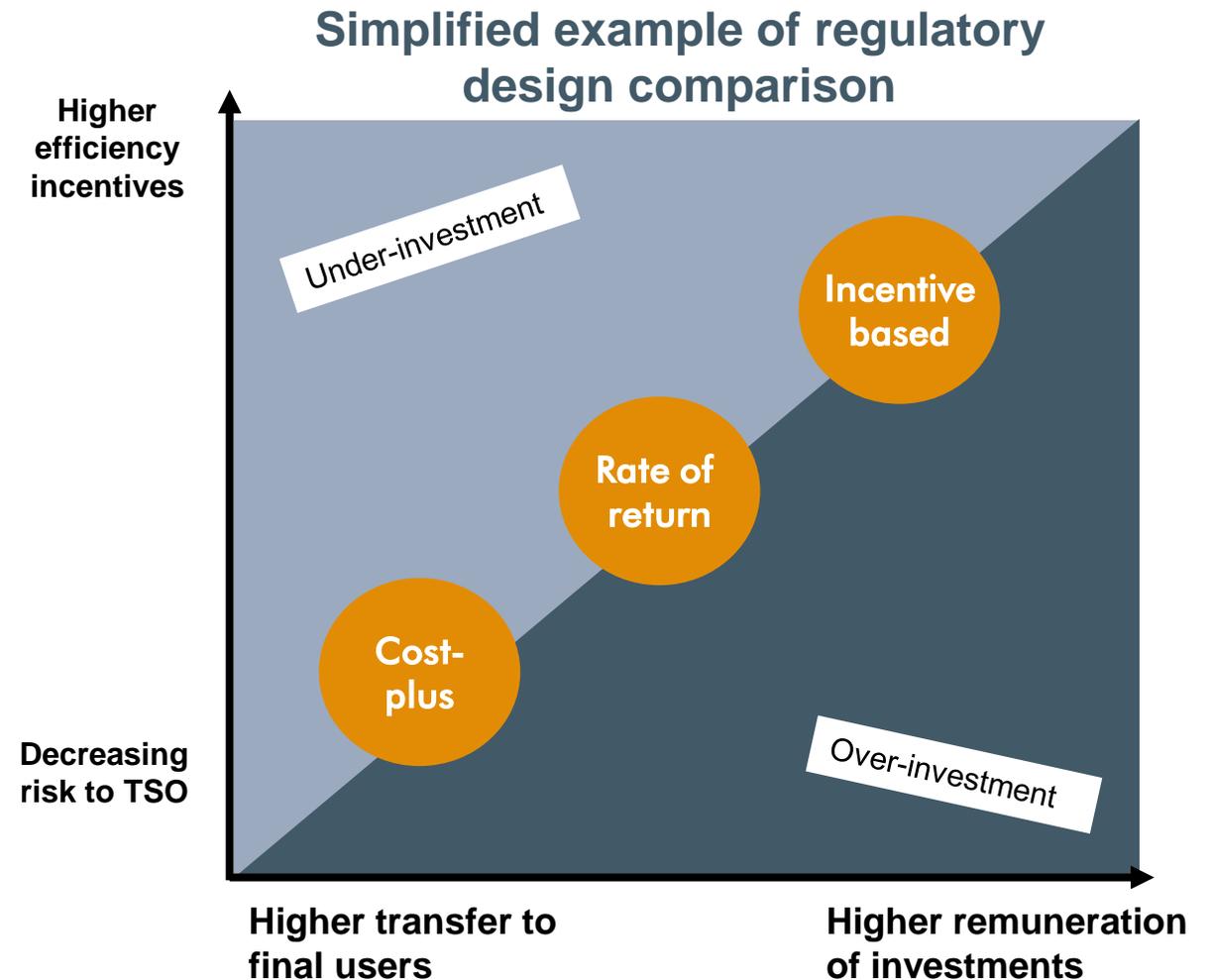
- Clear definitions
- Framework / component split
- Not straightforward, as models not applied in pure form

3. What criteria to use and how to present?

- Trade-offs between various objectives

4. Where should consistency be sought?

- Capital expenditure and RAB are the biggest element of cost



Other stylised assessment methods

Overall regulatory approach

	Risk for utility	Reliability of data	Efficiency incentives	Encouraging investment
Cost-Plus	✓✓	✓	xx	✓
Rate-of-Return	✓	x	x	✓
Incentive based (revenue/price cap)	x	xx	✓✓	x
Cost-Plus	Tariffs adjust rapidly to changing costs			
Rate-of-Return	Tariffs adjust to changing costs with a lag			
Incentive based (revenue/price cap)	Tariffs are calculated using projected costs and do not adjust to changes in actual costs			

Other stylised assessment methods

Valuing the asset base

	Transparency	Simplicity	Risk to utility (stranded assets)	Risk to customers (over-payment)	Economic efficiency (prices = marginal cost)
Historical cost accounting	✓✓	✓✓	✓✓	✓	xx
Current cost accounting					
<i>Inflation indexation</i>	✓✓	✓✓	✓	xx	x
<i>Replacement cost</i>	✓	x	✓	xx	x
<i>Modern Equivalent Asset</i>	x	xx	x	✓	✓
<i>Optimised replacement cost</i>	xx	xx	xx	✓✓	✓✓

Other stylised assessment methods

Assessing expenditure proposals

	Top-down unit cost benchmarking	Bottom-up activity analysis	Top-down statistical benchmarking
Reflect cost trade-offs	xx	x	✓✓
Reflect different environments	xx	✓	✓✓
Data requirements	✓✓	xx	xx
Reliability of calculations	✓✓	✓	xx
Transparency of approach	✓✓	✓	xx
Costs of assessment	✓✓	xx	x

What do credit rating agencies look for and is this relevant?

The Moody's methodology for regulated electric and gas networks

Rating Factor/Sub-Factor Weighting			
Broad Rating Factors	Broad Rating Factor Weighting	Rating Sub-Factor	Sub-Factor Weighting
Regulatory Environment and Asset Ownership Model	40%	Stability and Predictability of Regulatory Regime	15.00%
		Asset Ownership Model	10.00%
		Cost and Investment Recovery	10.00%
		Revenue Risk	5.00%
Efficiency and Execution Risk	10%	Cost Efficiency	6.00%
		Scale and Complexity of Capital Programme	4.00%
Stability of Business Model and Financial Structure	10%	Ability and Willingness to Pursue Opportunistic Corporate Activity	3.33%
		Ability and Willingness to Increase Leverage	3.33%
		Targeted Proportion of Operating Profit Outside Core Regulated Activities	3.33%
Key Credit Metrics	40%	Adjusted ICR (or FFO Interest Cover)	15.00%
		Net Debt/RAV (or Fixed Assets)	15.00%
		FFO/Net Debt	5.00%
		RCF/Capex	5.00%
Total	100%		100.0%

What do credit rating agencies look for?

Assessing the regulatory framework (1/2)

Factor 1: Regulatory Environment And Asset Ownership Model (40%)

Rating Sub-Factor	Aaa	Aa	A	Baa	Ba	B	Sub-weighting
a) Stability and Predictability of Regulatory Regime	Regulation is independent, well established (>15 years of being predictable and stable) and transparent (published methodologies clearly define risk allocation between companies and customers and are consistently applied, with public or shared financial model)	Regulation is independent, reasonably well established (>10 years of being predictable and stable) and transparent (published methodologies clearly define risk allocation between companies and customers and are generally consistently applied)	Regulation is generally independent and developed (published methodologies set out principles of risk allocation between companies and customers and are based on established precedents in the same jurisdiction)	Regulatory framework is relatively new and untested, but methodologies are based on established precedents and jurisdiction has a history of independent and transparent regulation for other utility services	Regulatory framework is defined but not consistently applied; tariff setting is subject to negotiation and political interference; some precedents in the country of predictable regulation for other utility services	Regulatory framework is unclear, untested or undergoing significant change, with a history of political interference	15.00%

What do credit rating agencies look for?

Assessing the regulatory framework (2/2)

Factor 1: Regulatory Environment And Asset Ownership Model (40%)							
Rating Sub-Factor	Aaa	Aa	A	Baa	Ba	B	Sub-weighting
c) Cost and Investment Recovery (Ability & Timeliness)	No regulatory or contractual impediment to adjust tariffs (no approval or reviews required)	Tariff formula allows for timely recovery of operating expenditure including depreciation, electricity losses and balancing costs/shrinkage gas and a fair return on all investment	Tariff formula allows for recovery of operating expenditure including depreciation based on allowances set at frequent price reviews (5-yearly intervals or shorter) and a fair return on all efficient investment	Tariff formula allows for recovery of operating expenditure including depreciation and return on investment but subject to retrospective regulatory approval or infrequent price reviews (> 5-yearly intervals); recovery of electricity losses and balancing costs/shrinkage gas is somewhat exposed to price	Tariff formula does not take into account all cost components and depreciation is set below asset consumption; recovery of electricity losses and balancing costs/shrinkage gas has large exposure to price	Tariff formula does not take into account all cost components and depreciation is set below asset consumption; recovery of electricity losses and balancing costs/shrinkage gas is fully exposed to price	10.00%
		Depreciation allowance fairly reflects asset consumption	Depreciation allowance fairly reflects asset consumption				
		All capital expenditure is included in asset base as incurred	Capital expenditure is included in asset base as incurred		Revenues allow coverage of most operating expenditure but	Revenues only partially cover cash operating expenditure	

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