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# 1. Analysis of current methodology and proposed changes

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The Regulatory Authority for Energy (RAE) is announcing a public consultation regarding an interim methodology for setting the allowed revenues for electricity transmission, in preparation for the privatisation of the transmission system operator (TSO), ‘ADMIE’.

This supporting document provides a review of the current methodology and proposes changes to it that will be effective for an interim period. RAE is in parallel developing a comprehensive regulatory framework for the regulation of electricity transmission and distribution networks that would replace the interim methodology described in this report and will be effective from the regulatory control period immediate following that envisaged by the proposed interim methodology.

## Background

Currently, the allowed revenues of the electricity Transmission System Operator (TSO), ADMIE, are set annually on a cost-plus basis. RAE, however, is working to develop a multi-year tariff framework that is consistent with best regulatory practice internationally.

As a result, RAE is proceeding with the proposed amendments of the existing methodology for setting allowed transmission revenues. The proposed methodology would apply for an interim period (possibly covering the years 2015 to 2017). The methodology builds on the existing one, but provides (if and where necessary) for greater certainty and stability in relation to key cost parameters. Finally, the proposed amendments are consistent with a transition to a comprehensive incentive-based regime that is likely to apply from 2018 onwards and will be developed under a consultancy assignment that is currently being tendered by RAE.

## RAE’s approach in revising the methodology

RAE’s approach aims to:

- **Limit the number of changes to the current methodology** – This helps maintain regulatory continuity and ensures that the revised methodology is understandable and implementable for both RAE and the TSO.
- **Avoid being too prescriptive** – Because a separate consultancy assignment will soon commence to define a comprehensive regulatory regime that will apply from 2018 onwards, RAE has paid attention not to pre-empt the analysis and conclusions of that assignment. Instead, RAE focuses on defining the principles that should underpin the regulatory framework going forward.
- **Balance the regulatory objectives** – the primary objectives of regulating the TSO are to (1) provide it with incentives to improve its operating and investment efficiency, while ensuring it can finance its activities and (2) ensure that electricity consumers benefit from any efficiency gains.

In this supporting document, RAE provides a review of the current methodology regarding ADMIE's allowed revenue regulation. For each key aspect of the methodology the current approach is described and a brief review of the alternative approaches are provided, taking account of international experience. The key aspects of the methodology are categorised under the following four headings:

- **Form of regulation** – including the overall type of regulatory regime being applied to the TSO and the chosen regulatory period.
- **Build-up of allowed revenues** – the costs that the TSO is entitled to recover and the approach to determining these costs ex-ante.
- **Treatment of regulatory assets** – the manner in which the TSO's assets are valued and new investments are added to the asset base.
- **Revenue adjustments (including incentive mechanisms)** – the ex-post adjustments that are made to allowed revenues and therefore the incentives that are placed on the TSO to improve its efficiency.

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## 1.1. Form of regulation

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In this section the overall type of regulatory regime being applied and the associated regulatory period is reviewed.

### 1.1.1. Type of regulation

Current approach:

The type of regulation being applied by the current methodology is **ostensibly a revenue cap regime**, because allowed revenues are capped on an ex-ante basis. The TSO then sets tariffs subject to the revenue constraint and based on a defined allocation methodology approved by RAE.

However, in practice, the allowed revenue is set regularly (every year) and the only cost that the current methodology does not fully adjust for ex-post is operating expenditure (opex) and, even then, any outturn opex that is more than three per cent different to forecast opex is adjusted for<sup>1</sup>. This means that incentives for the TSO to improve efficiency are weak, and therefore **the current methodology is effectively rate of return regulation**.

Review of approach:

The main forms of regulation that have been applied to network businesses internationally include:

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<sup>1</sup> Deviations that are due to external factors and are justified are still fully adjusted for. Also, opex adjustments are lagged by two years.

- *Rate of return / cost plus regulation* – The revenues of the network business are set based on its actual costs, so that the business achieves a fair rate of return. It requires careful inspection of the business's accounts.
- *Price / revenue cap regulation* – Establishes a price or revenue ceiling so that the profitability of the network business depends on the extent to which it can keep its costs below the cap. It therefore encourages productive efficiency and is often labelled 'incentive regulation'. The cap is periodically reviewed and adjusted to reflect actual costs and ensure allocative efficiency (customers paying a price that reflects costs).
- *Sliding scale regulation* – This is something of a compromise between rate of return and price cap regulation, in that a price/revenue cap is set and if profits rise above an agreed level then profiles are adjusted downwards immediately (or vice versa).
- *Yardstick regulation* – This is often viewed as a type of price/revenue cap regulation. The key difference is that rather than set prices/revenues based on costs that are specific to the network business under regulation, they are set based on benchmarked costs.

**A revenue cap regulation is proposed to be applied in the revised methodology**, on the basis that:

- It is inappropriate to leave the TSO/investors with volume risk, and a corresponding incentive to maximise consumption, as this remains outside the control of the transmission business and, in any case, environmental objectives are likely to conflict with incentives to maximise volumes.
- A revenue cap is most commonly used to regulate transmission network businesses in Europe and there is evidence that, on the whole, it works reasonably well to achieve the regulatory objectives and that it permits a lower cost of capital as the networks are protected from demand risk (arguably the main vehicle for systematic risk in the generality of businesses).
- The current methodology applies (or at least intends to be) revenue cap regulation.
- A revenue cap approach strikes an appropriate balance between providing certainty of cost recovery while incentivising efficient operation.

### 1.1.2. Regulatory period

Current approach:

The current methodology applies a **1-year regulatory period**. That is, the TSO's costs are reviewed and allowed revenue is set every year.

Review of approach:

An **initial regulatory period of 3 years, from 2015 through to the end of 2017**, is proposed as a first regulatory period to apply under a new multi-year regime. A longer regulatory period can be considered post 2017.

### Multi-year regulatory periods

Under a revenue cap regime, a 1-year regulatory period gives a regulated entity strong certainty that its costs will be recovered, but it also reduces its incentives to improve efficiency because it can only keep the benefit of beating cost forecasts for a maximum of 1 year.

By contrast, a multi-year regulatory period introduces potential for cost savings to be kept by the regulated entity for longer, thereby increasing incentives to improve efficiency (and ultimately passing on these efficiency savings to consumers in the form of lower tariffs). A multi-year regulatory period is also typically less burdensome on the regulator and TSO because a detailed review of costs only occurs every few years, with the adjustments being made in between being largely mechanical in nature.

The regulatory period for TSOs applied in most European jurisdictions ranges from 3 to 8 years, with the majority using either 4 or 5 years (for example France, Italy, and Spain use 4 years, while Germany, Ireland, and Czech Republic use 5 years).

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## 1.2. Build-up of allowed revenue

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A review of the costs that the TSO is entitled to recover and the approach to determining these costs are presented in this section. In Section 1.4 the focus is on the incentive mechanisms around the recovery of these costs (through ex-post revenue adjustments).

### 1.2.1. Cost components

Current approach:

The build-up of allowed revenues under the current methodology incorporates the following key cost components:

- **Operating expenditure**
- **Depreciation**
- **Return on capital**
- **Less: Interconnection revenues**
- **Less: Revenues from unregulated activities**

This approach uses depreciation and return on capital to allow the TSO to recover its costs of investment (sometimes known as the ‘regulatory asset base’ approach).

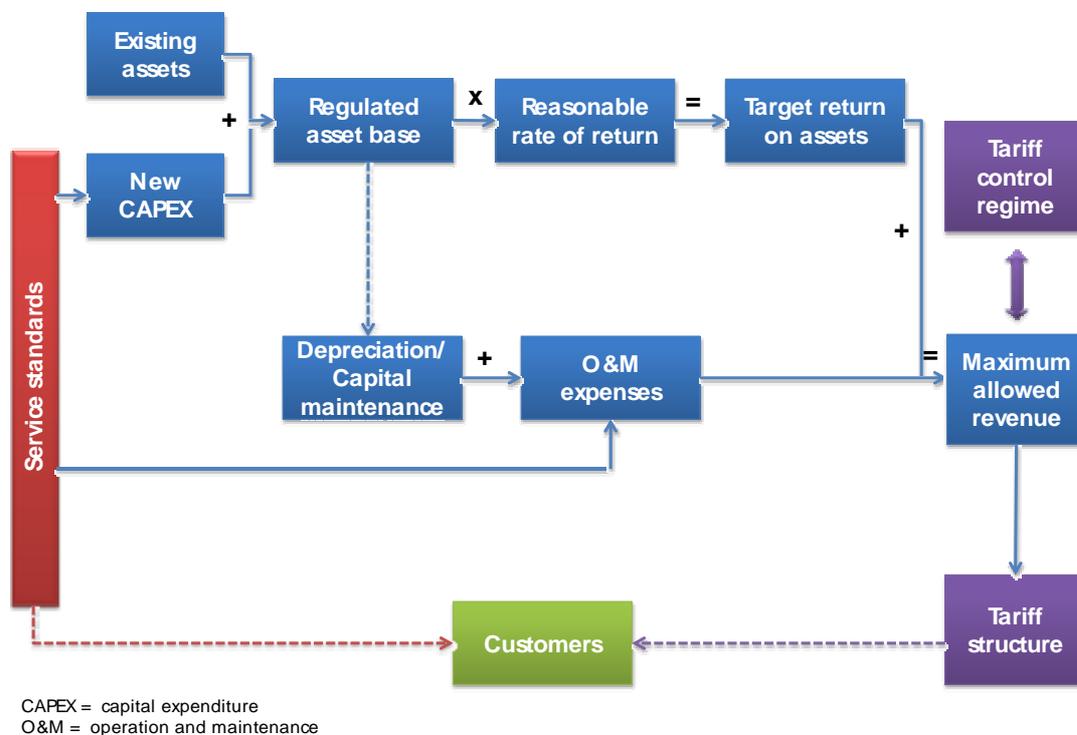
Review of approach:

The overall approach to building up allowed revenues is discussed below. In summary, **the current ‘regulatory asset base’ approach is deemed as appropriate and the key cost components are accounted for.**

*Regulatory asset base vs. net present value approach*

The current approach to building-up allowed revenues follows a ‘regulatory asset base’ (RAB) approach (also known as ‘building block’ approach) which is commonly used internationally to apply revenue cap regulation and is summarised in the figure below.

**Figure 1 Overview of building blocks approach**



The main alternative to the RAB approach is a ‘net present value’ methodology, which allows the TSO to recover the full cost of its investments over a defined time period. The RAB approach is more appropriate for long-term concessions or privatisations, where investment requirements are lumpy and often long-term. Determining revenues based on a straight net present value (NPV) of forecast costs can discourage long-term planning and result in customers paying for investments today that will bring benefits for many years to come.

A variation on the RAB approach was introduced in the UK recently<sup>2</sup>, titled RIIO (Revenue = Incentives + Innovation + Outputs), in response to observations that the previous RPI-X regime was unintentionally drawing the focus away from outputs and becoming too complex. The RIIO is

<sup>2</sup> The regulator, Ofgem, published its decision in October 2010 and the first revenue determinations have since been completed for most of the UK’s energy network businesses.

effectively a hybrid between the RAB and NPV approaches. Some of the key differences of the RIIO regime include:

- Network businesses submit long-term business plans that extend beyond the current regulatory period.
- Outputs are defined on a long-term basis, with clear provisions about how they will be updated, and revenue allowances clearly linked to these outputs.
- Rather than all capital expenditure (capex) going into the RAB, and all opex being funded in that same year, a fixed proportion of total expenditure will be funded that year ('fast money'), with the remainder being funded through the RAB ('slow money'). This addresses financing concerns directly, rather than being forced to change the profile of depreciation.
- Rewards and penalties related to cost savings and output delivery will be triggered during the regulatory period, rather than only at the regulatory review.

RAE is aware of these developments and examines whether there are lessons that can be adopted in Greece, however RAE considers that the RIIO framework should be treated with some caution given that it is still largely un-tested. More experience with multi-year regulation should be gained before any move to a more output-oriented approach is adopted. In any case, corresponding arrangements should be preceded by careful monitoring of the TSO's service quality/cost trade-off. The merits of the RIIO approach can be explored for the regulatory framework that will apply post 2017.

#### *Costs included in allowed revenues*

In regards to the cost components themselves, RAE's assessment is that all of the key components are accounted for in the current methodology.

#### 1.2.2. Inflation

Current approach:

The current methodology **forecasts costs in nominal terms and also uses a nominal rate of return (RoR)** to determine return on capital. This means that an allowance for inflation is built in to allowed revenues.

Review of approach:

The treatment of inflation is discussed below. In summary, **RAE suggests moving to forecasting costs in real terms and indexing allowed revenues to the consumer price index that is published by the Hellenic Statistical Authority (EL.STAT.).**

#### *Including inflation in allowed revenues*

There are two alternative approaches to ensuring that the TSO recovers the cost of inflation:

1. Forecast costs in **nominal** terms and **not index** allowed revenues to inflation (currently applied by RAE).
2. Forecast costs in **real** terms and **index** allowed revenues to inflation.

Because inflation is largely outside of the TSO's control, RAE aims at ensuring the inflation is fully passed-through to allowed revenues. By forecasting costs in nominal terms, the TSO is exposed to differences between projected and actual inflation (until the next revenue adjustment). This has minor implications under a one-year regulatory period, but if RAE moves to a multi-year regulatory period then the TSO will be exposed to significant inflation risk unless annual reconciliations are built in.

It is therefore proposed to move to forecasting costs in real terms and indexing allowed revenues to inflation. This protects the TSO against inflation risk, will be necessary to maintain investor confidence in light of the current economic situation in Greece, and will considerably simplify the determination of allowed revenues.

Forecasting costs in real terms means using a real RoR rather than a nominal RoR, as discussed in Section 1.2.6.

#### *Inflation index*

There is also the question what measure of inflation is appropriate to use. The chosen index should be one that reflects the likely increases in prices faced by the TSO, as well as being transparent and practical to implement.

In practice, it is difficult and contentious to develop a weighted cost index that reflects cost pressures on the wages, materials, etc. of the TSO. For this reason, most countries prefer to use a broad-based index that is free of interpretation and entirely outside of the control of the regulated entity and the regulator. Most use the consumer price index (or the Harmonised Index of Consumer Prices as it is known in Europe), including the UK, Netherlands, Australia, and New Zealand to name but a few. A number (including parts of Canada and the United States<sup>3</sup>) use a GDP deflator. Another option is to use a producer/industrial price index, although care must be taken to ensure that it is entirely outside of the influence of the TSO. RAE recommends the use of CPI for the first three-year regulatory period, as commonly used in most other countries reviewed. The merits of alternative indices will be investigated for the period post-2017.

#### 1.2.3. Tax

Current approach:

The current methodology applies a **pre-tax RoR**. This means that taxes are not explicitly included as a cost, but are instead implicitly included through the return on capital component.

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<sup>3</sup> US states using total factor productivity studies to determine revenues tend to use industry-specific inflation indexes.

Review of approach:

The treatment of taxis discussed below. In summary, **RAE's view is that using a pre-tax RoR based on the statutory corporate tax rate is the simplest to apply at this present time.** However, consideration will need to be given to moving to an effective tax rate estimate, possibly as part of the post-2017 regime, as this will result in a more accurate estimate of the TSO's true tax liability.

#### *Pre-tax RoR or separate cost component*

There are two main alternative approaches to ensuring that the TSO recovers the cost of taxation:

1. Incorporate tax through a pre-tax RoR (currently applied by RAE).
2. Incorporate tax directly by including it as a separate cost component and use a post-tax RoR.

The main advantage of including tax as a separate cost component (option 2) is that it more accurately estimates the tax liability that would be achievable by a well-managed privately owned business based on Greece's taxation rules. However, tax law can be complex and is outside the core expertise of the regulator.

#### *Statutory or effective tax rate*

The use of a pre-tax RoR (option 1) is usually simpler, although there are two variations on this approach:

1. Use a pre-tax RoR based on the statutory tax rate (assumed to be currently applied by RAE).
2. Use a pre-tax RoR based on an effective tax rate.

A statutory tax rate is very simple to apply, but will often overstate the tax liability of a business that is well-managed and makes full use of allowances in the tax law, in particular because under a pre-tax (statutory) RoR:

- Regulatory depreciation is used rather than accounting depreciation.
- Real interest payments are tax deductible rather than nominal interest payments.

Furthermore, using a pre-tax RoR entails converting it to a post-tax RoR, which can sometimes be contentious.

An effective tax rate is also easy to apply, but can be difficult to estimate. It uses benchmarks of taxation based on similar businesses to estimate the approximate rate that would apply to the regulated business.

#### 1.2.4. Operating expenditure

Current approach:

The costs included in the build-up of operating expenditure ('opex') as per the current methodology are as follows:

- **Payroll costs**
- **Contracting costs**
- **Utility expenses**
- **Materials and consumables**
- **Third party costs**
- **Administration costs, including corporate overheads.**

No regulatory costs are levied on the TSO and the cost of transmission losses is fully paid for by producers.

Opex is **forecast by ADMIE and checked/ approved by RAE for the year ahead based on a review of historical costs**. RAE also plans to take into consideration the results of international benchmarking exercises that have recently been completed or are on-going, but does not intend to rely heavily on benchmarking to determine opex. At present, there is no clearly defined set of service standards that the TSO must meet (and against which opex can be determined).

Review of approach:

The treatment of opex is discussed below. In summary, **the key costs are deemed to be accounted for, but a set of principles for forecasting opex is needed, as are service quality standards and a process for collecting regulatory information**.

##### *Principles for forecasting opex*

The current methodology lacks a set of principles for reviewing the TSO's forecasts of opex for the purpose of determining allowed revenues.

Most countries are not overly prescriptive about how opex (and capex) is forecast, given that information improves over time, as do the analytical tools that the regulator chooses to use. In all cases a reasonable amount of regulatory judgement is required (and statistical/analytical tools are never a complete substitute).

In practice, most regulators in incentive regimes apply a combination of the following, which RAE suggests could form the basis of the high-level principles to be applied:

- Engineering consultants are hired to conduct technical studies on the TSO's proposed forecasts.

- Benchmarking is used, although in practice benchmarking is of limited use for TSO's, as opposed to Distribution System Operators, because there is usually only one per country and therefore it is hard to draw meaningful comparisons.
- Forecast costs are compared to out-turn costs in the previous regulatory period, as well as forecasts (and allowances) in the previous regulatory period.
- A combination of top-down and bottom-up analyses.
- Various analytical tools that are specific to issues arising at regulatory reviews.

**Because opex is largely recurrent and predictable, regulators tend to rely most heavily on out-turn ('revealed') costs to forecast opex.**

The analytical tools a regulator might apply include:

- Trend analysis
- Methodology review
- Governance and policy review
- Predictive modelling
- Detailed project review
- Benchmarking (economic techniques and category analysis)

The trade-off between opex and capex is also important. Opex can be reduced by spending more on capex, but this is not necessarily the most efficient approach in the long-term.

More detailed guidelines for developed forecasts are proposed to apply post-2017.

#### *Output-focused opex*

It is very difficult to determine the reasonableness of opex forecasts without reference to a comprehensive set of service quality standards (i.e. outputs). It is therefore important that corresponding standards for the TSO are established in due time.

Similarly, opex forecasts should be based on long-term business plans that relate costs and outputs, rather than focus unduly on the current regulatory period.

#### *Reporting information*

When reviewing forecasts, there is no substitute for good information. The effective review of opex forecasts depends on good quality information about historical costs, and sound business cases that underlie forecast costs. This means having:

- A time series of historical data of sufficient length (e.g. 5 years).

- Detail on costs, including allocation to individual projects or programmes.
- Consistent definitions of costs over time.
- Audited data that is free of errors.

Such information is often collected by regulators through a separate process to the review of allowed revenues. RAE suggests that the TSO is required to submit regulatory accounts on an annual basis, with the format and detail specified by RAE.

### Cost types

To apply the above principles when forecasting costs, it is useful to require the TSO to distinguish between certain types of costs (at a minimum). An example of four broad opex cost types is as follows:

- **Fixed costs** – which do not vary with changes in energy demand, peak load, or number of customers.
- **Demand variable costs** – which vary with changes in the volume of energy demand.
- **Capacity variable costs** – which vary with changes in the peak load on the system.
- **Customer variable costs** – which vary with changes in the number of customers.

Furthermore, the above costs can be broken down into:

- **Controllable costs** – which are largely controllable by the TSO.
- **Uncontrollable costs** – which are substantially outside of the TSO's control.

### 1.2.5. Depreciation

Current approach:

Depreciation is **calculated based on the Regulatory Asset Value (RAV)**, excluding assets funded by third parties. It is calculated on a **straight-line basis, using accounting asset lives** that differ by asset class. The average life is approximately 35 years. Depreciation is calculated from the date in which the asset becomes operational.

The RAV, since 2005, has not been indexed or re-valued, as discussed in Section 1.3

Review of approach:

The treatment of depreciation is discussed below. In summary, **the current approach is deemed as appropriate; however RAE proposes to move to economic asset lives rather than accounting asset lives.**

## Depreciation of capex in allowed revenues

The use of depreciation to determine allowed revenues is intended to spread the costs of investments out across their useful lives. As discussed above, an alternative approach would be to allow the TSO to fully recover the costs of its capital expenditure in the year in which it occurs, but this would place the full cost burden on customers in that year, when in fact the investment is likely to benefit both present and future customers for many years to come.

## Economic vs. accounting asset lives

Because it is important that depreciation reflect the costs of investments across their useful lives, economic asset lives should be used rather than accounting asset lives. Accounting lives are set for tax reasons and often bear little resemblance to the actual useful lives of assets. Accounting lives lead to allocative inefficiencies because consumers pay charges that do not reflect the true cost of the service being provided. Most large engineering consultancies have asset information databases that can be used to determine an appropriate economic asset life for each asset class.

## Straight line depreciation

Calculating depreciation on a straight-line basis is commonly used in revenue cap regimes because it is easy to calculate and spreads the cost of an asset reasonably evenly across its life. Alternatives such as accelerated depreciation tend to front-load the cost of depreciation.

## Depreciation of the existing asset base

To calculate depreciation on the existing RAV (from the point when RAE moves to using economic rather than accounting asset lives), RAE proposes to take a straight-forward approach and apply a single approximate average remaining asset life. The key criteria for determining this remaining asset life should be that the resulting level of depreciation on the existing RAV is sufficient to cover the costs of maintaining those assets going forward.

### 1.2.6. Return on capital

Current approach:

Return on capital is **calculated as the average of the start of year and end of year regulatory asset values, multiplied by the approved Rate of Return (RoR).**

As discussed above, **a pre-tax nominal RoR is used.** The RoR has historically been fixed at 8% pre-tax nominal (from 2009 till 2013), but is currently under review.

Review of approach:

The treatment of the return on capital is discussed below. In summary, **the current approach is deemed as appropriate; however a clear set of principles for determining the RoR are needed.**

## Overall approach

Return on capital is the return required by debt and equity holders to finance investments in capital assets. This return applies both to the existing asset base (for which setting a value can be difficult and contentious, as discussed in Section 1.3) and new (prudent and efficient) capital expenditure. The approach to calculating return on capital that is applied in the current methodology is in line with international regulatory practice.

## RoR

In regards to the RoR, calculating it by applying a WACC approach essentially involves setting a debt/equity ratio for the two companies, establishing the cost of debt finance, estimating a ‘normal’ equity return, adjusting the latter by a factor for the risk category of the companies and finally putting together a weighted average of these two rates of return. It is important that a clear set of principles be put in place for reviewing and updating the RoR (on a consistent basis) at future regulatory reviews.

As discussed in Section 1.2.2 above, RAE suggests moving to forecasting costs in real terms and indexing allowed revenues to inflation. This effectively means that return on capital is being indexed to inflation, and therefore should be calculated using a real RoR.

As discussed in Section 1.2.3 above, RAE suggests continuing the use of a pre-tax RoR.

### 1.2.7. Interconnection revenues

Current approach:

The current methodology **deducts interconnection revenues** earned from two sources:

- Interconnector capacity auctions, subject to a RAE decision regarding the use of the revenues, up to a €30 million maximum.
- Any net revenues (after associated costs are subtracted) under the Inter-TSO Compensation Mechanism which is related to use of transmission infrastructure.

Review of approach:

**This approach of deducting interconnection revenues is in line with regulatory practice elsewhere** in Europe, given that the revenues are earned from an asset base paid for by domestic electricity consumers.

### 1.2.8. Revenues from unregulated activities

Current approach:

The current methodology **deducts revenue from unregulated activities** from other costs when determining allowed revenues.

Review of approach:

Revenues from unregulated activities (e.g. using network infrastructure to lay optical fibre, sale of scrap metals, external contracting works) can be accounted for in one of two ways:

1. Deduct unregulated revenues from the cost forecasts used to determine allowed revenue (currently applied by RAE).
2. Determine the costs associated with unregulated activities and exclude them from the cost forecasts used to determine allowed revenue.

The second approach has the advantage of ensuring that the regulatory regime does not distort the TSO's incentives to earn revenue from activities in competitive markets that do not need to be regulated. However, the counter argument is that the TSO should be focused on providing network services, not on competing in other markets, and to the extent that it uses its network assets for other purposes then customers should reap the benefit.

The decision on which approach to adopt is usually made on practical grounds – it can be difficult to accurately separate out the costs associated with unregulated activities and therefore revenues are simply deducted. RAE **suggests allowing the costs to be excluded with a fall-back option to deduct the revenues** until the TSO can accurately separate corresponding costs.

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### 1.3. Treatment of regulatory assets

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In this section RAE reviews the manner in which the TSO's assets are valued and new investments are added to the asset base. **When reference to the 'opening RAV' is made, the value of the existing RAV that will apply at the implementation of this interim methodology in 2015 is meant.**

#### 1.3.1. Opening regulatory asset value

Current approach:

**A separate account of regulatory asset value (RAV) has been in place since 2011, and a separate regulatory asset register was recently established in late 2013.** The value of existing assets has incorporated revaluations that took place in 2000 and 2004, but excluded the revaluation that occurred at the end of 2009 and an impairment loss in 2012. Moreover, the RAV has not been indexed for inflation since 2005, given that the RoR has always been set in nominal terms.

This means that **the current RAV lies somewhere in between the historical book value** (which, simplifying somewhat, would exclude all revaluations) **and the depreciated replacement cost of assets** (which, simplifying somewhat, would include all revaluations).

## Review of approach:

The value of existing assets is fundamental to the determination of allowed revenues because both depreciation and return on capital are calculated from it.

There is a wide range of asset valuation methodologies, but there is no single approach that is appropriate in all circumstances. The broad categorisation and description of these methodologies is as follows:

- *Historical cost accounting methods* – based on the cost of acquiring and renewing assets in the past less the cumulative depreciation on those assets. Where networks have old assets that have been maintained and can be kept in good condition for long periods into the future, historical cost accounting methods that depend on finite lives may have little relevance to the economics of transmission charging. This method also depends on accurate historical cost information being available.
- *Replacement cost methods* – based on the cost that would be involved in replacing the service capability of the existing assets, taking account of the cost of replacing their service capability were it to be replaced now and adjusting for depreciation to reflect the remaining useful lives of the assets. These methods are most commonly used to value privately owned transmission businesses. However, replacement cost valuations are often in excess of any practical measure of the value in use and are therefore subject to impairment adjustments to bring them in to line with a value in use measure.
- *Current (economic) value method* – based on the ‘value in use’, which reflects the present value of future net cash flows that can be expected from the operation of and services provided by those assets. The conceptual problem with a value in use methodology for revenue setting is that the assessment becomes circular – the value in use is itself driven by the anticipated level of revenue.

In choosing a valuation methodology to apply, **RAE suggests to use the methodology which is already prevailing and would therefore form the basis for any new ‘value in use’ valuation.** This is complicated somewhat by the fact that the current RAV is a mix of valuation methodologies (as described above). But because investments in the existing asset base are effectively sunk costs, there is no clear economic rationale for using historical cost accounting methods rather than replacement cost methods or vice versa. RAE’s suggestion is therefore simply to set the opening RAV equal to the existing RAV.

From an economic perspective, the critical point is not how RAE sets the opening RAV, but that **it continues to be clearly recorded in a separate regulatory asset register** (as has been recently established), and that it be updated in a consistent manner going forward. This will give prospective investors in the TSO confidence that their costs will be recovered, and therefore reduce the future cost of supply.

### 1.3.2. Rolling forward the regulatory asset value

Current approach:

A separate regulatory asset value is used. Each year the **RAV is updated by adding capital expenditure and subtracting annual depreciation, disposals, and consumers' contributions and grants or subsidies (if any).**

The **RAV is not indexed to inflation** nor have assets been revalued periodically.

Review of approach:

Rolling forward the RAV is discussed below. In summary, **the current approach of using a separate regulatory asset register is deemed as appropriate. As RAE's suggests moving to a real RoR, the RAV needs to be adjusted for inflation.**

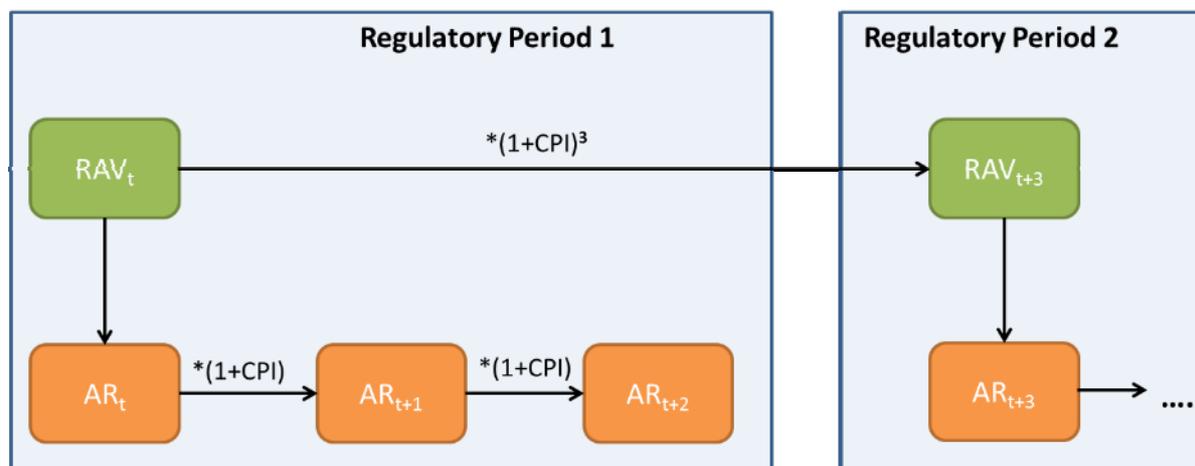
#### Separate regulatory asset register

It is generally accepted that statutory accounting frameworks are not suitable for rolling forward an asset base underwritten by private participants because accounting policies cannot be sufficiently constrained to meet the criteria for effective economic regulation. It is therefore appropriate (and likely) for the RAV to diverge from conventional accounting asset values.

#### Indexing RAV

As discussed in Section 1.2.2, RAE suggests moving to a real RoR with inflation indexation of allowed revenues. By indexing revenues to inflation, RAV is effectively indexed to inflation as well, given that both depreciation and return on capital are components of allowed revenue. This means that at the end of the regulatory period, the RAV needs to be adjusted for inflation, as illustrated in the figure below.

**Figure 2 Indexation of the RAV**



An alternative to indexing the RAV to inflation is for it to be revalued on a semi-regular basis. While in theory this would create an incentive for the TSO to ensure that its investments are efficient

(because inefficient investment may be stranded by an optimised replacement cost valuation or similar), most regulatory regimes have concluded that ex-post reviews of the efficiency of capex creates too much risk for the regulated business and can seriously distort allocative efficiency.

### 1.3.3. Capital expenditure

Current approach:

**Capex is added to the RAV when it is incurred. Capex is forecast based on an approved 10-year network development plan.**

Capex added to the RAV is net of disposals and customer contributions. Working capital is also included in the RAV (defined as current assets less liabilities).

Review of approach:

The treatment of capex is discussed below. In summary, **the current approach of adding capex to the RAV when it is incurred is deemed as appropriate, as is the approach to deducting capex funded by third parties. As with opex, a set of principles for forecasting capex is needed.**

#### Timing of capex

There are two alternatives with regards to the timing of capex additions to the RAV:

1. Capex is added to the RAV when it is incurred/ spent (currently applied by RAE).
2. Capex is added to the RAV when it is commissioned, with the total value grossed up to account for returns on the asset during construction.

Both approaches have largely the same effect on the incentives of the TSO, because (assuming the total value is grossed up for returns during construction correctly) both are equivalent in NPV terms. The key advantage of adding capex when it is incurred (option 1) is that it is easier to administer because there are no complexities related to capex being incurred in one regulatory period but not commissioned until the next. The key disadvantage is that consumers can end up paying for capex that is not yet operational and will not be for some years ahead (thereby distorting allocative efficiency). However, this effect is only significant for large assets with long construction periods, and is somewhat muted by revenue smoothing anyway.

The same pros and cons apply to depreciating assets from when the capex is incurred, as opposed to when the asset is commissioned. RAE therefore recommends moving to calculating depreciation based on when the capex is incurred.

For these reasons RAE's view is that the current approach (of adding capex to the RAV when it is incurred) is appropriate. RAE further suggests depreciating assets from when the associated capex is incurred.

## Principles for forecasting capex

Like opex, a set of principles that defines how it will review capex forecasts for the purpose of determining allowed revenues should be defined.

The principles and issues described in Section 1.2.4 for opex apply equally to capex. However, unlike opex, capex tends not to be recurrent and therefore out-turn costs from the last regulatory period are not as useful. Instead, regulators will often attempt to normalise capex for certain cost drivers (energy delivery, peak load, etc.) and examine per unit costs to check their efficiency.

## Capex funded by third parties

Capital expenditure funded by third parties, including customer contributions and government grants, should be excluded from the RAV on the basis that the TSO did not provide funding for the asset, and therefore should not be entitled to earn a return on it.

An alternative approach is to allow such capex to be added to the RAV, but require the TSO to ‘pay for it’ by deducting it from allowed revenues. This approach is suitable for relatively small capex items, but can create financing issues for the TSO if it is large (because the capex is ‘paid for’ in a single year).

The current approach of excluding third party-funded capex from the RAV is therefore deemed as appropriate.

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## 1.4. Revenue adjustments (incentive mechanisms)

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In this section the ex-post adjustments that are made to allowed revenues based on outturn costs are reviewed.

There are three types of revenue adjustments, those that:

- **Are linked to performance** and therefore place incentives on the TSO to improve its efficiency – including adjustments for opex and capex.
- **Reflect the uncertain nature of costs** and therefore reduce the risks of the TSO – including adjustments for volume or outputs, interconnection revenues, and unregulated revenues.
- **Smooth changes in revenues** to minimise the impact on customers.

### 1.4.1. Capital expenditure

Current approach:

The differences between **forecast and actual capex are fully reconciled each year, although adjustments are not NPV neutral**. This means that there is only a small benefit/cost to the TSO of capex under/over-spends, and therefore incentives to improve the efficiency of capex are minimal.

Capex incurred above forecast amounts is reviewed (ex-post).

Review of approach:

A review of possible capex incentive mechanisms is provided below. In summary, **RAE suggests that (for the purposes of the interim methodology alone) only revenues for capex over or under-spends at the end of the regulatory period are adjusted, with no claw-back of costs/benefits incurred during the period (with the exception of unjustified capex deferrals), thereby letting the TSO keep the difference for a period of time before passing it on to consumers. This should be coupled with the potential for ex-post review of overspent capex. RAE aims at applying a capital expenditure sharing mechanism post-2017.**

#### No claw-back of capex over or under-spends

Capex affects the TSO's revenues through the return on capital and depreciation components of allowed revenues. Most revenue cap regimes incentivise efficient capex by setting allowed revenues using forecast capex and not making any adjustments for the difference between forecast and actual capex until the end of the regulatory period. At the end of the regulatory period the RAV is updated based on actual capex and depreciation undertaken during the period, but there is no reconciliation for the over/under-recovery of allowed revenues due to capex under/over spends. This means that:

- If the TSO 'beats' the capex allowance, then it keeps the difference until the next regulatory period
- From the next regulatory period onwards, revenues are set based on the actual capex incurred, and therefore consumers will reap the benefit of more efficient capex.

**This requires a thorough review of capex to ensure that the TSO does not inflate forecast costs,** as discussed in Section 1.2.4.

A variation on this approach is whether to update the RAV based on actual or forecast depreciation. Using actual depreciation (which is based on actual capex incurred) increases incentives because the benefit/cost to the TSO of under/over spends is greater. Using forecast depreciation weakens incentives somewhat.

#### Capital expenditure sharing mechanism

The key weakness of the above approach to incentivising efficiency capex is that it discourages capex savings late in the regulatory period, because the TSO will keep the benefit for a shorter period. It has an incentive to delay the efficiency capex until the start of the next regulatory period and keep the benefit for longer.

A capital expenditure sharing mechanism can be used to achieve constant incentives in each year of the period. The sharing mechanism can work as follows:

- At the regulatory review, the over/under spend on capex is calculated for the recently completed regulatory period
- The value of the cumulative over/under spend is calculated in present value terms

- Apply a sharing ratio (typically 20 to 35 per cent) to this amount and adjust it for any benefit/cost already incurred during the recently completed regulatory period. The ratio applied to under/over-spending can be asymmetric, to further protect against consumers from the risk of the TSO over-spending.
- The above calculations then result in an adjustment to allowed revenues for the forthcoming regulatory period.

RAE's assessment is that **while a capex sharing mechanism would ensure that the incentives on the TSO are constant in each year of the regulatory period, it adds more complexity to what is already a significant change for RAE and the TSO. RAE therefore suggests moving to a simple incentive based regime for the first three-year regulatory period. More complex sharing mechanisms will be examined for the period thereafter.**

#### Ex-post capex reviews

Another regulatory tool that can be used to incentivise efficient capex is for the regulator to conduct ex-post reviews of capex overspend. If certain criteria are met, the disallowed portion of the capex would be excluded from the RAV.

The criteria against which RAE could disallow capex on an ex-post basis might be as follows:

- Capex incurred which was above the allowance and is deemed to be inefficient
- Capex incurred due to inflated 'related party' margins
- Capitalised opex resulting from a change in capitalisation policy that had already been recovered through opex allowances.

In the absence of robust service standards, RAE wishes to make ex-post adjustments for capex which was deferred without adequate justification.

RAE in theory already conducts ex-post reviews of overspent capex, although in practice the TSO has not overspent its allowance in recent years. RAE considers as reasonable that ex-post reviews are continued, as a means of extra protection for consumers from the risk of a TSO intentionally overspending.

#### Premium on significant investments

RAE is also investigating whether to allow a RoR 'premium' to capex that is deemed to be of national significance, or which has wider system or market benefits (such as reducing the costs of public service obligations by interconnecting islands to the mainland system), or otherwise have a strong economic cost-benefit justification. From a finance perspective, the underlying capital structure and risk profile of these investments should be no different, and therefore nor should the RoR. However, RAE recognises that a RoR premium could be justified from an economic perspective, if the investment results in benefits to Greece as a whole that are not otherwise reflected in the incentives faced by the TSO.

A RoR premium, and how it would be implemented, should be therefore considered in more detail with a view to potentially introducing it post-2017. Nevertheless, the proposed interim methodology makes an allowance for RAE to specify such a premium even earlier.

#### 1.4.2. Operating expenditure

Current approach:

**Allowed revenues are adjusted for differences between forecast and actual opex, but only outside of a 3% margin.** In other words, if actual opex is up to 3% greater or less than forecast opex, then the TSO bears/keeps the difference. In addition, changes in opex that is deemed outside of the TSO's control are adjusted.

Review of approach:

A review of possible opex incentive mechanisms is provided below. In summary, **RAE's suggestion is the same as for capex – that the TSO keep the benefit/cost of opex under/over-spends until the end of the regulatory period, and that the only way in which actual opex is scrutinised is when developing forecasts of opex for the next regulatory period. An operating expenditure sharing mechanism is proposed to be applied post-2017.**

##### Opex over or under-spends

Many revenue cap regimes incentivise efficient opex in a similar way to that described for capex above:

- Allowed revenues are set using forecast opex and no adjustments are made for the difference between forecast and actual opex.
- Except that when allowed revenues are set for the next regulatory period, the starting point will reflect historical opex (and therefore usually be lower if savings were made in the last regulatory period) which benefits consumers (the 'ratchet effect').

The current approach is similar to the above, except that it only applies to differences within a 3% margin of forecast opex. This affords the TSO some protection from opex increases outside its control, but weakens incentives. It is difficult to judge the extent to which the TSO genuinely needs this protection without further analysis, however RAE's current view is that a 3% margin is very likely to be too small and that the margin can probably be removed altogether.

It is important to note that the TSO has an incentive to inflate opex in the last year of the regulatory period, in order to try and justify a higher opex allowance in the next period. This can only be managed through robust reviews of opex forecasts.

##### Operating expenditure sharing mechanism

An operating expenditure sharing mechanism works much the same as a capital expenditure sharing mechanism – allowed revenues are adjusted at regulatory reviews to ensure that the benefit/cost of

opex under/over-spends are always kept (for a fixed period of time) based on a sharing factor, regardless of when they occur.

Opex and capex sharing mechanisms do have slightly different implications due to the way they are incorporated into allowed revenues (opex directly, capex indirectly through depreciation and return on capital over time). The use of capex sharing mechanisms is primarily about ensuring constant incentives throughout the regulatory period. Even in the absence of a capex sharing mechanism, capex under/over-spends are shared between the TSO and consumers through lower/higher future depreciation and return on capital. Depending on the RoR, the asset life and when the under/over-spend occurs, the TSO receives approximately 10-30% of the benefit/cost, with consumers receiving the rest.

Opex is different. If the TSO under-spends on opex it keeps the full benefit in that year and consumers do not share any direct benefit (only indirect benefits in the form of lower opex allowances in the next regulatory period). Therefore, a case can be made for applying an opex sharing mechanism to guarantee that opex savings are directly shared between the TSO and consumers.

A sharing mechanism will help mitigate the effect of the TSO inflating its forecasts; however, it should not be introduced purely as a substitute for a robust review of forecast opex. As with capex, **RAE's suggestion is to apply a simple incentive mechanism for the first three-year regulatory period, and consider implementing a more complex opex sharing mechanisms thereafter.**

#### 1.4.3. Interconnection revenues

Current approach:

**Interconnection revenues are fully passed through, with the exception of capacity auction revenues being subject to a €30 million cap.** This cap has never been breached to date.<sup>4</sup>

Review of approach:

There is no clear need to encourage the TSO to maximise (or minimise) its interconnection revenues, and therefore a cap seems unnecessary. However the cap on capacity auction revenues is required by European legislation. Therefore, RAE proposes to **continue the current pass-through arrangements.**

#### 1.4.4. Revenues from unregulated activities

Current approach:

**Revenues from unregulated activities are fully passed through.**

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<sup>4</sup> Revenues allowed for 2014 exceed this cap. RAE intends to use the additional revenue as a potential ad-hoc smoothing mechanism to alleviate year-on-year fluctuations in total allowed revenues.

Review of approach:

It is likely that revenues from **unregulated activities are not significant enough, relative to the overall costs of the network business, to warrant an incentive mechanism.** However, if they did become significant, RAE should examine implementing an incentive mechanism along the same lines of that applied to opex.

#### 1.4.5. Volumes

Current approach:

Allowed revenues are **adjusted annually based on the difference between forecast and actual revenues earned by the TSO.**

Review of approach:

The nature of a revenue cap regime is that the TSO is protected for changes in volume, given that such changes are largely outside of its control. The alternative is a price cap regime, whereby the TSO is exposed to changes in volume (and therefore arguably has an incentive to increase the volume of electricity sold relative to forecasts).

RAE therefore deems as **appropriate to continue volume adjustments of allowed revenues at regulatory reviews.** All adjustments should be on an NPV neutral basis.

#### 1.4.6. Revenue smoothing

Current approach:

There is currently **no formal mechanism for smoothing of allowed revenues** from year to year. In the past RAE has made ad-hoc decisions regarding the timing of interconnection capacity auction revenues or settlement of revenue adjustments to smooth the impact on final tariffs.

Review of approach:

A review of revenue smoothing mechanisms is provided below. In summary, **RAE suggests smoothing revenues within the regulatory period to minimise changes in tariffs from year to year. It is also suggested allowing revenues to be smoothed between regulatory periods when the impact of one-off changes in tariffs on consumers is a concern, or in exceptional cases to improve the financeability of large investments.**

##### Smoothing within the regulatory period

Smoothing of revenues *within* the regulatory period is a feature common to many revenue cap regimes. It smoothes the effect of large investments (occurring part way through a regulatory period) on customers by effectively averaging out forecast costs. It is a mechanical calculation undertaken at regulatory reviews that can be simplified as follows:

- The costs of the TSO are forecast for each year of the regulatory period.
- Allowed revenues, which are constant in each year of the regulatory period, are determined such that the NPV of forecast costs is equal to the NPV of allowed revenues over the regulatory period.

If significant changes in volume are expected over the period, revenues can be smoothed such that the average tariff is equal in each year. Technically, this is done by dividing the NPV of forecast costs by the NPV of forecast volumes.

#### Smoothing between regulatory periods

There may be circumstances where it is appropriate to smooth the change in allowed revenues from one regulatory period to the next, in order to minimise the impact on consumers. In rare cases, it may also be appropriate to change the profile of revenues to improve the financeability of large investments.

Allowed revenues can be smoothed between regulatory periods by introducing an ‘X’ factor. The X factor can be interpreted as average annual efficiency savings, but it should not be confused with efficiency factors that are set *exogenously* through benchmarking or total factor productivity studies (as applied in some regulatory regimes). The X factor is set *endogenously* based on forecast costs. It is calculated as follows:

- The costs of the TSO are forecast for each year of the regulatory period.
- The X factor is calculated such that:
  - Allowed revenue in year 1 of the regulatory period is equal to allowed revenue in the last year of the previous regulatory period, multiplied by  $1 - X$ .
  - The NPV of forecast costs is equal to the NPV of allowed revenues over the regulatory period, subject to the condition that allowed revenues in each year is equal to allowed revenues in the previous year multiplied by  $1 - X$ .

#### Cash flow considerations

Whenever revenues are smoothed, either within a regulatory period or between periods, RAE should consider the cashflow impacts on the TSO. Smoothed revenues mean that the TSO’s annual revenues may be substantially different to its annual costs, which could cause difficulties for financing large investments. In exceptional cases, RAE is proposed to change the profile of allowed revenues to improve financeability.

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## 2. Summary of recommended changes

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### 2.1. Form of regulation

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- Move to a 3-year regulatory period (2015 to 2017). Consider longer regulatory periods thereafter.

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### 2.2. Build-up of allowed revenue

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- Forecast costs in real terms and index allowed revenues to inflation.
- Define a set of principles for forecasting opex and capex and relate forecasts to service standards.
- Calculate depreciation using economic asset lives rather than accounting asset lives.
- Calculate return on capital based on a pre-tax real RoR.
- Define a clear set of principles for determining the RoR.
- Allow the costs related to unregulated activities to be excluded from opex if such a separation is possible, but if not, continue to deduct unregulated revenues from allowed revenues.

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### 2.3. Treatment of regulatory assets

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- There is no clear economic reason to revalue the existing RAV.
- Adjust the new RAV for inflation at each regulatory review.
- Roll the RAV forward based on actual capex and actual depreciation, from the date at which capex is incurred.

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### 2.4. Revenue adjustments (incentive mechanisms)

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- Increase the TSO's incentive to improve the efficiency of capex by not adjusting revenues for the difference between forecast and actual capex, with the exception of unjustified deferrals.
- Increase the TSO's incentive to improve the efficiency of opex by not adjusting revenues for the difference between forecast and actual opex. Consider historical expenditure when forecasting opex for the next regulatory period.
- Smooth revenues within regulatory periods to minimise the impact of tariff changes on consumers. Always consider the cashflow impacts of smoothing on the TSO.
- Smooth revenues between regulatory periods if there is concern about the impact of one-off tariff changes on consumers, or in rare cases to improve the financeability of large investments.
- Consider introducing capex and opex incentive sharing mechanisms post 2017, to apply constant incentives throughout the regulatory period.