Energimarknadsinspektionen
Swedish Energy Markets Inspectorate

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# Improved and clearer regulation of the electricity grid operators' revenue frameworks

## Proposed amendments to the Regulation concerning the determination of revenue frameworks for the supervisory period 2016 -2019

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The report is available from www.ei.se

# Foreword

The Swedish Energy Markets Inspectorate (Ei) is tasked with monitoring whether electricity grid operators fulfil their obligations in accordance with the Electricity Act.

There are approximately 180 electricity grid operators in Sweden. These have monopolies in their geographic areas. Since there is an absence of competition in the electricity network market, it is regulated, and Ei monitors to ensure that the companies are not charging excessive fees and that the electricity supply is of good quality.

In 2012, ex-ante regulation of electricity network fees was introduced. This means that Ei decided on a framework for every electricity grid operator which regulates the total amount in electricity network charges that they may collect from their customers during the years 2012-2015. The revenue framework shall ensure that the companies obtain reasonable coverage of their costs and profit on the capital that is required to run the operations, at the same time as the customers are assured reasonable fees. The decisions on the revenue frameworks for the period 2012-2015 have been appealed by approximately half of the companies, and there is ongoing litigation regarding the correctness of the decisions.

In April 2013, Ei submitted a number of legislative proposals to the Government on how the electricity network regulation could be developed and clarified prior to the second supervisory period spanning 2016 to 2019. Ei has subsequently been commissioned by the Government to submit proposals on the detailed provisions that will govern how the revenue frameworks shall be determined. These proposals, including impact assessments, are presented in this report.

As part of this work, Ei has obtained statements from representatives of the electricity grid operators and consumer organisations.

Eskilstuna, March 2014

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Director General

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# Summary

On 13 February 2014, the Government submitted the bill 2013/14:85, *The electricity grid operators' revenue frameworks*, to the Swedish Parliament (Riksdagen). The bill proposes that new normative powers should be introduced in Chapter 5 of the Electricity Act. This means that the Government, or Ei on the Government's authority, can issue Regulations regarding the calculation of reasonable costs and the calculation of a reasonable return in connection with the electricity grid operators' revenue frameworks being determined.

The Government has considered it necessary to prepare a supporting document that allows a position to be taken on what amendments should be made to the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857), the so-called Capital Base Regulation. For this reason, Ei has been commissioned to investigate and propose amendments to the so-called Capital Base Regulation.

## The current regulatory framework for calculating revenue frameworks has major shortcomings that must be addressed

Prior to the introduction of the ex-ante regulation, the issue was investigated of how revenue frameworks should be determined and which kind of legislation should apply. In the report submitted by the Energy Network Commission through SOU 2007: 99, *Advance review of network tariffs*, etc., the Commission primarily pointed to the need for an age determination of the network, and that certain key parameters in the regulation would be established in legislation.

When the advance review was initiated, however, many of the proposals from the report did not result in action. Most of the assessments of the control model's design were therefore submitted to be finally developed through case law.

Prior to the first supervisory period, Ei made certain choices of method. These choices must be seen against the background of the short time available to develop a completely new model for ex-ante regulation of the electricity grid operators' revenue frameworks. Ei can now conclude that some of the choices made were, in retrospect, wrong and in all material aspects based on the premise of a simple and predictable regulatory model. With the support of the experience gained by Ei through developing the existing regulatory model, applying the method to around 180 companies and also handling all the appeals that followed, Ei can conclude that both the current regulatory framework and the control method need to be revised.

In order for the companies and customers to be able to rely on the regulation remaining robust for a long time to come, Ei concludes that the regulation cannot be formed solely through Ei's application and the courts' case law, which may take a very long time. It is on the other hand not appropriate that Ei be given extensive authority to prescribe regulations in fundamentally important issues. Such regulations should instead be issued by the Government.

## Ei's method for the calculation of revenue frameworks has major deficiencies that are necessary to address

With current regulation, a real annuity method is applied for the allocation of capital costs. The method is applied without information on the installations' age, resulting in several serious consequences. There is an obvious risk of the companies being over-compensated and the customers having to pay for the same installation more than once. This risk arises that capital costs are reimbursed for fully depreciated assets, and through electricity grid operators receiving excessive equity compensation in the event that the depreciation period in the regulation is too short. Furthermore, the lack of information on the installations' age means that Ei is neither able to follow up on the depreciation periods applied in the regulation, nor the rate of renewal and age status of the Swedish electricity networks.

The current control model thus implies that there are significant and obvious risks of the grid operators being overcompensated, which affects the country's electricity customers.

Ei can also conclude that the method of capital cost calculation that has been applied can inhibit the renewal of critical infrastructure. The model provides incentives for companies to continue to run older installations rather than investing in new and more efficient installations. Incentives to continue running older installations arise from the companies receiving the same compensation level regardless of age.

The current control model is both theoretical and standardised. This leads to practical problems when the method is to be applied to the country's approximate 180 electricity grid operators, which all have varying conditions for running a network organisation and their current situation for historical reasons differs.

When a real annuity method is applied in the regulation, this means that the capital costs are allocated as a real constant over time, which means that the capital costs in the regulation do not reflect the companies' actual (accounting) capital costs which in reality decrease linearly over time. This gives rise to several difficulties, including newly-established grid operators having to finance the prevailing differences between regulated compensation and actual capital costs themselves. Furthermore, this could mean big problems for municipal companies that must adhere to the so-called prime cost principle of the Local Government Act.

In addition, a control method based on a real annuity method and standard costs for ongoing operating and maintenance costs could mean that certain categories of companies do not obtain cost recovery, as standard costs do not reflect the individual conditions prevailing within the particular electricity grid operator's operations.

Finally, it is pedagogically difficult to explain the control model to customers who have a lack of confidence in and acceptance of the regulatory model due to there being excessively large differences between the capital costs compensated through regulation and the actual capital costs.

## The shortcomings in the regulation would in essence be perpetuated by a development of the real annuity method - a method replacement is necessary

The real annuity method leads to overcompensation which, for the first supervisory period, Ei has chosen to manage with a so-called transition method that is subject to judicial review. Most of the electricity grid operators that submitted statements feel that the overcompensation resulting from the annuity method must be dealt with in some way. The proposal that most companies submitted is for the initial capital base to be adjusted so that the adjusted method gives the same capital cost as a real linear method would, using a "semi-old network" of around 20 years as a starting point. However, there are several problems with this type of adjustment, such as some companies whose capital base is younger than "semi-old" being affected particularly severely. Furthermore, such an adjustment entails an overcompensation for those electricity grid operators with a volume of installations which on average is older than 20 years. There is also a lack of data needed to perform adequate assessments of how these adjustments should be made, and thus a lack of supporting data needed to introduce such provisions in the Regulation.

When applying a real annuity method in the regulation, it requires the development of both standard costs for controllable running costs as well as tighter quality regulation. It is resource intensive and complex to develop standard costs and there are high requirements that standard costs be designed in such a way that companies are not systematically advantaged or disadvantaged. In an application with standard costs, virtually no companies will have real costs in line with standard costs. Standard costs fall within an area that includes extensive use of assessments and thus cannot be considered appropriate to establish in regulation. In the event of any court action, Ei must, using such a method, first present a report convincing the court that developed standard costs provide reasonable results, and that it is appropriate to make use of standard costs instead of the companies' actual costs.

When real annuity is applied without standard costs for controllable running costs, i.e. as in the current regulation, the only control that encourages reinvestments in the network becomes the quality regulation. It is not possible or appropriate to create a quality regulation that is so strong that it completely compensates for the incentives created with a real annuity method. In today's legislation, there are also limitations on the quality reduction.

Even if the current method were to be adjusted in the manner suggested by the companies, and even if standard costs for running costs and tighter quality regulation were developed, deficiencies in the method would still remain. Temporary and standardised solutions for taking care of the problem of overcompensation do not solve the problems with the method in the long term. An effective regulation cannot be achieved if the depreciation periods in the regulation are not followed up and if the age of the installations is not taken into account. Electricity grid operators have a significant information advantage when it comes to these issues and they will always have the incentive to work to ensure that the depreciation periods in the regulation are as short as possible. This leads to the electricity grid operators being overcompensated. Furthermore, regulation with a real annuity method and with standard costs for ongoing controllable costs would essentially be very theoretical and standardised and not take into account the companies' individual circumstances. This may mean that some companies do not obtain full cost recovery.

Finally, a theoretical model with real annuity and standard costs means that the various parts of the revenue framework do not match the reality of division between, for example, capital costs and running costs even if the total limits of the revenue framework might be considered reasonable. It would thus create a situation where companies that are undercompensated for certain parts of the revenue framework would appeal these parts, despite being overcompensated in other parts. That such a model is in itself very theoretical would mean that the court processes would be both complicated and risky. With a completely standardised regulation, Ei's control capabilities would also be significantly reduced. It is also questionable whether it is reasonable to apply a method that so pointedly ignores the approximate 180 electricity grid operators' individual circumstances in terms of size, history and ownership structure.

### Ei's proposal for method replacement

An alternative method for allocating capital costs is a real linear method that takes the installations' age into consideration. The method aims for correct depreciation periods as it is in the electricity grid operators' interest that the installations' generate returns for as long as possible. With this method, the risk of overcompensation found with the current method, is eliminated. The method also provides investment incentives for both new and replacement investments. The method thus requires neither standard costs for controllable running costs nor tight quality regulation to achieve control towards reinvestments in the network. With a real linear method, the regulation would, in its important parts, be based on the companies' actual conditions. This means that such a method is much easier to apply to a wide range of companies with different individual circumstances. Application of a real linear method provides a direct follow-up of both depreciation periods and reinvestments in the network.

Ei also suggests that the regulatory depreciation period should be fixed together with a so-called successive revision component which provides incentives for the electricity grid operators to maintain functioning installations even after the depreciation period has expired. This avoids the risk that the installations are not utilised optimally from a socioeconomic perspective.

### The regulatory model should be defined in a Regulation adopted by the Government

Ei considers it absolutely necessary that essential principles for the regulation are established in a Regulation adopted by the Government. Just as the Government has stated in the Preparatory Works, today's regulation is not sufficiently clear, which has resulted in a lack of legal certainty. Several significant issues, such as how capital costs should be calculated, are at present submitted to evolve in case law rather than being clarified in legislation. The fact that there is ongoing litigation in administrative courts will probably not mean that there will be established case law in this area that can serve as a guide in the place of legislation.

It is Ei’s view that the regulatory framework must be clarified already prior to the next supervisory period beginning in 2016. Ei's proposal for new provisions in the Capital Base Regulation assumes that it is the Government and not Ei who should issue regulations concerning provisions of great importance to the revenue framework's design. The establishment of additional rules in regulation form contributes to the

creation of a long-term perspective which has been lacking when it comes to ex-ante regulation of the electricity grid operators' revenue frameworks.

According to Ei's proposal, the so-called Capital Base Regulation shall prescribe the use of a real linear method for calculating capital costs. Furthermore, Ei's proposal states that the Regulation should indicate the economic life that is to apply, and the level of capital cost compensation to be paid after the economic life. The proposal also includes the normative powers to be provided to Ei.

The potential and less desirable consequences of applying a real linear method, such as more volatile tariffs, are of marginal importance according to Ei and are not reasonably proportionate to the serious deficiencies entailed by real annuity. Ei considers it entirely possible to implement a method change from a legal perspective, and the subsequent administrative consequences are deemed marginal according to Ei's analysis. The method replacement may also be considered part of the regulatory risk that is covered by the risk supplement in the costing interest when the companies' returns are calculated.

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# Legislative proposal

The Government prescribes the following with regard to the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857)
*firstly* that the current §§ 13–16 shall be designated §§ 17–20,
*secondly* that four new sections §§ 13-16 shall be inserted, and the preceding sections § 13, §14 and § 15 shall be given new headings with the following wording.

| *Current wording* | *Proposed wording* |
|---|---|
| | ***Reasonable costs*** |
| | *§ 13*<br>*In calculating reasonable costs, the costs shall be divided into costs that the network concessionaire can influence and costs that the network concessionaire cannot influence.*<br>*The Swedish Energy Markets Inspectorate may issue regulations on what costs the network concessionaire can influence and which index to use when these costs are recalculated with respect to changes in the price situation.* |
| | ***Assets' economic life*** |
| | *§ 14*<br>*In the calculation of consumption of fixed assets according to § 15,*<br>*first paragraph, the economic life shall be determined as the following:*<br>*1. 40 years for cables,*<br>*2. 40 years for stations, transformers and peripheral equipment, and*<br>*3. 10 years for systems for operation or supervision of a fixed asset for the transmission of electricity, or systems for calculating or reporting the measurement of electricity transmitted.* |

***Calculation of consumption of fixed assets***

*§ 15*

*When calculating a reasonable return, the part of the capital costs corresponding to consumption of fixed assets is calculated as a fixed share of the present acquisition value. The fixed share is calculated based on the asset's economic life in accordance with § 14.*

*For assets whose age exceeds what is stated in § 14, the part of the capital costs corresponding to the consumption of fixed assets is calculated as a fixed share of the present acquisition value. The fixed share is calculated based on the asset's age. For cables, stations, transformers and peripheral equipment that is older than 50 years, and for systems for the operation or monitoring of a fixed asset for the transmission of electricity or systems for calculating or reporting the metering of electricity transmitted that are older than 12 years, the consumption of fixed assets is calculated as zero.*

*The Swedish Energy Markets Inspectorate may issue more detailed regulations concerning the calculation of the consumption of fixed assets under the first and second paragraph.*

*§ 16*

*The Swedish Energy Markets Inspectorate may issue regulations on how the fixed assets' age shall be determined in those cases where age data is missing.*

# 1 Introduction

Electricity network operations represent both a legal and natural monopoly due to it being socioeconomically unviable to build parallel electricity networks that compete for customers. In a competitive market, competition typically leads to downward pressure on prices and or improved quality. In a market that is not competitive, competitive pressures need to be replaced by regulations and regulatory oversight. The basic purpose of regulating the electricity network charges is to protect customers so that they do not have to pay more than necessary. At the same time, monopoly companies must achieve sufficient revenues to operate the networks in a professional and cost efficient anner and ensure a reasonable profit. In order for electricity network regulation to work well in practice, the regulations must contain clear rules on how decisions on revenue frameworks are to be established.

In April 2013 the Swedish Energy Markets Inspectorate (Ei) submitted the report *"Proposal for a revised regulatory framework for the assessment of the electricity grid operators' revenue frameworks - legislative proposals for the second supervisory period 2016-2019*[1]*"* to the Government. In the report, Ei proposed inter alia extended normative powers with respect to how the electricity grid operators' revenue frameworks would be determined. The background to the proposals was primarily that the Electricity Act at present only contains general provisions on how the revenue framework shall be determined and that too much of the regulation is submitted to evolve through case law.

On 13 February 2014, the Government submitted the bill 2013/14:85, *The electricity grid operators' revenue frameworks*, to the Swedish Parliament (Riksdagen). The bill proposes that new normative powers should be introduced in Chapter 5 of the Electricity Act. This means that the Government, or Ei on the Government's authority, can issue regulations regarding the calculation of reasonable costs and the calculation of a reasonable return in connection with the electricity grid operators' revenue frameworks being determined.

The Government has considered it necessary to prepare a supporting document that allows a position to be taken on what amendments should be made to the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857), the so-called Capital Base Regulation. For this reason, Ei has been commissioned to investigate and propose amendments to this Regulation.

## 1.1 Commission

In February 2014, Ei received the following commission:

"The Government commissions the Swedish Energy Markets Inspectorate to investigate and submit proposals for amendments to the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857), the so-called Capital Base Regulation. The commission includes comparing different methods for calculating capital costs and describing the advantages and disadvantages of these.

[1] Ei R2013:06

The commission involves the Swedish Energy Markets Inspectorate gathering input from relevant authorities and organisations. The execution of the commission will involve continuous feedback to the Government Offices (Ministry of Enterprise, Energy and Communications).

The Swedish Energy Markets Inspectorate shall conduct an impact analysis of what the proposed amendments to the Regulation provisions entail for customers, electricity grid operators and other affected actors.

The commission results are to be presented to the Government Offices (Ministry of Enterprise, Energy and Communications) no later than 1 April 2014. The report may, by special agreement between representatives of the Government Offices (Ministry of Enterprise, Energy and Communications) and the Swedish Energy Markets Inspectorate, be presented on a date other than that stated.

The commission in its entirety can be found in Appendix 1.

## 1.2 Delimitations

The commission involves comparing different methods for calculating capital costs and describing the advantages and disadvantages of these. As there is a connection between the various parts of the revenue framework, Ei also intends to highlight the connections and the incentives created by choosing different paths. The focus of the report has, however, been on methods for calculating capital costs and methods for calculating controllable running costs and the relationship between these.

The report has also briefly highlighted the quality regulation's impact in different choices.

The report does not include methods for calculating the costing interest or calculating efficiency requirements as these are less appropriate to establish in law or Regulation.

## 1.3 Ongoing work at Ei prior to the second supervisory period

In addition to the work with submitting proposals for amendments to the Capital Base Regulation as outlined above, there are at present three additional projects being run by Ei pertaining to the electricity grid operators' revenue frameworks for the second supervisory period.

In the project “Efficiency requirements in ex-ante regulation”, the electricity grid operators' cost efficiency and productivity development are analysed. The analyses are based on historical data that the electricity grid operators have submitted to Ei. The results of the analyses will form the basis for the determination of the efficiency requirements on electricity grid operators for the next supervisory period.

In the project entitled ”Incentive regulation for smart grids linked to the electricity grid operators' revenue framework”, it is investigated the incentives that may contribute to smarter grids. The project is a natural development of the regulation as well as a result of Government Bill 2013/14:174, Implementation of the Energy Efficiency Directive, which imposes requirements in terms of efficient utilisation of electricity networks. Ei makes a delimitation in the project meaning that smart grids from a regulation perspective mainly focus on the efficient use of networks.

In the project *"Quality adjustment of the electricity grid operators' revenue framework"* it is investigated how the quality method applied in the Regulation during the first supervisory period 2012-2015 can be developed prior to the second supervisory period 2016-2019. Since the quality method was developed, access to more detailed outage statistics has improved, allowing for a more detailed description of customer outage costs. The motivation for developing the quality adjustment method is to better capture the outage cost for the electricity customers and further develop the desirable control effects.

## 1.4 Project organisation

Work on this project has been carried out by a project group made up of Semira Pandur (project manager), Dennis Jonsson, Christina Hjulström, Johan Carlsson and Rebecka Thuresson. The project owner has been Deputy Director General Tony Rosten.

Relevant authorities and organisations have been given the opportunity to submit written viewpoints in the initial phase of the work due to the short time that has been made available for the assignment. The questions provided by Ei are found in Appendix 2. The viewpoints received are presented briefly in Chapter 3 and are available in their entirety in Appendix 3.

The project group has provided continuous feedback on the work to the Ministry of Enterprise, Energy and Communications.

# 2 Ei's method of assessing revenue frameworks for the supervisory period 2012 – 2015

This chapter presents a brief account of the method Ei has applied in decisions regarding the electricity grid operators' revenue frameworks for the first supervisory period 2012 – 2015. The method has been based on the so-called standardised method and on the so-called transition method. Furthermore, the adjustments to the method that Ei has allowed within the context of the court processes are also presented. In addition, the chapter briefly describes the significance of the Administrative Court's rulings in the cases pertaining to revenue frameworks for the supervisory period 2012 – 2015.

## 2.1 The standardised method

The starting point for decisions on revenue frameworks for the first supervisory period has been a standard calculation method prepared by Ei (the standardised method). This method is based on assumptions about the cost recovery and return a reasonably efficient electricity grid operator with similar objective conditions should have over time in order to meet its obligations. With this revenue, the grid operator can recover its costs and achieve profitability in its operations so that the grid operator can run the network with high supply security and make the necessary investments to develop the electricity grid.

In accordance with the standardised method, the revenue framework is made up of capital costs, controllable and non-controllable running costs. When calculating the revenue framework, account is also taken of the electricity grid operators' way of conducting network operations through a quality regulation. The quality regulation has been established based on the historical quality the individual grid operators have had. Adjustment resulting from better or worse supply quality occurs first during the reconciliation, i.e. after the end of the supervisory period, when data on the actual supply quality during the period becomes available. If the companies' supply quality differs from the norm levels, the company's return will be reduced or increased during the reconciliation of the revenue framework. The quality impact may not exceed the reasonable return and may not be greater or less than three per cent of the total revenue framework. More on quality regulation can be read in the report *Quality assessment of electricity networks in ex-ante regulation*[2].

The standardised method has its origins in Chapter 5 of the Electricity Act with Preparatory Works (Govt. Bill 2008/09:141) and the Capital Base Regulation.

### 2.1.1 Capital costs

Capital base refers to all assets that the grid operators use in their operations and which are covered by the Capital Base Regulation's definition of a

[2] Ei R2010:08.

fixed asset. The Regulation also presents the methods to be used during the present acquisition valuation[3] of these. According to the standardised method used by Ei in deciding on the revenue frameworks for the period 2012-2015, the norm values developed by Ei have been primarily used in the valuation of the capital base. It is only in the case of special reasons that the present acquisition value has been calculated based on the cost of acquiring or producing the asset when it was originally put into service, taking into account the change in the price situation from the acquisition date. If there has been no basis to calculate a present acquisition value in accordance with the above methods, the present acquisition value is calculated based on the fixed asset's book value. If the fixed asset has not had a book value or if there have been exceptional reasons, the present acquisition value has instead been determined at a reasonable value taking into the asset's condition.

Based on the capital base, the companies' capital costs have been calculated with a real annuity method, which means that capital costs are divided in such a way that they become a real constant over time.

Interest rates and return have been calculated using the WACC method (weighted average cost of capital). This method is described in the Preparatory Works (2008/09:141 p. 79*), Advance review of network tariffs*, and is an accepted method for calculating a reasonable return on the capital employed in a business. Ei has based decisions for the first supervisory period on a real costing interest before tax of 5.2 per cent.

The life time, i.e. the depreciation period, for a fixed asset included in the capital base that Ei has used in the calculation of capital costs is either ten or forty years. A facility for the transmission of electricity has, in the calculation, been assigned a depreciation period of forty years[4]. Other assets, such as installations for the measurement of electricity transmitted, systems used for the operation and monitoring of said installations, as well as systems for calculating or reporting the measurement of electricity transmitted, have been assigned a depreciation period of ten years[5]. The justification for the chosen depreciation periods is presented in the report *Advance review of electricity network tariffs – final report prior to the first supervisory period 2012-2015*[6].

### 2.1.2 Running costs

Ei's calculation method for calculating reasonable running costs means that running costs are divided into so-called uncontrollable and controllable costs. As non-controllable costs for the first supervisory period, Ei has classified costs for network losses, costs for overlying networks, costs for public authority fees and costs for subscriptions at the infeed point, so-called network utilisation compensation. These costs have, prior to the supervisory period, been forecast by the companies and the forecasts have been the basis for deciding the revenue framework. Following the expiry of the supervisory period, these costs will be reconciled against actual outcomes.

[3] The value of the electricity network should be equivalent to the average cost of, at the time of valuation, investing in similar assets under similar objective conditions.
[4] § 3, paragraph 1 of the Capital Base Regulation
[5] § 3, paragraphs 2-4 of the Capital Base Regulation
[6] Ei R2010:24

Controllable running costs have been calculated based on the company's historical costs for the years 2006-2009 and have been assigned an efficiency requirement of one per cent. A detailed description of the information that forms the basis for the calculation can be found in Ei's report *Running costs in ex-ante regulation – basic principles during calculation*[7]. A description of the background to the selected efficiency requirement of one per cent is provided in the report *The ex-ante regulation's requirement for efficiency – the revenue framework for running costs*[8].

A detailed description of how the controllable running costs have been calculated, including calculation examples, is found in the report *Advance review of electricity network tariffs – final report prior to the first supervisory period 2012-2015*[9].

### 2.1.3 Transition effects

In conjunction with the grid operators' capital being calculated in autumn 2011, Ei could conclude that the revenue frameworks according to the standardised method significantly exceeded the companies' previous revenue levels.

In the table below historical revenues for the years 2006-2009 are compared with the revenue frameworks according to the standardised method, as well as the adopted revenue frameworks. The information relates to local and regional operators[10] and is presented at 2010's price level, as well as rounded to a whole SEK billion figure, see Table 1.

Table 1 Comparison between the revenue levels

| Historical revenues 2006 – 2009 | Revenue frameworks 2012 – 2015 in accordance with the standardised method | Adopted revenue frameworks 2012 – 2015 |
|---|---|---|
| SEK 132 billion | SEK 181 billion | SEK 148 billion |

Source: Ei

A decision in accordance with the standardised method would mean a maximum allowable increase in the revenues of approximately 35 per cent over a six year period, compared with the revenue level for the years 2006-2009. This meant that the majority of the grid operators could raise their network charges significantly. Ei did not consider such a large increase to be justified and noted that the transition to advance review with the legal conditions that existed gave rise to transition effects that must be handled.

After analysing the magnitude of the differences that arose with the standardised method's results in comparison with the companies' previous revenue levels, Ei assessed that it was appropriate to equalise the revenue frameworks over time so that only after a transitional period did they reach the revenue levels resulting from the standardised method. A suitable transitional period was, according to Ei, four supervisory periods, i.e., 16 years. Since Ei's calculations were based on the companies' revenues for the years 2006-2009 (at 2010's price level), the distribution for the first supervisory period must also include the years 2010 and 2011, which means a period of 18 years. For the supervisory period 2012–2015, this means

[7] Ei R2010:6
[8] Ei R2010:11
[9] Ei R2010:24
[10] Information relating to Bliekevare Nät AB, Baltic Cable AB, Laforsen Produktionsnät AB, Röbergsfjället Nät AB and Swepol Link AB are not included in the compilation.

that an electricity grid operator's revenues have been adjusted to a revenue framework calculated with the standardised method with a maximum of six eighteenths.

## 2.2 Adjustments to the method in connection with litigation

About half of all decisions made by Ei regarding the companies' revenue frameworks were appealed to the Administrative Court in Linköping. There, Ei conceded some adjustments to the method used in the determination of the companies' revenue frameworks for the first supervisory period.

According to Ei's method, all costs, calculated in accordance with the standardised method, were covered by the transition method, i.e. capital costs and controllable running costs as well as non-controllable running costs. This produced less desired effects and Ei therefore allowed the method to be adjusted so that capital costs for net investments during the years 2012 – 2015, and projected non-controllable running costs, were not covered by the transition method. For these costs Ei considers, according to its statement to the Administrative Court, that the standardised method should be fully applied. The revenue frameworks calculated in accordance with Ei's approved adjustments amount to SEK 160 billion[11], which is an increase in the adopted revenue frameworks of SEK 12 billion.

## 2.3 The Administrative Court's rulings in the cases

On 11 December 2013, the Administrative Court gave rulings in the cases regarding revenue frameworks for the supervisory period 2012 -2015. The Court found that the standardised method developed by Ei for calculating the grid operators' revenue frameworks is prepared in accordance with current provisions, according to which both the customers' and the grid operators' interests have been taken into account. An application of the transition method, according to the Administrative Court, means that the consumers' interest in low and stable fees, which was already taken into account when calculating the revenue framework using the standardised method, came to be considered once again. This also meant that the considerations made under the standardised method regarding both other consumer interests and the grid operators' interests more or less came to lose their significance. According to the Court, such a procedure lacks support in the regulation and the impact also affects the grid operators to varying degrees.

The Administrative Court found that Ei based its decision-making on and applied the transition method with consideration given to circumstances other than those which, according to legislation, should form the basis for determining revenue frameworks. Thus, according to the Administrative Court's assessment, Ei had not had the right to apply the transition method when determining revenue frameworks.

Some grid operators had also appealed Ei's calculated costing interest of 5.2 percent. Unlike Ei, the Administrative Court found in its rulings that a reasonable long-term stable costing interest should be set at 6.5 per cent before tax during the supervisory period 2012-2015.

[11] Information relating to Bliekevare Nät AB, Baltic Cable AB, Laforsen Produktionsnät AB, Röbergsfjället Nät AB and Swepol Link AB are not included in the compilation.

Ei has appealed virtually all of the Administrative Court judgments to the Administrative Court of Appeal in Jönköping. On 11 March 2014, the Administrative Court of Appeal issued leave to appeal in three so-called test cases as well as in one additional case. This means that the court processes regarding the electricity grid operators' revenue frameworks for the years 2012-2015 are still ongoing.

# 3 Identified deficiencies in the regulatory framework and in the current method for calculating revenue frameworks

This chapter describe the previous reports and the Government's positions on the issues considered relevant to Ei's report in this Government commission. The viewpoints received from stakeholders regarding Ei's work with investigating and submitting proposed amendments to the Capital Base Regulation are also briefly presented. The chapter concludes with a summary of Ei's position with regard to the current method, the so-called standardised method.

## 3.1 Previous studies of methods for advance review and the Government's positions

In this section Ei summarises some of the considerations that preceded the legislative process for introducing advance review in Sweden and which are of relevance to the current commission. This includes proposals submitted on 5 December 2007 by the Energy Network Commission in the report *Advance review of network tariffs, etc*. (SOU 2007:99) and the Government's positions on these proposals in Preparatory Works 2008/09:141, *Advance review of network tariffs*, which was submitted to Parliament on 5 March 2009.

The summary also includes Ei's considerations regarding the proposal for the so-called Capital Base Regulation submitted to the Government in autumn 2009 in the form of a report *Ex-ante regulation of electricity network charges - principle choices on key issues*, Ei R2009:09. Ei also provides a brief account of Bill 2013/14:85 *The electricity grid operators' revenue frameworks,* which was submitted to Parliament on 13 February 2014 and which is the basis for Ei receiving this commission.

The parts of the revenue framework highlighted in this section are the calculation of capital costs and running costs. Issues related to the quality of a network concessionaire's way of conducting network operations are not touched upon. Under section 3.1.6 is presented the normative powers found in the current provisions and which are attributable to the above Preparatory Works, as well as regulations that have been issued pursuant to these provisions.

### 3.1.1 Calculation of capital costs

To be able to calculate an individual grid operator's revenue framework, a capital cost needs to be determined separately for each network operation. A capital cost is a cost for the use of physical capital in the form of, e.g. cables and stations. The cost consists of two components, the cost for consumption of the asset (depreciation) and the actual return from the asset. The departure point is that the capital cost should be reasonable. In this assessment, the departure point is a cost for the effective running of a network operation with similar conditions. In order to calculate a reasonable capital cost in the determination of a revenue framework, several questions must be answered. These

include inter alia, what capital base should the capital cost be calculated, how the capital cost should be allocated over time, and what depreciation period should be used.[12]

### 3.1.2 Based on what capital base should the capital cost be calculated?

The following is laid down in Chapter 5, Section 9 of the Electricity Act. The capital base shall be calculated based on the assets which the network concessionaire uses in order to conduct the network operations. In addition, consideration shall be given to investments and depreciations during the supervisory period. An asset which is not required in order to conduct the operations shall be considered as part of the capital base, if it would be unreasonable towards the network concessionaire to disregard the asset. The Government can issue further regulations on how the capital base is to be calculated.[13]

*The Energy Network Commission's proposals*
The Energy Network Commission's proposals partially corresponded with the Government's proposals as expressed in the above provision of the Electricity Act. The Commission proposed that the network authority, prior to the first supervisory period, would determine the network concessionaires' opening capital base from the existing assets employed in network operations. The value of the electricity network, when determining the opening capital base, should be equivalent to the average cost of, at the time of valuation, investing in similar assets under similar objective conditions (present acquisition value). Under special circumstances, the value would, according to the Energy Network Commission's proposals, be calculated differently. Subsequently, an age deduction of fifty per cent of the value would be made. If a network concessionaire showed that its electricity grid was younger than the age deduction, the company would provide the network authority – i.e. Ei – a compilation of the average age of each individual component type. If information then was missing on a component type, on the component's age, an age deduction would be made of eighty per cent of the present acquisition value for this component. The value of the other assets in the determination of the opening capital base would be based on book value. If special reasons existed, the value would be calculated differently.

Prior to a supervisory period, according to the Commission, planned investments would be added to the capital base and depreciations would be deducted. The investments would correspond to the average cost of, in a rational and efficient way, carrying out similar investments under similar objective conditions. Investments that were obviously unnecessary to maintain a safe, reliable and efficient cable network would not be added to the capital base. The Energy Network Commission also proposed that the Government, or network authority authorised by the Government – i.e., Ei – would issue more detailed Regulations allowing investments up to a certain level to exceed the average cost, and methods for how depreciations should be calculated. Return would be calculated on the basis of established economic methods.[14]

The main difference between the Energy Network Commission and the Preparatory Works was that the Energy Network Commission advocated an asset-preserving principle in the valuation of the capital, while the Government

[12] Preparatory Works 2008/09:141 p. 67 f
[13] Preparatory Works 2008/09:141 p. 68
[14] SOU: 2007:99 p. 168 ff and 303 ff and Preparatory Works 2008/09:141 p.68 and 105

considered that the report did not present conclusive reasons that spoke for departing from the previous regulatory model's approach, i.e., a capacity-preserving principle.

Ei considered, like the Government, that there was no compelling reason not to apply a capacity-preserving method as shown in Ei's report *Ex-ante regulation of electricity network charges - principled choices on key issues*[15].

### 3.1.3 How should the capital cost be allocated over time?

The Government made, in the Preparatory Works to the Electricity Act, certain general considerations concerning the choice of method for calculating capital costs. Among other things it was noted that, during calculation, an established method for allocating the costs over time is needed. Furthermore, the Government stated that there are essentially four models for calculating capital costs. These methods are nominal linear, nominal annuity, real linear and real annuity. All of these methods meet the requirement of cost accuracy[16]. However, during an investment's life, the processes differ in respect of interest and depreciations depending on the method chosen. Upon introduction of the current concept of reasonableness in the Electricity Act, the Government did not take a clear position on which allocation methods should be used. The Government stated however that, when choosing a method in plant-heavy operations such as electricity network operations, the choice is usually between the nominal linear method and the real annuity method. From a regulatory perspective, both models should be applicable.[17]

*Nominal linear method*
The method is based on nominally constant depreciations of the acquisition value. Return is calculated on the undepreciated residual value. The capital costs are allocated in real terms so that they are high in the beginning of an installation's life and decrease towards the end of its lifespan.

*Real annuity method*
When applying a real annuity method, the present acquisition value is multiplied by an annuity factor calculated using a real interest rate and depreciation period. The capital costs are allocated so that they become constant in real terms over the course of an installation's lifespan.

*Choice of method*
The Energy Network Commission therefore advocated a nominal linear method, as the report considered it to be best in the application of an age-adjusted present acquisition value. The Government for its part thought that it was too early to decide which calculation method should be applied. It was the assessment of the Government that the network authority – i.e. Ei – should choose the method based on the methods' conditions as described above. In the Preparatory Works, the Government states the following. "The Energy Network Commission has stated that a nominal linear method is probably the most frequently used method, both in the municipal and private sector. A more detailed analysis has, however, not been conducted within the framework of the report. /…/. The Energy Network Commission recommends a nominal linear method as, according to the report, this is most appropriate in the case of an age-adjusted present acquisition value.

[15] Ei R2009:09
[16] Cost accuracy means that the present value total of the capital costs corresponds to the initial investment.
[17] Preparatory Works 2008/09:141 p. 76

The method used for calculating the capital base should dictate which interest principle is applied. Given that more detailed legislation on the valuation of the capital base shall be issued in Regulation form, the Government believes that it is currently too early to decide which method should be used. Once the capital base is determined, however, the choice of method should come quite naturally. It should therefore be the responsibility of the network authority to choose the method when calculating a reasonable capital cost."[18]

It was thus assigned to the network authority to choose the method when calculating a reasonable capital cost. The detailed considerations made by Ei in selecting a method, which ultimately was a real annuity method, are found in the report *Ex-ante regulation of electricity network charges - principled choices on key issues*.[19] As a capacity-preserving principle was chosen for the calculation of the capital cost, it was Ei's assessment that a real method should be used to allocate the costs over time. The choice of method was therefore between a real linear method or a real annuity method. The predominant reasons, at the time, for choosing an annuity method before a linear method was that the revenue framework should relate to quality and stable tariffs over time. There were also practical reasons for choosing an annuity method, as this method did not require information on the installations' age.

### 3.1.4 What depreciation period should be used?

The Government stated the following in the Preparatory Works' general considerations regarding depreciation periods: "In order to calculate a reasonable capital cost, regulatory depreciation periods need to be determined for the assets included in the capital base. The purpose of the depreciation period is to specify how long the asset is considered to have a value. The regulatory depreciation period need not be the same as the accounting depreciation period or the installation's technical life. The objective, from a regulatory perspective, should be to align the depreciation period with the installations' economic life. Taking into account that assets, such as electricity meters and electric cables, have different lifespans, it is necessary to some extent to differentiate the depreciation periods for different types of assets as per the Regulation. However, standardisation needs to be accepted for the regulatory model to be simple and transparent."[20]

The Energy Network Commission for its part, in its report, advocated specifying the depreciation periods in the regulatory framework. The report considered two alternative ways of determining a depreciation period in an ex-ante regulation; a fixed depreciation period or time intervals. According to the report, the advantage with fixed depreciation times for all companies was that it could facilitate comparisons between companies. With a depreciation interval for each component, the companies and the authority can determine the depreciation period that best suits the individual company. The advantage of the latter alternative was that the companies had a certain right of option to determine the rate of depreciation with respect to, for example, where they are located in an investment cycle. The method with depreciation intervals has been used in Finland. There, the companies have chosen as long a depreciation period as possible. Few have taken the opportunity to vary the depreciation period. In Norway, the depreciation period is between 25 and 40 years for different network components.

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[18] Preparatory Works 2008/09:141 p. 77
[19] Ei R2009:09
[20] Preparatory Works 2008/09:141 p. 77

The Energy Network Commission did not submit any proposal to what constitutes reasonable depreciation periods for different assets, but advocated a fixed depreciation period instead of time intervals.

However, with regard to the need for regulations, the Energy Network Commission's opinion was that the Government, or the network authority authorised by the Government – i.e. Ei – should be allowed to issue Regulations regarding depreciation periods. The advantage with such Regulations would be that appropriate depreciation periods for different assets could be analysed by the network authority and then specified in the authority's Regulations, thus avoiding the need to be subject to litigation. In this way, the possibility that depreciation periods would be the subject of future court disputes was eliminated. On the other hand, the Government considered that it might be reasonable for the grid operators to be able to have selected depreciation periods examined by the court in individual cases, especially considering that there is no practice relating to regulated depreciation periods for different assets in network operations. The Government therefore decided that the question of an applicable depreciation period would continue to be considered by the regulatory authorities. It was pointed out that this does not prevent the network authority from providing clear instructions in general guidelines regarding the authority's stance on the application of the Regulations.

In the report *Ex-ante regulation of electricity network charges - principled choices on key issues*[21], Ei proposed that the Government, or network authority authorised by the Government, should issue Regulations regarding depreciation periods. Ei's assessment was that it would facilitate the examination of the revenue frameworks and significantly reduce the risk of protracted litigation.

### 3.1.5 Calculation of running costs

In addition to an individual grid operator being provided coverage for capital costs, the revenue framework must also cover reasonable running costs. In Chapter 5, Section 8 of the Electricity Act there is a special provision for calculating reasonable costs which includes both capital costs and running costs. The Energy Network Commission's proposals were essentially consistent with those of the Government in terms of the formulation of this provision[22].

When they apply to the running costs, the Government stated the following.

"In the vast majority of cases it should be clear from the context whether a cost to be borne by the company is to be regarded as a running variable or fixed cost that should be considered when calculating a reasonable cost in network operations. The more comprehensive cost items would be costs for operation and maintenance, costs for having the network connected to overlying networks, different customer-specific costs such as costs for metering and invoicing, and costs for network losses. The revenue framework should cover reasonable costs for conducting network operations. This means that it is not necessarily the grid operator's actual costs that should be included in the calculation. A grid operator that has unnecessarily high costs due to the inefficient running of its operations should not be able to pass these costs on to customers through the network tariffs. It is also reasonable that the regulation be formulated in such a way as to provide

[21] Ei R2009:09
[22] Preparatory Works 2008/09:141 p. 64

the grid operator an incentive to reduce its controllable costs over time."[23]

The Government also stated the following on how the running costs can be divided and what can be assumed to be reasonable based on these costs.

"Roughly speaking, running costs in network operations can be divided into controllable costs, such as operating and maintenance costs, and non-controllable costs. Costs that companies cannot control should be considered as reasonable in their entirety. In terms of costs that can be controlled, it is fair that only costs for an appropriate and efficient running of a network operation be deemed reasonable. In determining whether a network operation is being conducted under appropriate and effective forms, the starting point for the comparison should be companies that conduct operations under similar objective conditions. Consideration may thus need to be given to the fact that the individual grid operators operate under different objective conditions. For example, grid operators running operations in coastal areas are in many cases assumed to have different conditions than companies with operations inland."[24]

Regarding issues pertaining to cost norms or efficiency criteria, the Government stated the following.

"For certain types of costs, it may instead be justifiable to have the same cost norms or efficiency criteria. From an administrative perspective, and to make the regulation reasonably simple, it may be accepted that the grid operators within a group differ between themselves. It is in the nature of the regulation that some simplifications and standardisations must be allowed. It should be the up to the network authority how the cost norms or efficiency criteria should be designed in detail. As an efficient operation will constitute the norm, it should be that the standard cost is lower than the average cost for the concerned grid operators. Such a scheme as the one now being proposed will effectively mean the network authority must establish a cost norm or develop efficiency criteria to which all or the individual grid operator's actual costs relate. The final design may be determined in practice. When using a cost norm or efficiency criteria, a grid operator that operates less efficiently than companies with similar conditions will probably not have their actual costs covered by the revenue framework. In reality, the return in this case may be lower in operations. In cases where a grid operator operates more efficiently than the cost norm, it is reasonable for the grid operator to profit by this difference. The grid operator will then be able to increase its return in operations. This in turn provides incentives for the grid operator to keep its costs down, which is positive from a societal perspective. In order for customers to also benefit from efficiency gains, the cost norms or efficiency criteria should be updated regularly."[25]

According to what has been stated above under the heading *Choice of method*, the Government transferred responsibility to Ei to choose the appropriate method for calculating capital costs.

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[23] Preparatory Works 2008/09:141 p. 65
[24] Preparatory Works 2008/09:141 p. 65
[25] Preparatory Works 2008/09:141 p. 66

Ei notes in the report *Ex-ante regulation of electricity network charges - principled choices on key issues*[26] that, if real annuity is applied, some kind of standard cost should be applied for at least those cost that increase with the installation's age (mainly operation and maintenance). Ei also notes that, if the real linear method is applied, it is reasonable to base calculations on the company's real costs and assign these an efficiency requirement.

### 3.1.6 Normative powers

The normative powers provided prior to the introduction of an advance review regarding the calculation of a revenue framework's costs are found in Chapter 5, Section 9, third paragraph of the Electricity Act[27]. There it states that the Government may issue additional regulations on how the capital base should be calculated. Ei, as a result of this, was commissioned to provide proposals on the Regulation provisions that needed to be communicated for the electricity grid operators' revenue framework to be able to be calculated within the framework of a new tariff regulation in which the grid operators' tariffs are fixed in advance. Ei's proposals were submitted in the report *Ex-ante regulation of electricity network charges - principled choices on key issues*[28] where Ei, inter alia, provided proposals on how the capital base should be valued and that Ei would be able to issue additional Regulations regarding depreciation periods. The Government then issued the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857), the so-called Capital Base Regulation. The Regulation contains, inter alia, provisions for the calculation of capital base and valuation of fixed assets (Sections 7-11) as well as authorisations for Ei to issue detailed Regulations on the information that a network concessionaire must submit for Ei to be able to examine a proposal for a revenue framework (Section 16, paragraph 1). With the support of this authorisation, Ei issued Regulation and general guidelines (EIFS 2010:6) on the network concessionaires' proposals for revenue frameworks and the collection of data to determine the revenue framework's size.

In the Bill that the Government has submitted to Parliament on 13 February 2014 (Govt. Bill 2013/14:85 The electricity grid operators' revenue frameworks), the Government proposes an amendment of the existing authorisation as well as a new authorisation in the Electricity Act.

Firstly, the Government proposes to introduce a new authorisation for the Government, or following authorisation by the Government, the network authority, to issue further Regulations concerning the calculation of reasonable costs. Secondly, the Government proposes that the current authorisation for the Government regarding the capital base calculation be changed so that the Government, or following authorisation by the Government, the network authority, can issue further Regulations concerning the calculation of a reasonable return.[29] The Government proposes that the amendments to the Electricity Act shall enter into force on 1 July 2014.

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[26] Ei R2009:09
[27] Preparatory Works 2008/09:141 p. 13
[28] Ei R2009:09
[29] Preparatory Works 2013/14:85 p. 4

The Government believes that the large number of appeals and the scope of litigation show that the desire to clarify the reasonability assessment through Regulations rather than case law has not worked within the existing regulatory framework. This causes a significant degree of legal uncertainty. Nor does the Government believe that the fact that there are ongoing litigation in administrative court necessarily means that there will be case law in this area that can serve as a guide in the place of Regulations. Moreover, the Administrative Court has in its judgments highlighted the possible deficiencies that may arise from the direct application of the regulation as something that should be urgently reviewed by the legislature. The Government's summary assessment is that it is important that a clearer regulation is already in place before the supervisory period 2016-2019. In practice this means that the provisions on the revenue framework need to be clarified on key issues, including the calculation of capital costs.

## 3.2 The electricity grid operators' position on the current method

Within the framework of the current Government mandate, Ei has obtained viewpoints from the electricity grid operators. These viewpoints are summarised below. The viewpoints in their entirety can be found in Appendix 3.

Many of the electricity grid operators seek predictability and a long-term perspective along with well-defined goals in the ex-ante regulation. According to the companies, there is currently a rather high degree of uncertainty regarding the applicable level of revenue, which is considered to have influenced necessary investment decisions.

All grid operators believe that there are shortcomings in the current regulatory model. According to some companies, there are very few socioeconomic considerations in the model. The deficiencies that most companies point out is that the quality regulation is rather weak and that it does not provide sufficient incentives to maintain quality and reinvest in the network. Another shortcoming that most emphasise is that real annuity is applied with real running costs. Some companies believe that the standard prices used for fixed assets in the regulation are too low and that these should be consistent with the companies' actual costs as far as possible in order to provide incentives for investment.

Most companies consider that real annuity should also continue to be applied because it gives the grid operators the opportunity to optimise installation utilisation by balancing investment initiatives with operation and maintenance initiatives. To maintain the quality of the network, the quality regulation should be strengthened and standard costs for controllable costs should be developed. Standard costs along with a more stringent quality regulation then become governing factors for reinvestments. The regulatory model should be developed in such a way that the concept of quality is broadened to encompass voltage quality and service quality (in addition to security of supply) so that a tighter quality regulation is achieved.

Most companies think that the capital base is overvalued and that real annuity initially provides too large a revenue capacity. The network is considered new and generates costs in line with this regardless of how much of the network is depreciated, which means that there is no incentive to invest in the network. It is also argued that it is not sustainable over time to have a regulation that permits higher revenue levels than is justified by the requirements of society.

Some companies believe that the problem with the capital base being overvalued can be solved by adjusting the starting capital base. The adjustment can be done in several ways, but in most cases it is about the capital base being limited until the year 2010. According to most companies, such an adjustment of the method is preferable to switching to a real linear method.

There are a few companies who believe that a real linear method for allocating capital costs should be applied. According to these companies, an age adjustment of the installations is needed to create incentives to invest in the network and to avoid the revenue frameworks becoming unreasonably high.

There are also companies that consider it important to have accurate depreciation periods in the regulation. These argue that the depreciation periods in the current regulation may be a little short but that the risk for the companies will increase if the depreciation periods are extended.

Most companies do not feel that the method of allocation of capital costs should be switched for a real linear method, for the following reasons.

- The control signal will be to replace old functioning installations when the regulatory depreciation period is reached, which means that the socioeconomic benefit is questionable.

- It is impossible to know in advance what the technical life is, and if it is shorter than the economic life, the companies miss out on full profitability. If the technical life is longer, profitability will be greater. It is reasonable that compensation is paid to the companies after the economic life has expired.

- A real linear method involves volatility in customer prices.

- The cash flow will be adversely affected and thus future investments will be hampered.

- When changing method from real annuity to real linear, the companies will not receive full compensation for investments made in the last 40 years and 10 years respectively.

- Ei will need to develop guidelines for determining the age of the networks and will also need resources to scrutinise the age determination process. This increases the administrative burden for the companies and for Ei.

- The quality regulation will require oversight.

## 3.3 The customers' position on the current method

The customers' viewpoints are summarised below. The viewpoints received can be found in their entirety in Appendix 3.

Several consultative bodies believe that the consumer interest should be reintroduced in the Electricity Act to clarify Ei's mandate. Ei either needs regulatory powers regarding the details of the regulatory framework or a particularly clear Regulation to relate to. Otherwise the alternative is protracted litigation, which is negative both for the customers and for the electricity grid operators.

The customer representatives believe that the biggest problem with the current regulation is that already depreciated networks are valued at the full present acquisition value. Already in the Energy Network Commission's report it was emphasised that too high a valuation of the electricity network would give rise to high profits that must be considered unreasonable. Furthermore, it is difficult to understand why the present acquisition value for the local electricity grid operators would have increased from SEK 180-190 billion to SEK 262 billion, when there was a transition from the previous legislation, the so-called Network Performance Assessment Model, to the current ex-ante regulation.

The current regulatory model leads to unjustifiably high prices without stimulating investment, which is to the detriment of both customers and the electricity network's long-term development. In an application of a real annuity method, the customers are forced to pay for the same electricity network over and over again. It is unreasonable to pay for an asset for as long as it is being used despite it being fully paid for. Another problem is the application of actual operating and maintenance costs, despite the model being based on real annuity. A costing interest of 5.2 per cent that has been applied in the regulation is very high for essentially risk-free assets. It is not reasonable that a network monopoly company has a return that is higher than an average level based on other businesses that operate under market conditions.

A linear method should be applied in the regulation. With a real linear method there are financial incentives in investing in the networks. To avoid over-investment, the regulator should be entrusted with curbing this possibility as part of its assignment. However, the risks of over-investment are small, as the industry is established, the market is mature and in most cases the actors are reputable. Even in the event of over-investment, the customers get something for their money, i.e., higher quality in the networks. An argument that prices become more volatile in the application of a real linear method has no relevance when it comes to electricity networks. It is a question of a large quantity of assets of varying ages, and when individual assets are gradually replaced, this will hardly have any impact at all. Even in extreme circumstances, there will not be any greater volatility in the tariffs. The electricity supply cost is only part of the total energy costs, and marginal volatility in the electricity grid tariffs would be lost in the noise of the volatility that is already found in the electricity price. In addition, new investments constitute a negligible part of the total capital, which means that the risk of possible volatility is very low. The alleged risk that a real linear method would lead to more expensive networks in rural areas is non-existent. Although volatility in prices would occur, in some notable way it is preferable for the customers when compared with the significantly higher level of tariffs that result from a real annuity method. A real linear method requires information on the installations' age and, although this requires

resources, it is a one-time cost that customers will gladly incur to avoid paying for the same network more than once.

A real linear method entails less risk for the electricity grid operators, which makes it easier to attract investment capital. Less risk means a lower level of the costing interest applied in the regulation and thus lower prices for customers. It is regrettable that the Swedish Competition Authority's proposal to apply a real linear method in capital cost calculation was not considered. If this method was chosen, one would have a more realistic allocation of the capital costs in relation to the increase over time of running costs for operation and maintenance.

Some consultative bodies consider that an issue that needs to be clarified in the regulation is the handling of connection charges. Some investments are paid out in full when connecting new customers, but at the same time the additional assets are included in the capital base and thus constitute a basis for the calculation of capital costs which increases the revenue framework. The fact that the connection charges are included in the revenues, to be contained in granted revenue frameworks, only involves a partial compensation.

## 3.4 Authorities and other actors

It is the assessment of the Swedish Competition Authority (KKV) that important departure points in Ei's work should include the use of a real linear method for allocating capital costs, an age adjustment of the networks, and the use of actual operating and maintenance costs. KKV argues that deficiencies and problems in the current regulation are largely the same as predicted in KKV's responses and consultation discussions prior to the examination and decision on the current regulation. A major shortcoming is that the regulation is unclear and unpredictable, as many important questions have been left to the judicial process to answer. This has led to continued long and uncertain appeal processes. The selected regulatory model has led to a general overcompensation of electricity grid operators. Achieving a stronger and more predictable regulation requires Ei to be given expanded regulatory powers regarding several essential parameters such as depreciation method, depreciation periods, efficiency requirements and costing interest.

KKV considers there to be overwhelming reasons for a real linear method for the allocation of capital costs. In this way, an overall orientation towards good quality is achieved without the need to focus on a data-intensive and resource-intensive quality regulation. When applying a real linear method, an age determination of the fixed assets should be carried out. In some cases it can be difficult to determine the age of the network, but it is not an insurmountable obstacle when faced with a necessary change of regulatory principle. Any extra investments for the purpose of age determination are clearly a one-time measure and are acceptable. Time-saving standardisations should be developed by Ei to facilitate age determination. When applying a real linear method, the stability in the fees does not have to significantly deviate from that of the current regulatory model. Nor can KKV see that it would risk greater differences in fees between urban and rural areas. The viewpoints can be found in their entirety in Appendix 3.

Linköping University has expressed that it is positive that the network regulation now takes into account what they see as the three fundamental goals in working with energy systems; energy efficiency in the form of supply security, cost efficiency and environmental consideration. According to Linköping University, Ei needs to be aware

of its own role as part of the value creation in the electricity network market by strategically analysing what creates willingness-to-pay among consumers (environmental consideration, supply security and low costs), what creates value for electricity grid operators and suppliers, and in which parts cost efficiency can be created without undermining the long-term value creation. Linköping University states that the present regulation is too focused on short-term cost control, which may have repercussions for the long term development and technology, methods and procedures. Ei should reflect on how the agency impacts or supports innovation in the electricity network market and for electricity grid operators. One of the biggest problems facing the energy sector in general is uncertainty. Uncertainty can, for example, stem from technical development, financing and required rate of return, and policy decisions/rules. According to Linköping University, Ei needs to, in future regulations, take into account the length of the supervisory period and the long-term nature of the electricity grid operators' enterprise and investments. The reason for this is that the short supervisory period creates great uncertainty in terms of future cash flows, which then becomes particularly difficult to value. The viewpoints in their entirety can be found in Appendix 3.

The School of Economics and Management at Lund University has also provided comments from which it, in short, follows that the revenue frameworks have become too wide and that quality control is too weak. It has also been pointed out that there are a few different problems related to the determination of capital base and that this is in part linked to uncertainty in the use of terminology. The School of Economics and Management at Lund University considers it regrettable that KKV's proposal to apply a real linear method was not accepted when developing the model. Such a method would mean a more realistic allocation of the capital costs in relation to the increase over time of running costs for operation and maintenance. The School's recommendation is to apply the method recommended by KKV, i.e. a real linear method. Finally, it is emphasised that the issue of management of connection charges in the regulation needs to be clarified and that inspection and audit of the electricity grid operators must be substantially increased. The viewpoints in their entirety can be found in Appendix 3.

## 3.5 The Swedish Energy Markets Inspectorate's position on the current method for decisions on revenue frameworks for electricity grid operators

This section briefly describes the main deficiencies that Ei has identified in the current ex-ante regulation. According to Ei, these shortcomings should, to the extent possible, be considered when proposed new rules for calculating the revenue framework are submitted to the Government.

Ei has identified four main deficiencies in the current regulation.

### 3.5.1 Major risk of overcompensation for electricity grid operators which impacts the country's electricity consumers

For the first supervisory period, Ei has chosen to apply a real annuity method for the allocation of capital costs. The method can be applied without information on the installations' age. The lack of information on the installations' age may however lead to more serious consequences. The fact that knowledge of the installations' age is lacking means that there is an obvious risk that the companies are overcompensated and that the customers pay for the same installation more than once. This risk arises in that capital

costs are reimbursed for fully depreciated assets in a model based on real annuity, and through electricity grid operators receiving excessive equity compensation in the event that the economic life in the regulation is too short. Furthermore, the lack of information on the installations' age means that Ei is not able to follow up on the depreciation periods applied in the regulation, nor the rate of renewal and age status of the Swedish electricity networks.

### 3.5.2 The control model inhibits the renewal of the critical infrastructure that the electricity networks represents

The real annuity method gives companies an incentive to maintain their installations for as long as possible. The steering towards the renewal of fixed assets in the electricity network operations is mainly achieved through quality regulation, where the quality deduction is limited and has at most a marginal impact on the revenue framework's size. The electricity grid operators' costs for diminished quality are relatively low, which means that incentives for reinvestment in the network are low.

### 3.5.3 The regulatory model does not sufficiently take into account the real conditions in the country's approximate 180 electricity grid operators, which can result in a lack of cost recovery for some electricity grid operators

When real annuity is applied in the regulation, this means that the capital costs are allocated as a real constant over time, which means that the capital costs in the regulation do not reflect the companies' actual (accounting) capital costs which in reality decrease linearly over time. This gives rise to several difficulties, including newly-established grid operators having to finance the prevailing differences between regulated compensation and actual capital costs themselves. This can also mean big problems for municipal companies that, according to a ruling[30] by the Administrative Court in Jönköping, should follow the so-called prime cost principle of the Local Government Act.

In addition, a control method based on a real annuity method and standard costs for ongoing operating and maintenance costs means that certain categories of companies do not obtain cost recovery, as standard costs do not reflect the individual conditions prevailing in the country's approximate 180 electricity grid operators.

Finally, it is pedagogically difficult to explain the control model to customers who have a lack of confidence in and acceptance of the regulatory model due to there being too large differences between the capital costs compensated through regulation and the actual capital costs.

### 3.5.4 The lack of adequate rules for how revenue frameworks are determined results in the requirements of predictability for electricity grid operators not being fulfilled

The Electricity Act is largely still a framework legislation. The delegation of normative powers that exist today are not far-reaching enough and many principles, details and parameters have been submitted to be developed through case law. Several significant issues, such as how capital costs should be calculated, are at present submitted to evolve in case law rather than being clarified in legislation. The experiences of how previous litigation have developed since deregulation shows that it takes a long time to establish guiding case law. For this reason, the regulation of electricity network operations is not considered to be sufficiently predictable.

To sum up, Ei can observe that there is a broad consensus from authorities, companies and customers that the current ex-ante regulation should be adjusted prior to the upcoming second supervisory period starting in 2016.

[30] Case no. 544-13, 1031-13, 1494-13, 1588-13

# 4 Guiding choices in the development of the regulation

A central issue in calculating capital costs is the method used for the allocation of capital costs over time. For this reason, it has been a central focus of Ei's investigation in this Government commission. The commission reveals that a capacity-preserving principle should continue to be applied in the regulation. This has the consequence that only real methods of allocating capital costs may be relevant to apply. The real methods that are relevant to apply are real annuity and real linear method.

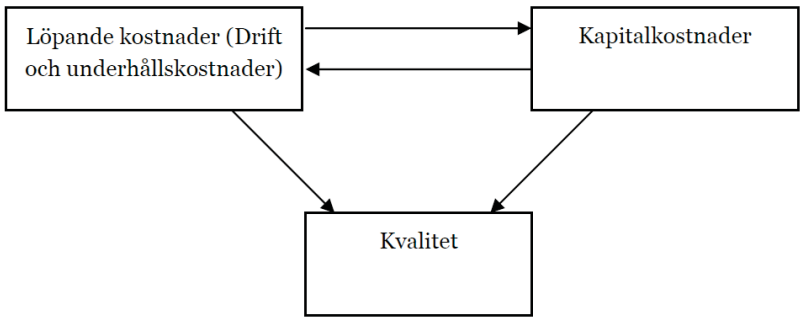
In this chapter, the deficiencies identified in the current method are analysed and presented. Furthermore, there is an analysis of the adjustments to the current method that would be needed in order to rectify the observed deficiencies.

In addition, there is a presentation of the way in which the current deficiencies would be rectified when applying a real linear method as well as the consequences of a switch from a real annuity method to a real linear method.

## 4.1 Connections between different parts of the revenue framework

There is a connection between the various parts of the revenue framework (see Figure 1 below). The guiding choices within the different parts are interdependent and create different types of short and long-term incentives.

Figure 1 Correlation between different parts of the revenue framework




The question of how capital costs are to be allocated over time is linked to how the regulation treats running costs such as operating and maintenance costs and the quality of the network service. If the capital costs are allocated as a real constant over time, running costs should also be allocated as a real constant despite the fact that they do not have a constant outcome in reality. A grid operator with a certain quality is given the

same level of revenue framework regardless of the network's age. In an application with declining capital costs over time and with actual running costs rising at the end of the installation's life, the total revenue framework will in principle correspond to the alternative with real annuity. However, the total costs for the customer group are, overall, identical over time in both alternatives.

A prerequisite for a reasonable revenue framework to be calculated is that good matching is achieved between the various parts of the revenue framework, and Ei considers that:

- When real annuity is applied for the allocation of capital costs, standard costs should be set for at least the running costs that increase with the installation's age (mainly operation and maintenance).

- When a real linear method is applied for the allocation of capital costs, controllable running costs should be calculated on the basis of the electricity grid operators' actual running costs.

The quality regulation's function in the regulation will constitute a more central part when applying a real annuity method than when applying a real linear method.

## 4.2 Identified deficiencies in the current method

The deficiencies that Ei has identified in the current method have been described briefly in Section 3.5. This section explains the shortcomings and the consequences of these in more detail.

### 4.2.1 Overcompensation with the current method

The real annuity method can be applied without information on the installations' age. This means that it will be key that a well-balanced economic life is applied in the regulation, i.e., regulated depreciation periods. The term economic life is not the same as technical life. Technical life is the period an asset is operational, and this can be very long if companies perform periodic maintenance on the installation. As the costs for maintenance increase over time, the companies eventually come to a point where the maintenance costs become so high that it becomes economically viable to replace the installation. Economic life is thus the period where an investment is, or is deemed to be, commercially profitable. The economic life is never longer but is sometimes shorter than the technical life.

When applying real annuity with incorrect depreciation periods, the electricity grid operators will be over- or undercompensated. With a depreciation period that is too short, each annuity becomes too high and the electricity grid operators' capital costs become too high, i.e., overcompensated. With a depreciation period that is too long, each annuity becomes too low and the electricity grid operators' do not obtain full cost recovery.
When a real annuity method is applied, as in the current regulation, i.e., without information on the installations' age, there is no way to monitor how the depreciation periods applied in the regulation relate to the economic life. Electricity grid operators have an information advantage in this matter, and from their perspective it is advantageous if the economic life is as short as possible. For this reason, the electricity grid operators will, in the application of real annuity, always endeavour to ensure that the depreciation periods are as short as possible. If the depreciation periods are too short,

there is a risk that customers pay more than once for the same installation. The compensation that companies receive in the regulation for an installation which has reached the end of its economic life is equivalent to the level of compensation for a brand new installation. This means that, as long as the installation is in use, the electricity grid companies will receive compensation, despite already having obtained full cost recovery for the investment. This risk can be eliminated if the installation stops generating capital costs after it has reached the end of its economic life, but this requires information on the installations' age.

To illustrate the consequences, an example is presented below in which the capital base, which has a present acquisition value of approximately SEK 330[31] billion, is assumed to be used beyond the regulatory depreciation period. The life expectancy is assumed to be 40 years and the costing interest is assumed to be 5.2 per cent.

If the installation is in use for 45, 50 or 60 years, i.e. 5, 10 or 20 years longer than the calculated depreciation period, the customers pay 13, 25 or 50 per cent more, calculated as total capital costs for the installation. The present value total of future capital costs in year 1 would exceed the present value of the investment by about six per cent if the installation was used for 50 years, or up to 10 per cent if the installation was used for 60 years, as shown in Table 2.

Table 2 Overcompensation with a real annuity method

| | 40 years | 45 years | 50 years | 60 years |
|---|---|---|---|---|
| Present value total Year 1 | SEK 330 billion | SEK 341 billion | SEK 350 billion | SEK 362 billion |
| Total capital costs | SEK 790 billion | SEK 889 billion | SEK 988 billion | SEK 1,186 billion |
| The installation's residual value Year 40 | SEK 19 billion | SEK 100 billion | SEK 162 billion | SEK 249 billion |

Source: Ei

The residual value is used to calculate the remaining value of the installation and relates to the business' value. The residual value of the installation is calculated as the present value total of future capital costs. If the installation is in use 5, 10 or 20 years after the depreciation period, the residual value will increase significantly after year 40. After 40 years, when the installation should not generate any capital costs, an extended use of the installation by a further 10 years will see an increase in the residual value from SEK 19 billion to SEK 162 billion, which corresponds to about 50 per cent of the present value of the capital base.

### 4.2.2 Low investment incentive with the current method

The real annuity method is investment driving only when it comes to new investments. New investments expand the companies' capital base and they obtain cost recovery and a return for these. However, the application of real annuity involves slower capital recovery compared with the alternative method, i.e. real linear method, which means that the electricity grid operators' risk increases with an annuity method.

[31] The present acquisition value of the capital base was measured at the end of 2010 at approximately SEK 330 billion and comprised approximately 95 per cent of the installations whose depreciation period during the first supervisory period was assessed at 40 years.

In the application of real annuity, reinvestments do not affect the capital base – nor, consequently, the capital cost. As long as the installations are being used, the companies receive the same compensation in the regulation, regardless of age. The electricity grid operators therefore have an incentive to maintain the installations as long as possible. When a real annuity method is applied without standard costs for operating and maintenance costs, i.e. as in the current regulation, the only control that encourages reinvestments in the network is the quality regulation.

To dissuade companies from using the installations longer than is socioeconomically optimal, which would be the case if companies receive full or almost full compensation for operating and maintenance costs, these costs should be calculated based on an established norm. A company with high maintenance costs due to, for example, old inefficient installations, would likely not obtain cost recovery for the actual operating and maintenance costs if the compensation would be set at, e.g., average cost. A norm can, if properly designed, provide incentives to replace older installations that require a lot of maintenance.

According to Chapter 5, Section 7 of the Electricity Act, the quality assessment can entail an increase or decrease in what is considered to be a reasonable return on the capital base. This means some restrictions from a regulatory point of view. In Government Bill 2008/09:141[32] and in SOU 2007:99[33] it is possible to deduce that the return is defined as the cost of capital tied up (i.e. the cost of borrowed capital and equity). This means that the part of the capital cost that relates to depreciations will not be affected by any quality deduction.

The aim with introducing a limitation in terms of the quality deduction is, according to the Preparatory Works, to ensure that the grid operators are provided equitable cost recovery even during quality problems. The justification for this according to the Bill[34] is that the grid operators, despite poor quality, shall have the capacity to make investments that improve the quality so as not to fall into a negative spiral where the company cannot make the necessary investments and thus receives yet higher quality deduction.

As the quality deduction can be at most equal to the cost of capital tied up, the electricity grid operators can, regardless of quality, always assimilate the depreciation part of the capital cost. This means that grid operators can theoretically continue to run old installations in bad condition and still receive some compensation.

The costs of deficient quality in the current regulation are low, which means that they are probably less than the costs of quality improvements, causing low incentives for reinvestments in the network. In addition, the companies receive compensation for controllable running costs which are calculated on the basis of the companies' actual costs. It is thus in the interests of the electricity grid operators to utilise existing installations for as long as possible. There are socioeconomic gains in utilising existing installations as long as possible (assuming that the operating and maintenance costs do not exceed the capital costs for new installations), but these gains are currently only enjoyed by the electricity grid operators. Customers on the other hand pay fees that are as high as if the installations were new, despite there being no reinvestments in the network.

[32] p. 60 f and p. 67 f
[33] p. 159
[34] Preparatory Works 2008/09:141 p. 103

With such a low incentive for reinvestment in the network, there is a clear risk that reinvestments are postponed, something which would reasonably impair both supply security and quality in the long run. With the current application of real annuity, Ei has no insight into the reinvestment rate in the electricity network operations, and this situation is less desirable and may eventually lead to significant negative consequences.

### 4.2.3 Real annuity does not account for the companies' individual conditions

Real annuity provides a real constant capital cost as opposed to the costs on the books which decrease over an installation's lifespan. The grid operators therefore need to make continuous provisions to balance periods in which the method provides a lower capital cost than the companies' actual (accounting) costs. This means that the companies themselves must finance the balancing of a low regulated capital cost in the early years when the installation is new with an excessively high regulated compensation for a relatively long residual period. Furthermore, this can also lead to the costs for a significant investment, which the companies have, not being covered during the initial period in the event that real annuity is applied in regulation.

With the application of the real annuity method, the companies' capital costs are not affected by the installations' age. This means that companies with old installations and low capital costs in their accounting receive the same capital cost compensation as companies that have newer installations and thus higher capital costs in their accounting. This in turn leads to variation in the companies' returns.

The fact that the capital cost development in the regulation does not reflect the development of the companies' capital costs in their accounting causes difficulties for Ei in explaining the regulatory method to the customers. The customers perceive the method as complex and difficult to understand, which in turn leads to a lack of confidence and acceptance for it.

### 4.2.4 Specific risks with a real annuity method for municipally owned electricity grid operators

The imbalance between regulated and book capital costs that arises with real annuity may cause problems for municipally owned electricity grid operators, which constitute about 38 per cent of all electricity grid operators. The Administrative Court in Jönköping has given a judgment[35] regarding legality review under the Local Government Act (1991:900), and a brief summary of the judgment is presented below.

According to Chapter 2, Section 7 of the Local Government Act (KL), municipalities and county councils may operate a business if it is non-profit and aims to provide public facilities or services to the members of the municipality or county council. Furthermore, it follows from the so-called prime cost principle (Chapter 8, Section 3 c of KL) that the municipality or county council is not allowed to charge higher fees than what corresponds to the costs for the services or utilities provided by the municipality or county council. In some cases, the court may revoke a municipal decision if for example it has not been legally constituted or if it is contrary to law or statute (Chapter 10, Section 8 of KL).

[35] Case no. 544-13, 1031-13, 1494-13, 1588-13

Matters examined in the case included whether decisions made by the municipal council regarding, inter alia, the required rate of return for a municipally owned grid operator run as a public limited company comply with the Local Government Act's provisions on the prime cost principle.

In conclusion, the Administrative Court gave the following assessment. Borås Elnät has budgeted a substantial surplus in the company's operations. This surplus should, in accordance with decisions of the municipal council and municipal executive board, be used for something other than costs in Borås Elnät's operations, and is thus contrary to the prime cost principle in Chapter 8, Section 3 c of KL.

The conclusion one can draw is that a municipal electricity grid operator may not violate the prime cost principle in the Local Government Act. This applies notwithstanding there being specific provisions in Chapter 5 of the Electricity Act, for example, which deal with network concessionaires' revenues from network operations.

The judgment has been appealed to the Administrative Court of Appeal in Jönköping[36] but, if this ruling gains legal force, an application of a real annuity method in the regulation may involve major implications for municipally owned electricity grid operators. The capital costs allocated with real annuity are real constant and do not reflect the capital costs for companies in the accounts. During the years where the companies' actual capital costs are higher than the regulated capital costs, they will not be able to cover these costs due to the revenue limitations in the regulation. During the years when the regulation permits that they charge fees that are higher than their actual costs, problems covering these costs may arise due to the Local Government Act's provisions on the prime cost principle.

## 4.3 Extensive adjustments to the current method are required to remedy the deficiencies

When the regulation involves incentives to operate installations for as long as possible, which is the case with real annuity, there is considerable risk that the installations are used longer than is optimal from a socioeconomic perspective. In view of this, standard costs for operation and maintenance must be developed for the method to be correct. The standard costs must be set at the right level. The right level refers to the breakpoint that generates a reinvestment when the operating and maintenance costs rise.

In addition to standard costs for running costs, a significantly tighter quality regulation than at present must be developed in order to strengthen incentives for reinvestment in the network.

In addition, the overcompensation which the method provides needs to be dealt with. It is not enough to make temporary and partial adjustments, instead the method must be adjusted so that the risk of overcompensation is eliminated. It is only in this way that the method can work from a long-term perspective.

[36] Case no. 325-14, 326-14, 327-14 and 328-14

### 4.3.1 Standard costs for controllable running costs

If real annuity is used to allocate capital costs over time, this means that the capital costs become constant in real terms and independent of the network age. If real constant total costs should be sought due to quality and not age reflecting the tariffs, this means that running costs also need to be constant in real terms. In reality, some of the running costs increase with an installation's age. This means that some type of standard or standard cost needs to be established for at least the running costs that increase with the age of the installation (mainly operation and maintenance), or that efficiency requirements are imposed on the companies' age-dependent costs.

Ei viewed, even prior to the first supervisory period, that it would be desirable to standardise the controllable running costs. Ei therefore drew up a proposal on how standard costs for running costs could be calculated, and then commissioned the Royal Institute of Technology (KTH) to evaluate the proposal. The KTH assignment included evaluating the EKM (Equivalent Cable Length) as a weight measurement for comparing companies in their current form and submitting proposals for improvements where necessary. This work also included studying whether a standardised method based on the EKM as a comparison measurement would be perceived as objective by the Swedish grid operators.

KTH assessed that the EKM as a comparison measurement needs to be further analysed and therefore discouraged allocating the controllable costs based on the key ratio EKM. For this reason, Ei considered that it was not reasonable to set standard costs for the controllable running costs for the first supervisory period based on the key ratio. Instead, Ei proceeded from the companies' actual historical controllable running costs and imposed efficiency requirements on these. However, Ei considered that the possible introduction of standard costs for controllable running costs should be investigated further for subsequent supervisory periods.

In the middle of last year, Ei commissioned the consulting firm Sweco with outlining alternative approaches to ensuring the development of accurate standard costs, and consider in particular the differences that exist for electricity network operations across the country and the different conditions for the approximate 180 electricity grid operators. The assignment also included outlining the advantages and disadvantages that the application of standard costs would entail.

Ei also commissioned Wistrand Advokatbyrå to describe the consequences that applying standard costs for running costs would have for Ei's burden of proof in any future litigation. The work also included describing, from a legal perspective, the advantages and disadvantages that would result from standard costs.

Summaries of the reports of Sweco and Wistrand Advokatbyrå are presented below. For more information, see Appendix 4 and Appendix 5.

*Sweco's report*
Sweco has in its report found that, for a possible implementation of standard costs, the cost catalogues used will be of great importance. The catalogues must sufficiently take into account the varying conditions that exist for different electricity networks, such as varying geography. To illustrate the change, an example with calculations of standard costs based on the so-called EKM measurement has been conducted.

A preliminary conclusion based on the calculations is that standard costs based on cost catalogues comparable with the EKM would be possible to implement. However, it cannot be excluded that the consequences for the individual grid operators would be significant. Existing data does not provide any support for a deeper analysis of the differences that exist between actual reported costs and standard costs based on the EKM. Further data collection would be required to analyse the deviations observed. The electricity network components' age, for example, is not presented in the data, and this factor's potential significance for the operating and maintenance costs can thus not be elucidated.

To calculate standard costs for operation and maintenance, an alternative approach could be to base the calculation on the average ratio of operating and maintenance costs/present acquisition value. In order to achieve a sufficiently refined methodology, a number of installation classes need to be identified, whereby different cost ratios are applied per installation class. Whether a method based on a small number of installation classes would sufficiently take into account the differences in operating and maintenance costs, could be considered justified, would have to be investigated further.

Were standard costs like the EKM to be introduced, most grid operators would have about the same cost for operation and maintenance as the current level in the regulation based on the companies' actual historical costs.

The introduction of standard costs for operation and maintenance would likely mean a significant workload for Ei irrespective of the chosen methodology, not least in connection with data collection and the drawing up of cost catalogues. The duration expressed in calendar time for data collection as well as the anchoring of the methodology in the industry is expected to be significant, probably several years.

Furthermore, Sweco has in its report also concluded that the use of standard costs in the electricity network regulation is, at least in theory, a methodology that is transparent and easily understandable. The methodology also provides an incentive for the electricity grid owner to work with efficiency, since it is allowed to be credited with cost reductions. The possible advantages of standard costs should be set against the complexity of the cost catalogues as well as the adjustments to specific factors that are considered necessary.

*Wistrand Advokatbyrå's report*
Wistrand Advokatbyrå has concluded in its report that, when it comes to issues of fairness and compliance with the law, it is not appropriate to ask which party has the "burden of proof". A decision on the determination of running costs within a revenue framework under Chapter 5 of the Electricity Act concerns specifically these issues and can hardly be considered as either onerous or beneficial for the individual. It is therefore not a question of any real burden of proof allocation, according to the law firm.

The Court shall, in an administrative process, ensure that the case is sufficiently examined. If Ei's report, on how the standard costs have been calculated and why it is reasonable to apply a norm for just such costs, is not considered satisfactory by the Court, the Court may request that Ei further investigate the matter. However, in a type of case such as this, the Court's responsibility to investigate is limited, which need not always be an advantage. When the Court, in the case of an appeal, shall weigh the parties' arguments and determine who has the best justification for their position, the Court, instead of requesting further investigation in some respect that is unclear, may simply rule in favour of the party who has succeeded in producing the most compelling investigation.

With regard to the impact of any standard costs in a process, it can be concluded that, if standard costs are established in the form of a Regulation, based on a Government Regulation, this would give Ei a much better starting point in the process than if standard costs were completely absent or if such were only communicated in the form of internal guidelines.

Standard costs communicated in the form of internal guidelines or recommendations do not, at least formally, make any difference to the legal process, compared to decisions that are made on the basis of historical costs. Rather, the differences are practical. Ei must be able to present a report which convinces the Court, firstly, that a standard cost has been successfully calculated which gives reasonable results in general, and secondly, that it is appropriate to make use of standard costs instead of making decisions on the basis of each grid operator's actual costs. If Ei cannot do this, it is likely that the processes that concern the size of the standard cost will be lost.

If a case regarding standard costs would be tried in a higher court (the Administrative Court of Appeal or the Supreme Administrative Court), the ruling may have an indicative effect on the outcome of other cases regarding standard costs. The practical benefit of a precedent-setting ruling is however questionable given that Ei's standard cost is likely to be changed regularly, e.g. prior to each new supervisory period.

Wistrand Advokatbyrå's conclusion is thus that, from a legal perspective, it does not simplify future litigation, regarding the size of revenue frameworks, to establish a standard cost for running costs, unless this is done through a directly applicable Regulation on the level of the standard cost.

### 4.3.2 Development of the quality regulation

The purpose of the quality adjustment within the context of ex-ante regulation is to create a quality-driven mechanism by punishing or rewarding the electricity grid operators through bonuses or deductions on the revenue framework. Bonuses or deductions are based on the costs incurred as a result of the quality level (outage costs).

The reason for applying a quality regulation is to counter the potential risk of quality deterioration related to the grid operators' monopoly position. There is a risk that the quality of the network will be affected negatively by the companies' attempts to increase profits through, e.g. reduced maintenance, reduced contingency measures or obsolete installations. With a real annuity method, the quality problems risk being greater than with a real linear method as the economic motives behind running

old installations longer are greater with the first method. However, reinvestments do not replace maintenance or the level of contingency measures, wherefore there must still be a quality regulation even with a higher reinvestment rate.

It is difficult in practice to achieve tighter quality regulation, and even if this is achieved, the quality deduction is limited. For this reason, it is difficult to rely on the quality regulation as the main governing factor towards the renewal of such important infrastructure as the electricity networks.

### 4.3.3 Proposals from the electricity grid operators regarding the handling of overcompensation resulting from real annuity

Most of the electricity grid operators who submitted viewpoints consider the real annuity method to cause overcompensation, and that this can be solved by the initial capital base (opening capital base) being adjusted downwards. The companies have submitted various proposals, but the proposal that most companies submitted is briefly described below.

According to the proposal, the initial capital base would be adjusted downwards by two different factors. These factors would be calculated in such a way that the adjusted method provides the same capital cost as a real linear method would if the capital cost was calculated on a semi-old initial capital base, i.e. 50 per cent of the present acquisition value. With two different depreciation periods being applied in the regulation, i.e. 40 and 10 years, two different adjustment factors must be calculated. According to the proposal, all future investments (both new and reinvestments) would increase the capital base with their full value. In the event of retirement, the capital base would be decreased by a value corresponding
to the value of reinvestments multiplied by the adjustment factor. According to the companies the incentives to invest in the network increase while the capital cost decreases, when applying such a method.

Regardless of how the initial capital base is adjusted, it is an adjustment of the real annuity method that is essentially done in order to avoid overcompensation. This proposed adjustment can be compared with the transition method that Ei applied for the first supervisory period and which is subject to judicial review. Ei's transition method is based on the companies' historical revenues and affects the companies differently depending on how high their revenues were during the years 2006-2009 and depending on how big the difference is between the historical revenues and the permitted revenue according to the standardised method.

However, the method that companies suggest involves all companies being treated equally regardless of their individual circumstances. This means that some companies would be disadvantaged by such a method. These are companies that have installations that are newer than the proposed adjustment factor. Companies that have installations that are older than the adjustment factor will, on the other hand, have unreasonably high capital costs with such a method. There is a lack of data needed to conduct adequate assessments of how these adjustments are to be made and thus there is no basis to introduce these in Regulation form.

The proposal is based on the assumption that the network is semi-old as proposed in the Energy Network Commission. However, the Commission proposed that the present acquisition value be adjusted by 50 per cent, but that those companies that wish

to demonstrate that they have younger networks would submit a compilation of the average age of each component type. This is different from the companies' proposal which assumes that all companies should be treated equally regardless of their individual circumstances. The Energy Network Commission proposed the standardised deduction for the first supervisory period, and if the adjusted method were to be used from the second supervisory period, it is questionable whether the proposed level is appropriate as the network is likely, on average, to have gotten older since the incentive for renewal in the network is so low.

Another aspect that is important to consider is how such an adjustment, as proposed by the companies, would affect the other parts of the revenue framework and thus the balance of the entire control model. The companies propose, inter alia, that standard costs are developed for operating and maintenance costs. It seems reasonable that in an age adjustment of the capital base, age is also taken into account in the calculation of controllable running costs. However, standard costs mean however, that operating and maintenance costs become constant in real terms and independent of the network age.

#### 4.3.4 Further development of the current method will not lead to a regulation which is viable in the long term

A real annuity method requires developing both a tighter quality regulation and standard costs for controllable running costs. It is fairly difficult in practice to achieve tight quality regulation, and even if this is achieved, the quality deduction is limited due to the provisions of the Electricity Act. For this reason, it is difficult to rely on the quality regulation as the main governing factor towards the renewal of such important infrastructure as the electricity networks. It is complex and resource-intensive to develop standard costs for running costs. There are high requirements on the standard costs being designed in such a way that they do not systematically benefit or disadvantage companies. Standard costs fall within an area that includes extensive use of assessments and thus cannot be considered appropriate to establish in Regulation. When applying standard costs, Ei must therefore, in the event of any litigation, be able to first present a report convincing the court that the standard costs provide reasonable results, and secondly, that it is appropriate to make use of standard costs instead of working from the companies' actual costs.

A regulation with a real annuity method with standard costs for controllable running costs would essentially be theoretical and standardised and not take into account the companies' individual circumstances. In an application of standard costs, virtually no companies will have real costs in line with standard costs. It would thus create a situation where companies that are undercompensated will react (e.g. through the appeal process), while companies that are overcompensated will not react. With a completely standardised regulation, Ei's control capabilities would be significantly reduced. Using a method that so pointedly ignores the companies' individual circumstances, the assessment is that it is not possible to create a regulation which is viable in the long term for approximately 180 electricity grid operators of varying size, history and ownership structure.

Even if the current method was adjusted in the manner suggested by the companies, and even if standard costs for running costs and tighter quality regulation were developed, serious deficiencies in the method would still remain.

To apply a method in the regulation without information on the installations' age, that does not provide any follow-up of regulated depreciation periods that are quite difficult to assess and which have such a significant role in the regulation, is not reasonable. It would entail risks that overcompensation would arise and risks that economic gains would only be enjoyed by companies. Temporary solutions such as the adjustment factors relating to the opening capital base, as proposed by the companies, do not solve the problems of the method in terms of overcompensation in the long term. Therefore, an effective regulation cannot be achieved if the depreciation periods in the regulation are not followed up and if the installations' age is not taken into account.

## 4.4 Real linear is the most appropriate alternative to the current method

A real linear method is an alternative method that can be applied in the regulation instead of real annuity. This section describes how the identified deficiencies in the current method are affected by the application of a real linear method.

### 4.4.1 Over/undercompensation with real linear

It is important that the depreciation periods in the regulation are well-balanced, even with a real linear method, but it is not as crucial in terms of the risk of overcompensating the electricity grid operators.

Real linear does not give rise to the same problem as with real annuity, that the electricity grid operators are overcompensated if the depreciation period is shorter than the economic life. The electricity grid operators receive full coverage for the capital costs regardless of how many years they are distributed over, and when installations reach the end of the depreciation period in the regulation, they stop generating capital costs. In this way there is no risk that customers will pay more than once for the same installation, and thus there is no risk of companies being overcompensated.

Real linear creates incentives for companies to ensure that the depreciation period is as close as possible to the economic life, as it is in the grid operators' interests that the installations generate a return for as long as possible. At the same time, an extended depreciation period involves greater risk for the companies as it takes a longer time to recover the investment. If the depreciation periods in the regulation are too long in relation to the economic life, the companies are undercompensated just as in the case of real annuity. The companies become required to replace their installations even though they have not obtained full cost recovery for these. This risk, however, is something that should be taken into account in calculating the costing interest and not in the calculation of the depreciation period.

### 4.4.2 Investment incentives with the real linear method

A real linear method creates incentives for new investments. As with the annuity method, this method provides the companies with cost recovery as well as a reasonable return during the life of the installation, but the real linear provides faster capital recovery than the annuity method. This means that real linear reduces the electricity grid companies' risk-taking.

The incentives for reinvestments in the network, when applying a real linear method, are as great as the incentives for new investments, which creates good conditions for replacement with newer and probably more efficient installations that enable smart solutions in the network. This thereby reasonably improves the supply security and the quality in the network. This is because with a real linear method, aside from the depreciation period and the costing interest, the age of the installations also impacts the size of the annual capital cost. When reinvestments are made, this affects the age of the total volume of installations which in turn also leads to the capital costs being affected.

As a real linear method in itself promotes investment in the network, it does not require a quality regulation which is just as tight as that needed with a real annuity method in order for investment incentives to be achieved.

### 4.4.3 Real linear accounts for the companies' individual conditions

A depreciation pattern according to the real linear method reflects how the companies allocate capital costs in their accounting, which can be seen as an advantage from a regulatory perspective as the method is easy to understand and relate to reality. With this method there is therefore less imbalance between the companies' regulated and book capital costs.

With the real linear method, capital costs will differ in size for companies with old and new installations, which is not the case with real annuity. Those companies which in reality have higher capital costs because the installations are new also receive higher capital costs in the regulation and thus an opportunity to cover these through a revenue framework that is tailored to the actual circumstances.

When a real linear method is used, this means that the capital costs decrease in real terms with the network's age. If actual running costs increase at the same rate as the capital costs decrease, this leads to constant total costs. It is reasonable that running costs such as operation and maintenance would increase with an installation's age. With a real linear capital cost method, it is therefore reasonable to base calculations on the company's actual operating and maintenance costs which reflect the realities of the respective grid operator. However, a limitation in the form of efficiency requirements must be established to ensure that operations are run efficiently.

As covered in Chapter 2 of this report, a method for calculating controllable running costs based on the companies' actual costs has been applied by Ei during the first supervisory period. The method that works from the companies' actual costs is established but needs to be developed somewhat. It is easy to understand and apply, hence also probably easy to accept for both customers and companies. The disadvantage of this method is that it is not very easy to determine which efficiency requirements should be imposed on those costs.

## 4.5 Consequences when applying a real linear method and Ei's view on these

In the previous section it was showed how shortcomings with the current method are dealt with in the application of a real linear method. However, there are a number of other consequences

that may arise when switching to a real linear method. These consequences and Ei's view on them are presented in this section.

### 4.5.1 Real linear requires information on the installations' age

A precondition for a real linear method being applied is access to information on the installations' age. There have been comments from the electricity grid operators stating that it can be problematic and resource-intensive to determine the age of all installations, and in particular those that are old.

In accordance with Section 9 of the Auditing of Network Operations Regulation (1995:1145), companies shall establish an installation register and keep it up to date. The register shall be established in accordance with generally accepted accounting principles and include, inter alia, information on the acquisition date, acquisition value, etc. In addition, in accordance with the Swedish Accounting Standards Board's general guidelines, BFNAR 2003:1 installation Register, the companies must keep an installation register that contains, inter alia, information on the acquisition date.

During the analysis, it has emerged in contacts with the electricity grid operators that most of the grid operators have some kind of technical register where, in many cases, in addition to the technical data, there is also information on the year when the installation was put into service. There have also been reports that the year when installations are commissioned is stamped on all installations.

Given the requirements that exist, the companies should have access to age data for most installations. It cannot however be entirely ruled out that it can be problematic and expensive to produce data on the age of certain installations. For some companies there may be significant deficiencies in the company's register, wherein for various reasons these are not complete. Furthermore, it is not certain that age data is specified at the installation level. In order to facilitate and minimise the cost of inventory, it is in such cases appropriate to apply some kind of standard age. Examples of such a standard could be that, at the age determination of an installation, the assessment is based on the years when a whole area has been built and thus connected to the electricity grid. The actual age should apply in the first instance, as the consequence of all standardisations is that some companies become over- or undercompensated.

The resource investment required to determine the age of the installations is a one-time measure and will vary from company to company. Ei has had contact with several companies that have determined the age of their installations and has gained the impression that the age determination in many cases probably will not require very extensive resource investments.

### 4.5.2 Volatile tariffs in the application of real linear

The electricity grid operators have submitted viewpoints suggesting that the introduction of a real linear method will lead to volatile tariffs. This is because the capital costs decrease with the age of the installation. When, after reaching its end of life, the installation is replaced with an equivalent installation, the capital costs increase back to the level they were at in year one. This means that the capital costs fall each year to then sharply rise again to the original level when the installation is replaced. The capital costs vary markedly with the real linear method and remain constant with a real annuity method. However, this only applies when based on one installation. It is more reasonable in an analysis to work from an installation portfolio, where the installations

are in different phases of the life cycle, in order to compare the capital costs' development over time.

*Analysis of the allocation of capital costs based on information available in natural gas network operations*

Ei currently lacks collected data on the installations' age in electricity network operations. In order to get a picture of the allocation of capital costs over time in an entire operation, Ei has chosen to conduct an analysis on the basis of the data available for natural gas network operations. However, natural gas operations are an extreme example as they have been built up over a short period of time.

Natural gas network operations differ significantly from electricity network operations which have been built up gradually over a long time, but it is nevertheless considered reasonable to conduct an analysis of a similar operation.

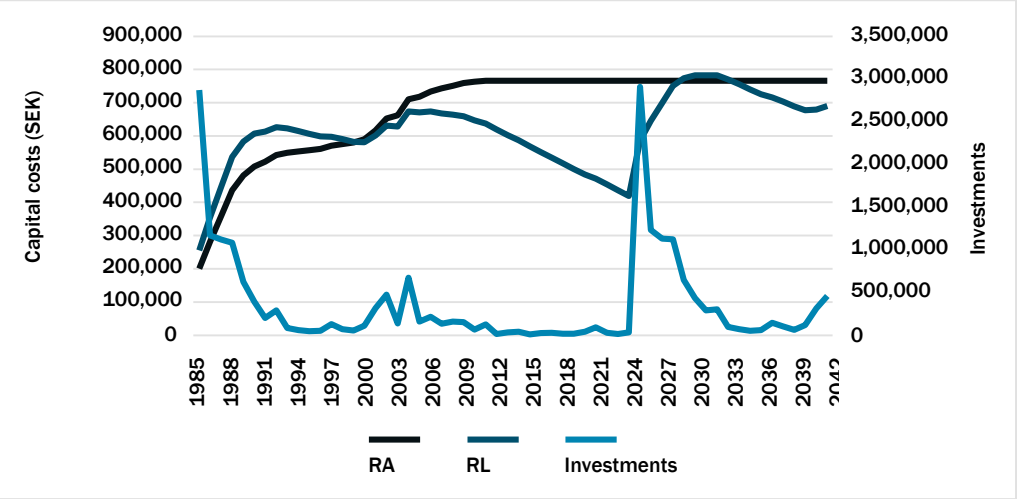
The analysis has been performed based on the following data and assumptions. Natural gas network operations have been built up over a relatively short period starting in 1985. In the first year, 1985, approximately 27 per cent of the capital base[37] was built, and between 1985-1990, about 65 per cent of the capital base was built. The remaining 35 per cent was built between 1990 and 2011. This has meant that the investment pattern exhibits extreme peaks for short periods.

The capital base has been calculated based on the present acquisition value of all installations in the natural gas operations. The installations have been assigned a depreciation period of 10, 12, 20, 25 or 40 years depending on the type of installation. The costing interest has been set at 6.35[38] per cent. All installations have been assigned an age based on when they became operational. Subsequently, it has been assumed that all installations are reinvested at 100 per cent when the installation's life cycle has ended. This assumption is extreme and it is unlikely that it will represent a realistic investment pattern in reality. It would mean that approximately 65 per cent of the capital base is replaced between the years 2025-2030. In the analysis it is also assumed that the capital base is not extended after 2010, which means that the only investments made up until 2042 are reinvestments.

[37] Opening capital base in 2011

[38] The costing interest that was applied in the assessment of the gas network operators' tariff revenues in 2011

Figure 2 Allocation of capital costs




Source: Ei

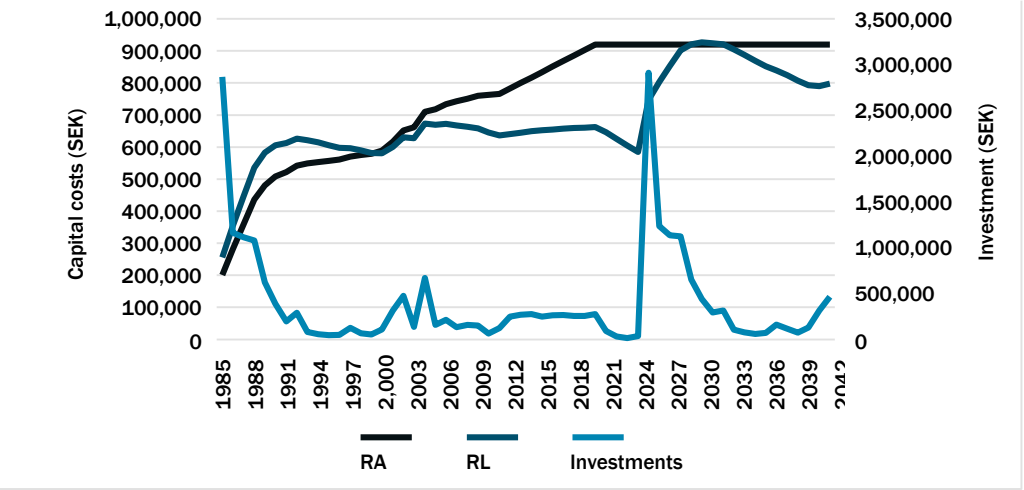
The figure shows that capital costs calculated using a real linear method are higher than capital costs calculated using real annuity up until the breakpoint in 1999. The figure also shows that the capital costs allocated with the real linear method decrease gradually up until the investment peak in 2025, where the capital costs rise sharply.

The development of the capital costs depends on the investment pattern. Even if significant investments are made over a short period of time, the capital costs with real linear barely exceed the capital costs calculated with real annuity. If the sharp investment peak would be distributed over a period longer than six years, capital costs allocated with a real linear method would have a much more even development.

*Allocation of capital costs during expansion of the network*

To show how an expansion would affect the capital costs allocated with a real annuity and real linear method respectively, we work from the previous example and assume there to be an expansion of 20 per cent of the capital base during the period 2012 - 2020.

Figure 3 Allocation of capital costs during expansion of the network




Source: Ei

The figure shows that, during the expansion, the capital costs increase the most when allocated using real annuity while the capital costs allocated with real linear are instead evened out. The development would be different if the expansion instead took place around the year 2025 when large investments are made. However, it is less likely that large expansions occur at the same time as major reinvestments are made.

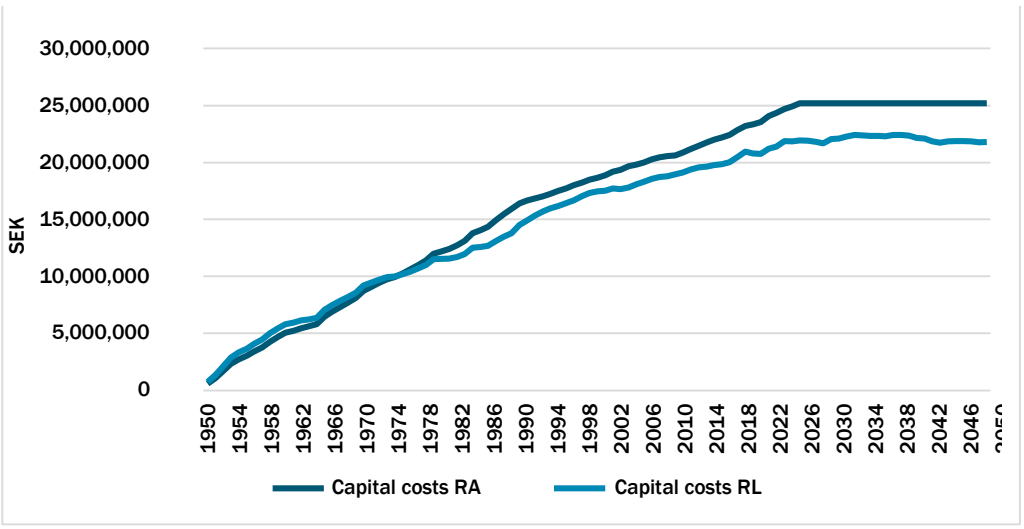
Even with extreme investment patterns the level admittedly becomes volatile with real linear, but the capital cost peaks will still be lower than if real annuity was applied.

*Analysis of the allocation of capital costs in electricity network operations during the period 1950-2050*

To assess the capital costs' development along the choice of allocation method, a historical investment pattern first needs to be identified. Then assumptions must be made about future investments, both new investments as well as reinvestments.

Ei does not, at present, have access to the electricity grid operators' historical investment pattern prior to deregulation in 1996. In addition, information is missing on investments broken down into new investments and reinvestments. The electricity grid operations have been built up gradually over a long period of time, unlike natural gas operations, and it is therefore reasonable to assume a more even investment pattern. To establish a historical investment pattern, calculations are made based on the companies' total investments for the period 2005-2012. More on what assumptions have been made is found in Appendix 6.

**Figure 4 Allocation of capital costs based on assumptions for the electricity network operations**




**Source: Ei**

The figure shows that the capital costs allocated using real linear do not vary significantly.

It can in conclusion be observed that there may be a greater variation in capital costs when applying a real linear method than when applying a real annuity method. However, the variation depends on the investment pattern, and the more even the investment pattern is, the more even the allocation of capital costs.

It requires extreme investment peaks for major variations to arise in the capital costs. In a major expansion of the network, the variation is not greater with a real linear method, but rather the opposite. This is however affected by the average age of existing installations.

The variation in tariffs is also affected by the development of the controllable running costs. Capital costs allocated using a real linear method decrease with the installations' age while at the same time the controllable running costs very likely increase, which means that the total cost will also probably be fairly constant even when applying a real linear method.

In light of the above reasons, Ei does not consider that the application of a real linear method in the regulation will lead to any greater volatility in the tariffs. The volatility in the tariffs with a real linear method will never be great enough for the capital cost peaks to exceed the level attained when real annuity is applied.

### 4.5.3 Socioeconomic impact of the application of real linear

When applying a real linear method, the installations do not generate capital costs after the end of the regulatory depreciation period. This may mean that, if the depreciation periods are too short, it risks leading to fully functional installations being replaced with new ones in order for them to generate capital costs and thus returns, despite the operating and maintenance costs not exceeding the costs of the new investments. According to Ei's view, it is not appropriate for such an incentive to be found in the regulation from a socioeconomic perspective.

It should however be noted in this context that, with well-balanced depreciation periods corresponding to the economic life of the installation category in question, it will in no way constitute a problem. On the contrary, when the economic life has expired there should be incentives to replace the installation. There are however some difficulties in assessing depreciation periods in the regulation that correspond to the installation's economic life. One cause for this is the long investment horizons that electricity network installations represent. To adjust the depreciation periods between different supervisory periods in an attempt to emulate the economic life may lead to companies receiving significant overcompensations due to the installations' residual values increasing during an extension of the depreciation period. There are thus problems with correcting the depreciation period between supervisory periods. It is therefore important to examine how the social benefit can be considered when applying a real linear method. If any social benefit arises, it is important that it be shared between the customers and electricity grid operators and not just fall to the operators, as in the case of real annuity.

*A fixed depreciation period with a successive revision component*
To account for the social benefit of the real linear method in cases where the regulatory depreciation periods are too short compared to the actual economic life and avoid fully-functioning installations to be replaced, a certain level of compensation should be obtained following the depreciation period. The problem with a practice where compensation is provided after the expiry of the depreciation period is that the companies are overcompensated if compensation is paid following the depreciation period. This overcompensation comes about through depreciation and return having already been paid to the grid operator in question, as compensation for the

investment that has been made. If it is economically advantageous for the customer group that the installations are used after the expiry of the regulatory depreciation period, it also means in practice that the companies' compensation for depreciation and return has occurred over too short a term. In that case, it is considered to be an undercompensation for the companies, which have not received compensation for capital that has been used for a sufficient period of time. It is thus important to provide compensatory mechanisms in these cases.

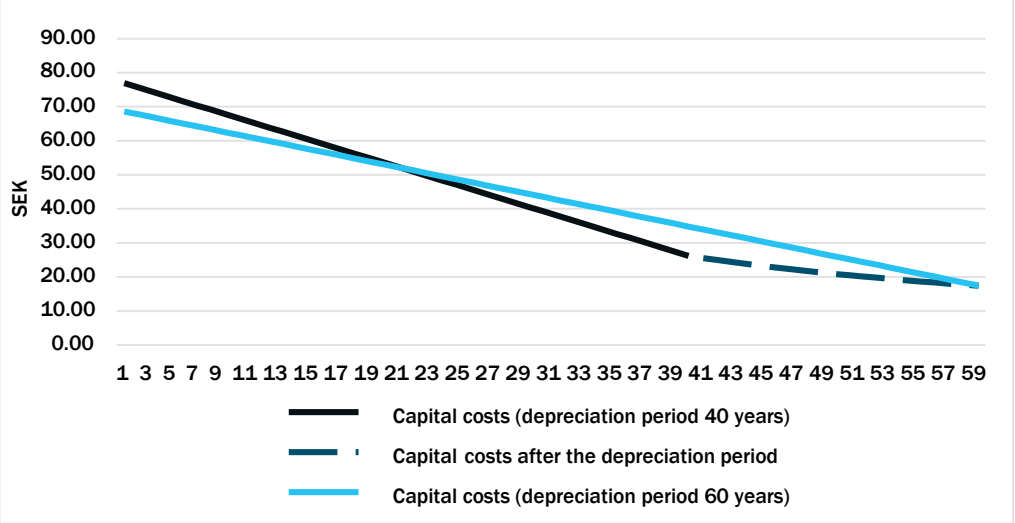
However, if the incentive to utilise installations after the depreciation period becomes too great, there is a risk that the quality of the network will fall and that operating and maintenance costs might exceed the costs of the alternative, which is to invest in new installations.

In assessing the amount of compensation to be paid, there should be a balance between cost accuracy – i.e., the companies' compensation for capital costs overall should neither be too high or too low – and the interest in taking into account the socioeconomic benefits of utilising the installations optimally.

Ei considers that an appropriate way to calculate the compensation for installations used after the expiry of the depreciation period is to successively revise the depreciation period for these installations in the event that they are still in use. In Year 41, the depreciation period will be 41 year, in Year 42, the depreciation period will be 42 years, etc. This means that there will always be compensation paid for capital costs for the companies as long as the installation is in use. The solution means that the depreciation period is gradually increased. The implication is that both the depreciation and return will drop every year. This therefore leads to a gradual adjustment being made to the depreciation period the installation is used. The capital cost's[39] development with a successive revision component is shown in Figure 5.

[39] The example uses the present acquisition value SEK 1,000 thousand, a 40-60 year depreciation period and a costing interest of 5.2 per cent

Figure 5 The capital cost's development with a successive revision component




Source: Ei

The correction which means that the installations continue to generate capital costs even after the depreciation period will result in some overcompensation to the companies. The investment has been repaid after 40 years but at the same time the companies miss out on the return that the installation would have generated with a correct depreciation period. The overcompensation that occurs is however not particularly big, calculated as the present value of future capital costs. The companies are overcompensated by about 2.4 per cent if the installations are used for 50 years with an original regulatory lifespan of 40 years. In considering the total capital costs, this means that the outcome for the companies is only marginally less than the capital cost that the installations would generate if a correct depreciation period had been established from Year 1. This is shown in Table 2.

Table 2 Effects of adjustment with a successive revision component

| | 40 years | 45 years | 50 years | 60 years |
|---|---|---|---|---|
| Present value total Year 1 with a 40 year depreciation period | SEK 1,000 thousand | SEK 1,014 thousand | SEK 1,024 thousand | SEK 1,035 thousand |
| Total capital costs with a 40 year depreciation period | SEK 2,066 thousand | SEK 2,188 thousand | SEK 2,298 thousand | SEK 2,488 thousand |
| The installation's residual value Year 40 | SEK 25 thousand | SEK 125 thousand | SEK 195 thousand | SEK 279 thousand |
| Total capital costs with a correct depreciation period from Year 1 | SEK 2,066 thousand | SEK 2,196 thousand | SEK 2,326 thousand | SEK 2,586 thousand |

To avoid the incentive to continue running the installations after the depreciation period becoming too great, thus risking quality deterioration and unreasonably high operating and maintenance costs, a limit should be set for how long installations will generate capital costs. Such a limit should not deviate too much from the regulatory depreciation period. Ei's assessment is that a maximum adjustment should be around 25 per cent of the depreciation period, i.e., if the depreciation period is 40 years, capital costs will be obtainable for at most another 10 years.

### 4.5.4 The companies' cash flows in the application of real linear

Some companies have submitted viewpoints suggesting that the application of a real linear method may create problems for the companies' cash flows, especially when it comes to regional network companies.

The cash flow represents the companies' payment flows in the form of receipts and disbursements during a period of time. It is the regulation in the form of the companies' revenue frameworks that controls the companies' inpayments while the companies themselves generally control the disbursements. However, the intention is that the revenue streams generated in the operations shall cover the costs incurred in the network operations.

As regards the regulation's design, the allocation of capital costs is a central part. The allocation of capital costs affects the companies' annual inpayments depending on whether the model is linear or with annuity[40]. Real annuity leads to the inpayments being allocated evenly in real terms during the installation's life while real linear leads to declining inpayments in real terms. The annual inpayments are affected by the different methods, but the total inpayments during the life of the installation do not differ between the two methods. The present value of all future inpayments is equal in size with both methods. Thus, the cash flow is not affected by the choice between real annuity and real linear.

With regard to the companies' disbursements, these are affected by the companies themselves. The companies themselves decide on dividends and on how investments will be financed, i.e., with borrowed capital or equity. If the companies borrow capital to finance the investment, amortisation and interest payments will influence the disbursements, whereas if the companies finance the investment with equity, higher dividends may be required, which in turn affect the disbursements.

When calculating the costing interest there is a parameter where the percentage of borrowed capital and equity is taken into account. For the first supervisory period the percentages were assessed as being equal, i.e., 50 per cent each.

The regulation, in the current situation, only controls the inpayments, as the regulation shall provide the companies with reasonable cost recovery and an equitable return. Both real linear and real annuity provide reasonable cost recovery and an equitable return. The cash flow, in the form of inpayments from the customer group, is the same for both methods viewed over time. The companies themselves then choose the manner in which investments are financed and how the cash flow is otherwise allocated to operate the business.

The companies have, at present, no special requirements imposed on them by the regulation in terms of their capital structure. Companies have the option to, instead of using inpayments from operations for investments, distribute money and then borrow money for investments. This can lead to a debt percentage increase or investments not being made. In the report entitled *Proposal for a revised regulatory framework for the assessment of the electricity grid operators' revenue frameworks - legislative proposals for the second supervisory period 2016-2019*[41], Ei has highlighted that this may pose potential problems in the future and has determined that there is a need to investigate the matter further.

[40] Whether the model is a real or nominal model also affects the annual inpayment but, since this matter only involves two real methods, this is not considered further.

### 4.5.5 Differences in tariffs between rural and urban areas in the application of real linear

The electricity grid operators have submitted viewpoints that the application of a real linear method may lead to differences in tariffs between rural and urban areas. This is due to the networks in urban areas generally being older than the networks in rural areas. The underlying reason for this appears to be that large parts of the rural networks have been replaced and buried because of the storms in 2005 and 2007. The companies also believe that this will lead to large price differences between urban and rural areas, and thus the investments will be directed to the urban areas rather than rural areas.

With a real linear method, new installations generate higher capital costs than old installations. This means that the areas with old installations will have lower capital costs and hence lower tariffs than areas with new installations. Here it is important however to point out that real linear only affects the capital costs. This means that it is not certain that the customers' tariffs decrease with the installations' age, as the customers' tariffs are also influenced by the companies' operating and maintenance costs. A likely scenario is that the companies' operating and maintenance costs increase the older the installation gets.

Since Ei currently lacks data on the age of the installations, it is analysed here to what extent the network in rural areas has actually been buried during the period 2005-2012. It is also analysed how much the companies in urban and rural areas have invested during the same period.

To do this, Ei has divided all electricity grid operators into the categories[42]:

- Rural area (customer density less than 10 customers per km of cable),
- Mixed network (customer density between 10 and 20 customers per km of cable) and;
- Urban area (customer density more than 20 customers per km of cable).

The cable length in Sweden has increased from 476,005 km to 506,119 km between 2005 and 2012. This is an increase of about 6 per cent. The largest increase was in sparsely populated areas, which can be partly explained by the fact that a buried cable usually has to be longer than an overhead line. Part of the increase can also be explained by new connected customers. The network comprises approximately 40 per cent of high-voltage network and 60 per cent of low-voltage network.

It is mainly the high-voltage network that has been buried during the period 2005-2012, and the high-voltage network is also more expensive than the low-voltage network and thus has a greater impact on the capital cost during a rejuvenation. Figure 6 below shows how the percentage of buried underground cable, high-voltage, has changed over the period 2005-2012.

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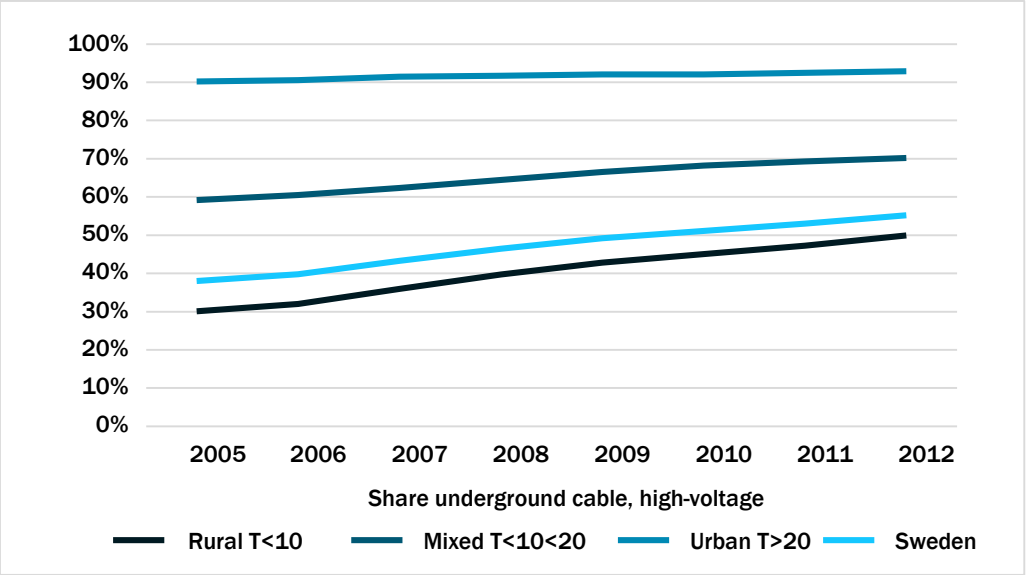
41 Ei R2013:06

42 The division has been based on the companies' customer density in 2012. As joint accounting was conducted during the period, we have worked from the status of the accounting units as they were in 2012. The reason for this is that consolidations between urban networks and rural networks should not affect the change to underground cable in the various categories.

Figure 6 Share of the electricity network buried during the period 2005-2012




Source: Ei

The burial of high-voltage network in rural areas has been pursued to the extent that the percentage has increased from 30 per cent to 50 per cent. Half the high-voltage network still consists of overhead lines and about 30 per cent was already buried before the storms of 2005. It must also be pointed out here that the high-voltage network represents only about 40 per cent of the total rural network, and that the network does not constitute the entire capital base.

Below is presented how large the electricity grid operators' investments[43] (reinvestments and new investments) have been in relation to the capital base[44] during the period 2005 to 2012. The table below shows that the rate of investment has indeed been higher in rural networks than in urban networks, but that the difference is marginal. There is therefore no indication that the networks in rural areas, due to burial, are considerably newer than in urban networks.

Table 3 Investments in relation to the capital base

| | | 2012 | 2011 | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 |
|---|---|---|---|---|---|---|---|---|---|
| Rural | T<10 | 3.38% | 2.63% | 3.90% | 3.69% | 4.15% | 4.23% | 3.56% | 2.40% |
| Mixed network | 10<T<20 | 1.94% | 2.02% | 2.11% | 3.26% | 4.05% | 2.33% | 2.42% | 1.93% |
| Urban network | T>20 | 2.86% | 1.82% | 2.88% | 3.23% | 3.96% | 2.48% | 2.26% | 1.60% |
| | Sweden | 3.21% | 2.38% | 3.23% | 2.97% | 3.60% | 3.03% | 2.87% | 2.10% |

Source: Ei

[43] Linked in 2010's price level to FPI for buildings
[44] Capital base at the end of 2010 in 2010's price level

Another reason to suggest that no major variations in tariffs arise between rural and urban areas is the rules that exist regarding joint accounting. Joint accounting means that grid operators with several neighbouring accounting units shall engage in joint accounting and apply the same tariffs in the joint accounting area, i.e. equalise the tariffs between the areas. Most of the accounting areas consist of both rural networks and urban networks which means that similar types of customers pay the same tariff whether they live in rural or in urban areas.

In view of the foregoing, Ei's view is that no major variations in tariffs should occur between rural and urban areas in the application of a real linear method. Even if individual variations would arise, Ei considers it reasonable that the regulatory model takes into account the companies' individual circumstances and that companies that have higher capital costs due to newer installations receive higher capital costs in the regulation. It is also reasonable to assume that the quality in newer networks is higher and it also justifies higher costs for the customer group in these network areas because a newer network creates added value for the customers.

## 4.6 A transition to the real linear method is necessary in order to create a regulation which is viable in the long term, and the negative consequences for the customer group are marginal

When applying a real linear method, the risk of electricity grid operators being overcompensated is eliminated as it takes the installations' age into consideration.

A real linear method provides incentives for investment, both in terms of new investments and reinvestments in the electricity network, without the need for complex quality regulation.

A real linear method also takes into account the individual circumstances of each grid operator. This will mean that the capital costs will not be the same for all companies but instead will vary depending on how old the companies' installations are. Capital costs allocated with the real linear method thus reflect the companies' actual capital costs in a much better way than the real annuity method.

The calculation of running costs can be handled in the same way as in the method applied today, i.e. based on the companies' actual controllable running costs. The regulation will then in this part also be based on the companies' actual circumstances rather than developing a standardised regulation using standard costs for operation and maintenance. As mentioned above, such a regulation is extraordinarily complex when applied to approximately 180 electricity grid operators with varying size and conditions. The assessment is that such standard costs would favour the large electricity grid operators and disadvantage the smaller grid operators.

If a regulation is to be effective in the long term, it must take into account the installations' age, otherwise there is a great risk of overcompensation. This requires age determination of the electricity network. The resource investment required is a one-time measure and the effort can also be limited by certain standardisation when the age determination is carried out, especially for older components. The costs incurred as a result of the age determination are marginal in relation to the value of the measure.

Well-balanced depreciation periods are essential for the regulation to work well from a socioeconomic perspective. There are uncertainties when it comes to assessing depreciation periods in the regulation. Determining the age of a network will facilitate the monitoring of these. When the installations have reached the end of the regulatory depreciation period, capital costs will no longer be generated in the regulation.

In order for socioeconomic losses not to arise as a result of an installation being replaced for the sole reason that the regulatory depreciation period has expired, there should be mechanisms in the regulation which ensure that a certain compensation is also paid out after the depreciation period's end in the event that the installations are still in operation.
The level of compensation must however be determined with care so that there are no new incentives to run installations beyond their economic life. This is because it can generate quality problems and rising operating and maintenance costs which negatively impact the customer group. Therefore Ei considers that the regulatory depreciation period should be defined in regulations along with a mechanism to ensure some compensation after the expiry of the depreciation period. Ei currently does not consider there to be any reason to abandon the assessment of appropriate regulatory depreciation periods that has been applied in the first supervisory period 2012-2015 (i.e. 40 years and 10 years respectively). Additionally, Ei notes that the regulatory depreciation periods have not been contested by any of the near 180 electricity grid operators.
The assessment is, in light of this, that the depreciation periods in any case cannot be assumed to be too short. The uncertainty associated with the regulatory depreciation periods will be eliminated by the successive revision component proposed by Ei. This aims to generate the compensation that the electricity grid operators are entitled to due to the network components' actual life possibly being longer than the regulatory life. However, such a revision component should not be provided indefinitely but instead should extend to a maximum of about 25 per cent longer than the proposed regulatory depreciation period (i.e. 50 years and 12 years respectively).

With such a practice, economic gains are divided between the customers and companies. In addition the companies obtain, with reasonably high accuracy, the same compensation level on that investment as if the regulatory depreciation period had reflected real conditions.

Since the capital costs allocated with a real linear method decrease with the installations' age, it may, from a theoretical standpoint, be feared that the method will lead to large variations in tariffs. However, electricity network operations have been built up gradually and the vast majority of the installations are in different phases of their life cycle, which means that it is unlikely that any major variations in tariffs will arise. Furthermore, the variation in the tariffs is also affected by the development of the controllable running costs. Capital costs allocated with a real linear method decrease with the installations' age while at the same time the controllable running costs very likely increase, which means that the total cost will also be constant when applying a real linear method.

The analyses conducted by Ei show that no major variations in tariffs between urban and rural areas will arise in the application of a real linear method. Even if such variations would arise, it is reasonable that the regulatory model takes into account the companies' individual circumstances and that companies that have higher capital costs due to newer installations receive higher capital costs in the regulation.

The method used for the allocation of capital costs does not have any significant impact on the companies' cash flows. It is important that the regulatory model provides the companies with reasonable cost recovery and an equitable return. It is then up to the companies to determine how the actual financing of the investments is done.

A change of method from real annuity to a real linear method is necessary in order to create conditions for a regulation which is viable in the long term. All the serious deficiencies identified in the current method would be eliminated if a real linear method was applied. The consequences arising from the application of real linear are mainly positive.

## 4.7 Implications of a method change from real annuity to real linear

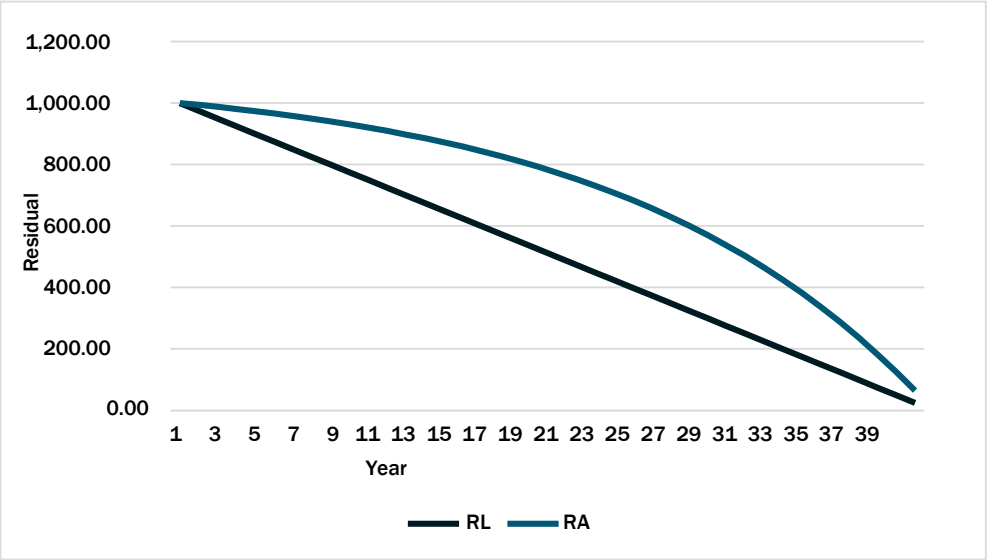
The introduction of a real linear method in the regulation means that there is a change in the method of allocating capital costs, resulting in different effects that must be considered.

To analyse the possible effects of a method replacement, the history of the previous handling of capital costs must first be known. Depending on how different parts of the capital cost calculation were previously handled in the regulation, different effects will result from the change of method. This primarily relates to depreciation periods, depreciation method and valuation of assets.

*Effects with a change of depreciation method*
How the capital costs are allocated over time appears different with real annuity and real linear. The capital costs decrease in real terms with real linear and are real constant with real annuity. A change of depreciation method during installations' life cycle may mean that the companies' are undercompensated for existing installations. This is because the companies are only allowed to impose capital costs in accordance with real annuity before the change in method, and therefore have not taken advantage of the initially higher capital cost allowed by real linear, but still have to adjust to the lower level that real linear permits at the end of the installation's life.

With real annuity, the consumption of fixed assets has a progressive pattern where the progression is determined by the costing interest. The value of the installation decreases slowly in the beginning as the majority of the capital cost consists of interest. At the end of the installation's life, the installation's value decreases at a faster pace. With real linear, the value decreases linearly over time. Figure 7 shows how the residual value changes over the installation's life with the two allocation methods. The example uses a present acquisition value of SEK 1,000 thousand, a life of 40 years and an interest of 5.2 per cent.

Figure 7 Change in residual value with RL and RA




When changing from real annuity to real linear during an installation's life, the value of the installation will decrease. The point where the installation is at in its life cycle affects the magnitude of the consequences of the change. If the change occurs at the beginning or the end of the life cycle, the impact will not be as great as if the change occurs in the middle of an installation's life cycle.

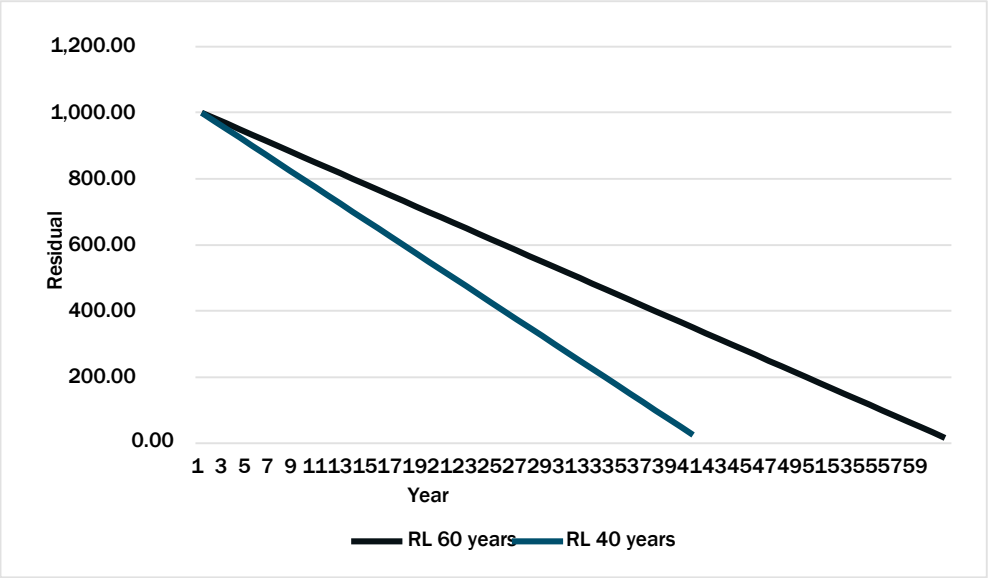
*Effects when changing the valuation of the assets*

How the assets are valued impacts the capital costs. A change of valuation method during a life cycle can lead to under- or overcompensation. If, for example, an installation is revalued from a book value to a present acquisition value, the interest rate must also be changed from a nominal rate to a real interest rate so that the companies are not overcompensated.

*Effects when changing depreciation periods*

A change in the depreciation period during the life cycle means that the residual value of the installation changes, as the consumption of fixed assets must be divided over more or fewer years. The figure below shows what happens when the installation's depreciation period changes from 40 years to 60 years. The figure shows that the line is moved upward to be distributed over 60 years instead of 40. If the depreciation periods change during an installation's life cycle, the residual value in this example will increase. The magnitude of the increase will vary depending on when during the life cycle the change occurs. The capital costs and the present value of the capital costs in Year 1 will also rise during such a change.

Figure 8 Change in residual value for different depreciation periods




*Previous methods of regulation*

In order to accurately show the effect of a method replacement on the allocation of capital costs, one must be able to trace installations from when they are put into service until the date of the actual method replacement.

After deregulation in 1996, the regulator focused on price changes and not the actual tariff level. In 2003, the Network Performance Assessment Model was introduced, which was based on real annuity for the calculation of capital costs. The Network Performance Assessment Model was an ex-post regulation used to determine which companies would be singled out for inspection. However, it is unclear what impact the Network Performance Assessment Model had in practice
in terms of calculating the capital costs, as the model was only in use over the course of a few years, and as it was contested by the grid operators as early as in the first year, 2003, and case law never was established.

The Network Performance Assessment Model calculated the capital costs based on the present acquisition value of a fictitious network. The present acquisition value of the local grid operators' installations was calculated at a total of SEK 177.4 billion in 2007. The depreciation periods applied were 40 years for transformers and cables, 12 years for low-voltage meters and 18 years for high-voltage meters. However, the depreciation period for low-voltage meters was adjusted during the Network Performance Assessment Model's time to 6.5 years, which was then adjusted further to 3.5 years.

The Network Performance Assessment Model was used until 2008, after which a gradual transition took place to the method used today. The method used today was introduced in 2012, wherein the capital costs are allocated with an annuity method. The capital costs are calculated on a present acquisition value on the companies' actual installations and the capital base's present acquisition value was calculated at the end of 2010 at about SEK 330 billion, where the local networks accounted for about SEK 260 billion. The depreciation period used is 40 years for stations and cables and 10 years for meters and systems. In addition to this, a transition method was used that limits the companies' revenues during an initial period.

As regards the regional networks and the national grid, no structured regulation was employed prior to 2012. The same method has been used for the regional networks as for the local networks since 2012. For the national grid, the method that has been used since 2012 resembles the one used for the regional and local networks, but the supervisory period only extends over one year. However, the method for the national grid has been changed every year since 2012.

*Effects from the change of method*

As stated above, the consequences of a method replacement depend on several different things and it is difficult to perform a complete analysis. Historically, the regulation has been changed several times and Ei notes that the historical handling of the capital costs is not relevant to consider for the period before 2012, as the methods applied have had no legal effect on the electricity grid operators' tariff setting.

For this reason, an analysis is performed on the effects of a method replacement starting from the year 2012. The starting point is primarily[45] the projected investments[46] for the years 2012-2015.

Presented below in Table 4 are capital costs for installations in which the companies have invested or can be expected to invest during the years 2012-2015 and how these capital costs are influenced by a method replacement in 2016. The present acquisition value in 2010 is used for all installations that were acquired during this period, the installations are assumed to have a depreciation period of 40 years, and the costing interest is set at 5.2 per cent. In the analysis, the transition method Ei applied for the first supervisory period is not used. Table 4 shows the present value of future capital costs, total capital costs and how the residual value is changed.

Table 4 Effects of a method replacement

Investments 2012-2015

| Investment (SEK thousan | Present value total of future capital costs (SEK thousand) | | Capital costs 2012-2015 (SEK thousand) | | Residual value in 2016 (SEK thousand) | |
|---|---|---|---|---|---|---|
| | Real annuity | RL from 2016 | Real annuity | Real linear | Real annuity | Real linear |
| 30,998,337 | 30,998,337 | 29,474,109 | 4,927,576 | 6,219,726 | 30,311,945 | 28,941,156 |

Source: Ei

The table shows that the present acquisition value for all investments during the period 2012-2015 is expected to amount to approximately 31 billion. The method replacement leads to some undercompensation for these installations. The table shows that the residual value of the installations drops when a replacement is made. The capital cost for investments during the first supervisory period has been calculated with real annuity at SEK 4.9 billion. A method change to real linear at the beginning of 2016 means that the companies are missing out on the initially higher capital cost that real linear would have given. In total the companies are missing out on SEK 1.3 billion due to such a method replacement, which corresponds to approximately 0.7 per cent of the total revenue framework that has been calculated with the standardised method.

[45] For 2012, the companies' real investments as reported in the Annual Report 2012 are used.

[46] Investments relating to local networks and regional networks.

The above effects show that there is some undercompensation for installations that the companies have or are expected to invest in during the period 2012-2015. However, these installations only represent a small part of the total capital base. In the discussion, it is therefore important to consider that the rest of the capital base has partially been overcompensated during this period. This is because the valuation of the capital base does not take into account the installations' age and thus probably includes depreciated installations. During the first supervisory period, due to overcompensation, the capital costs may even have been at a higher level than what would have resulted from an application of a real linear method. This despite the initially higher compensation the method permits.

This reasoning implies that the companies, which according to Ei have been overcompensated by real annuity and where the return has been too high, through the method replacement are guaranteed an equitable return under the Electricity Act's requirements. An excessively high return, which has resulted from the overcompensation, cannot be said to be reasonable under the Electricity Act's provision.

*The effect of not implementing the method replacement*
It is important to consider that real annuity has been used without taking into account the installations' age. As stated earlier in this report, this implies a great risk that companies will be overcompensated. The electricity grid operators, as well as Ei and the customers, can agree that overcompensation is something that occurs with the current model. Such a regulatory model is therefore contrary to the Electricity Act's requirement of an equitable return.

A change to real linear means that the method becomes more cost accurate. It is therefore important, in this respect, to also consider the implications of a method replacement not being implemented. Although the change in method leads to undercompensation for certain installations, the method replacement results in greater cost accuracy something that should be pursued according to the Electricity Act's provisions.

It is difficult to with complete precision calculate the total over- or undercompensations that the change from real annuity to real linear results in. It depends on the combination of other changes in the method. Ei's assessment is that the consequences are extremely marginal for the companies since it only involves consequences for a four year period as well as for a small percentage of the total volume of installations subject to new investment or reinvestment during the time period in question. In this context it should also be noted that when the installations' age is determined, the risk of overcompensation is also reduced, which must be factored into the reasoning.

# 5 Proposed amendments to the Capital Base Regulation

Prior to the introduction of ex-ante regulation of the electricity grid operators' revenue frameworks, the Government noted that the proposed regulatory framework for advance review essentially
consists of onerous public law regulations and lies within the area where delegation is possible under Chapter 8, Section 7 of the Instrument of Government (1974:152).[1]

The Government also stated that the question of whether case law is likely to be established in due time is of great importance to whether the reasonability assessment is to be concretised through case law or through Regulations. The Government also stated that the main principles for the design of the revenue framework are of such a nature that they should be specified in law, but that the law should not need to be amended due to changing conditions in industry structure or economic situations. The Government also commented that it is reasonable to assume that the supervisory model may need to be adjusted at least during the first supervisory periods, which should be possible without amending the Electricity Act. The Government thus concluded that more detailed Regulations should be issued by the Government or the network authority (Ei), supported by clear normative powers.[2]

In the subsequent Preparatory Works in the area, the Government stated that the large number of appeals and the scope of the current court processes show that the desire to clarify the reasonability assessment through official Regulations rather than case law has not been realised under the current regulations. Since there is a clear need to clarify the rules regarding the revenue framework in the near future and it is doubtful that this need can be met through the legal process taking place in the administrative courts, the Government considers that the normative powers in the Electricity Act should be extended.[3]

## 5.1 Regulation issued by the Government or by authorities

Based on the Government's proposal for new normative powers, Ei has been commissioned to investigate and submit proposals for amendments to the Capital Base Regulation. The proposed normative powers relate partly to the calculation of reasonable costs (Chapter 5, Section 8 of the Electricity Act) and partly to the calculation of a reasonable return (Chapter 5, Section 9 of the Electricity Act).

In concurrence with the Government, Ei considers that the basic principles for what should be specified in Regulation by the Government and by Ei respectively shall be that provisions of great significance to the design of the revenue framework should be communicated in the Capital Base Regulation in the same way as before. However there is a need for further Regulations in

[1] Preparatory Works 2008/09:141 p. 59
[2] Preparatory Works 2008/09:141 p. 59 f
[3] Preparatory Works 2013/14:85 p. 13

more specific issues considered by Ei to be of such a nature and degree of detail that Ei should be the authority issuing the Regulations.

## 5.2 Reasonable costs (§ 13)

The electricity grid operators' running costs can be roughly divided into controllable and non-controllable costs. The running costs increase with the installation's age. A limitation must be set in order to ensure that these costs do not rise too much. Ei's assessment is that the controllable costs should therefore be subject to an efficiency requirement while the electricity grid operator should be able to be credited the non-controllable costs in full.

There are currently no provisions on which costs are considered controllable costs and how these costs should be adjusted according to changes in the price situation. Ei considers the question of what costs are to be considered controllable to be a clearly defined and detailed issue. The same applies to the question of what index is to be used to adjust the controllable costs with respect to changes in the price situation. These matters should be left to Ei to establish in Regulations, and Ei therefore proposes that the Government, through the Capital Base Regulation, authorises Ei to issue Regulations regarding the running costs that are to be considered controllable and the index to be applied to adjust these costs. A corresponding provision is already found in the Regulation (2014:35) concerning the determination of revenue frameworks in the natural gas area.

However, the question of which efficiency requirements to impose on the controllable costs is not covered by the proposed authorisation.

## 5.3 Assets' economic life (§ 14)

To be able to calculate the consumption of fixed asset requires regulated depreciation periods to be determined for the assets included in the capital base. The purpose of the depreciation is to describe how much of an asset is being consumed or otherwise decreases in value.

It is important that the depreciation periods are well balanced so that they correspond to the installations' economic life. If not, this may lead to both over- and undercompensation. Since there are difficulties with assessing the depreciation periods in advance, there are two ways to handle this problem. Either the assessment of the depreciation periods is submitted to be developed in case law **or** they are established in a Regulation. Submitting the depreciation periods to be determined in court processes means that there are adjustments to the depreciation periods between different supervisory periods, which can lead to major over- or undercompensations for electricity grid operators. To establish the depreciation periods in a Regulation can result in installations being replaced before the economic life is reached if the depreciation periods are too short. To ensure that installations are not replaced prior to the expiry of the economic life, there should be, in the event that the depreciation periods are established in a Regulation, some compensation paid for installations still in use after the end of the depreciation period.

Ei currently does not consider there to be any reason to abandon the assessment of appropriate regulatory depreciation periods that has been applied in the first supervisory period 2012-

2015 (i.e. 40 years and 10 years respectively). In addition, Ei notes that the regulatory depreciation periods have not been contested by any of the approximate 180 electricity grid operators. In light of this, the assessment is that the depreciation periods in any case cannot be assumed to be too short. The uncertainty associated with the regulatory depreciation periods will be eliminated by the successive revision component proposed by Ei.

Ei believes that the issue is of such importance to the revenue framework's design that the Government should issue Regulations regarding the depreciation periods that should apply for different fixed assets. Ei proposes that this be achieved through the Capital Base Regulation.

## 5.4 Calculation of consumption of fixed assets (§ 15)

Ei proposes that a real linear method for calculating consumption of fixed assets be introduced in the Capital Base Regulation. From Ei's proposal for the Capital Base Regulation follows that, in the calculation of a reasonable return, the part of the capital costs that corresponds to consumption of fixed assets should be calculated as a fixed share of the present acquisition value. The fixed share is calculated based on the asset's economic life. This means that the annual depreciations in relation to the present acquisition value are equal in size over the entire life of the installation.

The second and third paragraphs of the proposal specify how the consumption of fixed assets should be calculated in the event that the economic life is over but the installation is still in use. To avoid socioeconomic losses as a result of installations being replaced solely due to the regulatory life having expired,
Ei's assessment is that there should be mechanisms in the regulation which ensure that some compensation is paid after the end of the depreciation period for the installations that are still in operation. The level of compensation must however be determined with care so that there are no new incentives to run installations beyond their economic life. This is because it can generate quality problems and rising operating and maintenance costs which negatively impact the customer group. Ei therefore proposes introducing a revision component which also ensures
some compensation after the depreciation period has ended if the regulatory economic life is established in the Capital Base Regulation (§ 14).

The successive revision component proposed by Ei in the second and third paragraph aims to generate the compensation that the electricity grid operators are entitled to due to the network components' actual life possibly being longer than the regulatory life. However, such a revision component should not be provided indefinitely but instead should extend to a maximum of about 25 per cent longer than the proposed regulatory life (i.e. 50 years and 12 years respectively).

Ei considers the provisions concerning the calculation of the fixed assets' consumption to be of such importance to the revenue framework's design that these should be established directly in the Capital Base Regulation and not delegated to Ei. Within the frameworks and based on the method the Regulation establishes for the calculation of consumption of fixed assets, however, there is cause to authorise Ei to issue more specific Regulations regarding the details of the regulation. The details may, for example, relate to the starting point from which the consumption of fixed assets should be calculated for an installation, and the installation categories on which a calculation of the consumption of fixed assets should be based.

## 5.5 If age data is missing (§ 16)

The basis for the calculation of consumption of fixed assets is that the electricity grid operator must specify which year the installation was put into service. In the event that a grid operator does not have information on how old an installation is, there must be regulations that govern how the age of the installation is to be calculated. Such a provision is only intended to be applied in exceptional cases. In addition, an alternative age determination will only be necessary prior to a single supervisory period. Thereafter, the age will have been determined for all of the company's existing installations.

Given that this involves an exception to the general rule, Ei's view is that the Government should authorise Ei to issue specific Regulations on how an installation's age shall be determined in cases where age data is missing. The proposed provision is a direct consequence of the introduction of a real linear method according to Section 14 and would thus mean that Ei regulates in more detail what the Government has prescribed. The general rule will therefore be outlined in the Regulation while the proposal is for Ei to be given regulatory powers in respect of those installations whose age cannot be determined under the general rule.

# 6 Summary analysis, conclusions and proposals

Electricity network operations represent both a legal and natural monopoly due to it being socioeconomically unviable to build parallel electricity networks that compete for customers. In a competitive market, competition typically leads to downward pressure on prices or improved quality. In a market that is not competitive, competitive pressures need to be replaced by regulations and regulatory oversight. The basic purpose of regulating the electricity network charges is to protect customers so that they do not have to pay more than necessary. At the same time, monopoly companies shall achieve sufficient revenues to operate the networks in a professional and cost efficient manner and ensure a reasonable profit. In order for electricity network regulation to work well in practice, the regulations must contain clear rules for decisions on how revenue frameworks are to be established.

In April 2013, Ei submitted a report to the Government entitled *Proposal for a revised regulatory framework for the assessment of the electricity grid operators' revenue frameworks - legislative proposals for the second supervisory period 2016-2019*[47]. In the report, Ei proposed inter alia extended normative powers with respect to how the electricity grid operators' revenue frameworks would be determined. The background to the proposals was primarily that the Electricity Act at present only contains general provisions on how the revenue framework shall be determined and that too much of the regulation is submitted to evolve through case law.

On 13 February 2014, the Government submitted the bill 2013/14:85, *The electricity grid operators' revenue frameworks*, to the Swedish Parliament. In the bill, it is proposed that new normative powers should be introduced in Chapter 5 of the Electricity Act. This means that the Government, or Ei on the Government's authority, can issue Regulations regarding the calculation of reasonable costs and the calculation of a reasonable return in connection with the electricity grid operators' revenue frameworks being determined.

The Government has considered it necessary to produce a supporting document that makes it possible to consider what amendments should be made to the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857), the so-called Capital Base Regulation. For this reason, Ei has been commissioned to investigate and propose amendments to this Regulation.

## 6.1 The current regulatory framework for the calculation of revenue frameworks has major deficiencies that are necessary to address

Prior to the introduction of ex-ante regulation, there was an investigation into the question of how revenue frameworks should be determined and what regulatory framework should apply. The report that was submitted by the Energy Network Commission through SOU 2007: 99, Advance review of network tariffs, etc.,

[47] Ei R2013:06

primarily pointed to the need for an age determination of the network, and that certain key parameters in the regulation would be established in legislation.

When the advance review was initiated, however, many of the proposals from the report did not result in action. Most of the assessments of the control model's design were therefore submitted to be finally developed through case law.

Prior to the first supervisory period, Ei made certain choices. These choices must be seen against the background of the short time available to develop a completely new model for ex-ante regulation of the electricity grid operators' revenue frameworks. Ei can now conclude that some of the choices made were, in retrospect, wrong and in all material aspects based on the premise of a simple and predictable regulatory model. With the support of the experience gained by Ei through developing the existing regulatory model, applying the method to around 180 companies and also handling all the appeals that followed, Ei can conclude that the current regulatory framework as well as the control method need to be revised.

In order for the companies and customers to be able to trust that the regulation will remain robust for a long time to come, Ei concludes that the regulation cannot be formed solely through Ei's application and the courts' case law, which can take a very long time. Nor is it appropriate that Ei is given extensive authority to prescribe regulations in fundamentally important issues. Such Regulations should instead be issued by the Government.

***It is Ei's assessment that the normative powers that exist today are not extensive enough and that too many principles, details and parameters have been handed over to be developed through case law. The lack of adequate rules for how revenue frameworks are determined results in the requirements of predictability for the customers and electricity grid operators not being fulfilled.***

## 6.2 Ei's method for the calculation of revenue frameworks has major deficiencies that are necessary to address

In the current regulation, a real annuity method is applied for the allocation of capital costs. The method is applied without information on the installations' age, resulting in several serious consequences. There is an obvious risk of the companies being over-compensated and the customers having to pay for the same installation more than once. This risk arises in that capital costs are reimbursed for fully depreciated assets, and through electricity grid operators receiving excessive equity compensation in the event that the economic life in the regulation is too short. Furthermore, the lack of information on the installations' age means that Ei is not able to follow up on the depreciation periods applied in the regulation, nor the rate of renewal and age status of the Swedish electricity networks.

The current control model thus implies that there are significant and obvious risks of the grid operators being overcompensated, which affects the country's electricity customers.

***Ei's assessment is that the current control model gives rise to significant risks of overcompensation to the grid operators, especially if applied without the transition method used by Ei in the decisions in the first supervisory period.***

Ei can also conclude that the method of capital cost calculation that has been applied can inhibit the renewal of critical infrastructure. The model provides incentives for companies to continue to run older installations rather than investing in new and more efficient installations. The incentives to continue running older installations arise from the companies receiving the same compensation level regardless of age, giving companies an incentive to maintain their installations as long as possible. When real annuity is applied without standard costs for controllable running costs, i.e. as in the current regulation, the only control that encourages reinvestments in the network becomes the quality regulation. It is not possible or even appropriate to create a quality regulation that is so strong that it completely compensates for the incentives created with a real annuity method. In today's legislation, there are also limitations on the quality reduction.

***Ei's assessment is that the control model inhibits the renewal of the critical infrastructure represented by the electricity networks. The incentives for the companies to renew the electricity networks are very weak and push towards maintaining existing components even when the economic life has expired. A stronger quality regulation cannot compensate for these shortcomings.***

The current regulatory model is both theoretical and standardised. This leads to practical problems when the method is to be applied to the country's approximate 180 electricity grid operators, which all have varying conditions for network operations and varying histories.

When a real annuity method is applied in the regulation, this means that the capital costs are allocated as a real constant over time, which means that the capital costs in the regulation do not reflect the companies' actual (accounting) capital costs, which in reality decrease linearly over time. This gives rise to several difficulties, including newly-established grid operators having to finance the prevailing differences between regulated compensation and actual capital costs themselves. Furthermore, this can also constitute far-reaching problems for municipal companies that should adhere to the so-called prime cost principle of the Local Government Act.

A control method based on real annuity and standard costs for ongoing operating and maintenance costs can also mean that certain categories of companies do not obtain cost recovery, as standard costs do not reflect the individual conditions prevailing within the particular electricity grid operator's operations.

Finally, it is pedagogically difficult to explain the control model to customers who have a lack of confidence in, and acceptance of, the regulatory model due excessively large differences between the capital costs compensated through regulation and the actual capital costs.

***Ei can conclude that the fact that the country's approximate 180 electricity grid operators are of varying size, history and ownership structure means that significant problems emerge when applying a real annuity method, which is both theoretical and standardised. This can give rise to inadequate cost recovery for companies that have a cost structure which differs to that allowed by the regulation.***

## 6.3 The shortcomings in the regulation would in essence remain with a development of the real annuity method – a method replacement is necessary

A real annuity method leads to overcompensation which, for the first supervisory period, Ei has chosen to manage with a so-called transition method that is subject to judicial review. Most of the electricity grid operators that submitted viewpoints feel that the overcompensation resulting from applying the real annuity method must be dealt with in some way. The proposal that most companies submitted is for the initial capital base to be adjusted so that the adjusted method gives the same capital cost as a real linear method would, using a "semi-old network" of around 20 years as a starting point. However, there are several problems with this type of adjustment, for example that some companies whose capital base is younger than "semi-old" would be particularly affected. Furthermore, such an adjustment entails an overcompensation for those electricity grid operators with a volume of installations which on average is older than 20 years. In addition, there is a lack of data needed to conduct adequate assessments of how these adjustments are to be made and thus there is no basis to introduce such provisions in Regulation form.

When applying a real annuity method in the regulation, it is necessary to develop both standard costs for controllable running costs as well as tighter quality regulation. Developing standard costs is resource intensive and complex and there are high demands that standard costs are designed in such a way that companies are not systematically advantaged or disadvantaged. In an application of standard costs, virtually no company will have real costs in line with standard costs. Standard costs fall within an area that includes extensive use of assessments and thus cannot be considered appropriate to establish in Regulation. In the event of any court action, Ei must first present a report convincing the court that developed standard costs provide reasonable results, and secondly, that it is appropriate to make use of standard costs instead of the companies' actual costs.

With regard to the quality regulation, it is difficult in practice to achieve tighter quality regulation, and even if this is achieved, the quality deduction is limited. For this reason, it is difficult to rely on the quality regulation as the main governing factor towards the renewal of infrastructure as important as the electricity networks.

Even if the current method were to be adjusted in the manner suggested by the companies, and even if standard costs for running costs and tighter quality regulation were developed, deficiencies in the method would still remain. Temporary and standardised solutions in terms of overcompensation do not solve the problems with the method in the long term. An effective regulation cannot be achieved if the depreciation periods in the regulation are not followed up and if the age of the installations is not taken into account. Electricity grid operators have a significant information advantage when it comes to these issues and they will always have the incentive to work to ensure that the depreciation periods in the regulation are as short as possible. This leads to the electricity grid operators being overcompensated. Furthermore, a regulation with a real annuity method and with standard costs for controllable running costs would essentially be very theoretical and standardised and not take into account the companies'

individual circumstances. This may mean that some companies do not obtain full cost recovery.

Finally, a theoretical model with real annuity and standard costs means that the various parts of the revenue framework do not match the reality of division between, for example, capital costs and running costs even if the total limits of the revenue framework might be considered reasonable. It would thus create a situation where companies that are undercompensated for certain parts of the revenue framework would appeal these parts, despite being overcompensated in other parts. That such a model is in itself very theoretical would mean that the court processes would be both complicated and risky. With a completely standardised regulation, Ei's control capabilities would also be significantly reduced. It is also questionable whether it is reasonable to apply a method that so pointedly ignores the approximate 180 electricity grid operators' individual circumstances in terms of size, history, and ownership structure.

An alternative method for allocating capital costs is a real linear method that takes the installations' age into consideration. The method aims for correct depreciation periods as it is in the electricity grid operators' interest that the installations' generate returns for as long as possible. With this method, risks of overcompensation, found in the current method, are thereby eliminated. The method also provides investment incentives for both new and replacement investments. The method thus requires neither standard costs for controllable running costs nor tight quality regulation to achieve control towards reinvestments in the network. With a real linear method, the regulation would, in its important parts, be based on the companies' actual conditions. This means that such a method is much easier to apply to a wide range of companies with different individual circumstances. Application of a real linear method provides a direct follow-up of both depreciation periods and reinvestments in the network.

Ei also suggests that the regulatory depreciation period should be fixed together with a so-called successive revision component which provides incentives for the electricity grid operators to maintain functioning installations even after the depreciation period has expired. This avoids the risk that the installations are not utilised optimally from a socioeconomic perspective.

***Ei considers that further development of the method with applying real annuity gives rise to obvious difficulties in application, enactment of rules and evidence in court processes. It is Ei's assessment that the deficiencies identified in the current regulation would to a great degree persist in such a further development of the method. The same applies to the obvious risks that the grid operators are overcompensated.***

***Ei's assessment is that a method switch to real linear is necessary to bring about a regulation of the electricity network monopolies in Sweden which is viable in the long term.***

## 6.4 The control model should be defined in a Regulation adopted by the Government

Ei considers it absolutely necessary that essential principles for the regulation are established in a Regulation adopted by the Government. Just as the Government has

stated in the Preparatory Works, today's regulation is not sufficiently clear, which has resulted in a lack of legal certainty. Several significant issues, such as how capital costs should be calculated, are at present submitted to evolve in practice rather than being clarified in legislation. The fact that there are ongoing processes in administrative court will not mean that there will be case law in this area that can serve as a guide in the place of legislation.

Ei therefore considers that the regulatory framework must already be clarified prior to the next supervisory period beginning in 2016. Ei's proposal for new provisions in the Capital Base Regulation assumes that it is the Government and not Ei who should issue Regulations concerning provisions of great importance to the revenue framework's design. The establishment of additional rules in Regulation form contributes to the creation of a long-term perspective which has been lacking when it comes to ex-ante regulation of the electricity grid operators' revenue frameworks. Ei proposes that the following provisions are supplemented in the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857):

- A provision that entails a definition of what is intended with controllable and non-controllable running costs• That a real linear method is used for calculating capital costs
- What economic life is to be applied for different installation categories
- What capital cost compensation is to be paid after the economic life has expired

However, there is a limited need for additional Regulations on more specific issues of such a nature and degree of detail that Ei can and should be the authority issuing the Regulations. Ei proposes that the following normative powers, to be issued to Ei, are supplemented in the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857):

- Which running costs are controllable and which index shall be used for calculating changes in the price situation
- Additional rules on the calculation of the consumption of fixed assets
- How the installations' age is determined when such data is not available

The rules that Ei proposes to be enacted in Regulation by the authority would relate to clearly defined and detailed issues where there may be justification for further development of the provisions in the future, something which would be difficult if the provisions were laid down in a Government Regulation.

**Ei has prepared proposals for amendments to the so-called Capital Base Regulation which involve a real linear method being used for calculating capital costs. This also includes a proposal regarding the level of capital cost compensation to be paid after the economic life has expired and the normative powers to be given to Ei. More detailed descriptions and considerations are presented in Chapter 4 and 5.**

## 6.5 The consequences that arise for the customer group as a result of a switch to the real linear method are due to actual circumstances

The real linear method takes into account the age of the installations with the result that newer installations generate higher capital costs than older installations. This leads to a reallocation of the companies' charges where customers in areas with older networks will pay lower charges than customers in areas with newer networks. Electricity grid operators with newer installations have higher actual capital costs and it is reasonable that they also receive higher capital cost compensation in the regulation. The customers' charges are also affected by controllable running costs that likely increase with the installations' age, which means that it is not certain that the tariffs will decrease with the installations' age.

According to the provisions on joint accounting, grid operators with several neighbouring network areas shall engage in joint accounting and apply the same tariffs in the joint accounting area, i.e. equalise the tariffs between the areas. The analyses conducted by Ei show that there will most likely be some reallocation between customer groups where newer networks will be slightly more expensive and older networks will be cheaper. However, Ei views this solely as a consequence of actual circumstances in respective networks. Ei also believes that these effects are likely to be marginal given that the tariffs are not governed exclusively by capital costs but also running costs, and also taking into account the existing joint accounting rules.

To study the effects of a method replacement for the customer group, Ei has analysed what impact a reallocation of the companies' charges would have for customers in urban areas whose networks are usually somewhat older than the networks in rural areas. Thus, customers in urban areas will experience slightly lower network charges than customers in rural areas. However, Ei's analyses show that no major variations in tariffs are expected between urban and rural customers. This is due to the investments in rural areas in the near future only marginally differing from the investments in urban areas, as well as the fact that grid operators with several neighbouring accounting units shall apply the same tariffs in the joint accounting area, i.e. equalise the tariffs between urban and rural areas.

The possible marginal effects that arise from a method replacement should be weighed against the risk of overcompensation inherent in the alternative method, i.e. real annuity.

***Ei can conclude that a method replacement will also result in consequences for the customer group. Because the risk of overcompensation is in essence eliminated, the risk of customers incurring excessively high network charges will decrease. However, there will be reallocations between customer groups wherein newer networks will become slightly more expensive and older networks will become cheaper. Furthermore, this is solely a consequence of actual circumstances in respective networks. Ei also assesses that these effects will be marginal, especially given the rules on joint accounting.***

## 6.6 Ei considers that the economic consequences for grid operators arising as a result of a method replacement are marginal in relation to the risks associated with maintaining or developing the current method

The effects arising from a method replacement will depend on many things, and it is difficult to perform a complete analysis since Ei does not have access to all the data necessary for such an analysis. Historically, the regulation has been changed several times, and Ei has noted that the historical handling of the capital costs is not relevant to consider for the period before 2012 as the methods
applied have had no legal effect on the electricity grid operators' tariff setting. For this reason, Ei has performed an analysis of the effects of a method replacement starting from the year 2012. The starting point in the analysis is primarily the projected investments for the years 2012-2015. The analysis shows that a method switch to real linear at the beginning of
2016 means that the companies will miss out on the initially higher capital cost that real linear would have provided for the investments made during the period in question. According to Ei's estimates, the electricity grid operators will miss out on SEK 1.3 billion due to not being able to implement tariff setting according to the real linear method during the supervisory period 2012-2016. This corresponds to approximately 0.7 per cent of the total revenue framework that has been calculated with the standardised method.

However, Ei's assessment is that, in the calculation of a reasonable costing interest rate for calculating revenue frameworks, bonuses are included for the financial, operational and regulatory risks faced by a regulated electricity network monopoly. A method replacement can be considered to constitute a regulatory risk that is intended to be covered by the costing interest rate. Thus there is no reason to weigh in the financial consequences of a method replacement for the owners of a regulated monopoly.

Ei has noted that the application of a real annuity method in the calculation of the electricity grid operators' capital costs poses a great risk that the companies will be overcompensated as the age of the installations is not taken into account in the regulation. This risk is eliminated when applying a real linear method. The method also means that companies that have higher costs due to having new installations also receive higher compensation in the regulation. This differs from real annuity where all companies receive the same compensation regardless of their actual costs, which leads to companies with old installations and low real capital costs obtaining unreasonably high returns. The real linear method provides the companies with reasonable cost recovery and an equitable return. For this reason, there are also no legal obstacles to the implementation of the change in method.

***Ei concludes that switching to the so-called real linear method will give rise to consequences. Ei considered a method replacement to be entirely possible from a legal perspective. The economic consequences that may arise for the grid operators are marginal according to Ei's analysis. The method replacement may also be considered part of the regulatory risk that is covered by the risk supplement in the costing interest when the companies' returns are calculated.***

## 6.7 Ei believes that the Government should urgently adopt the proposed Regulation

The electricity grid operators shall apply for a revenue framework for the second supervisory period no later than 31 March 2015, and Ei shall announce decisions on those revenue frameworks by 31 October 2015. Both Ei and companies must make preparations for the second supervisory period and, for these to be carried out in time, the conditions for the second supervisory period must be known within a reasonable timeframe. Ei's proposal for amendments to the Capital Base Regulation has an impact on the conditions coming into the next supervisory period. If a decision on the Capital Base Regulation is not made before the forthcoming supervisory period, it will not be possible to implement the changes before 2020. For this reason, Ei considers it important that the Government urgently examines the proposal.

***Ei's assessment is that the Government should urgently adopt the proposed Regulation so that the regulatory conditions can become known to the companies affected as soon as possible. Both the grid operators and the regulating authority will need to make preparations for the upcoming supervisory period 2016-2019. However, Ei finds that the time remaining is sufficient for the Government to decide on an amended Regulation for the next supervisory period.***

## 6.8 Further investigative work of importance for the future

Ei has previously identified several investigative measures that need to be taken for future supervisory periods. Ei has noted that the Government has stated that the issue regarding the handling of connection charges in calculating the revenue frameworks needs to be examined further. The same applies to the issue previously identified by Ei regarding requirements concerning the grid operators' capital structure in order to avoid or minimise the risk of the State being forced to take over electricity grid operators that go bankrupt. This can happen, for example, when a high indebtness ratio is applied in order to increase returns for the owners of a monopoly company.

Ei would also like to point out to the Government that the required return that the state has for the public utility Svenska Kraftnät, the TSO, may need to be reviewed if the regulation proposals now being submitted are later adopted by the Government. In this context, a new examination should also be conducted of the situation where one-year revenue frameworks are used for the public utility Svenska Kraftnät, which differs from other grid operators who are subject to four-year supervisory periods.

# 7 Impact analysis

In this report, Ei is submitting several proposals for amendments to the Regulation (2010:304) concerning the determination of revenue frameworks under the Electricity Act (1997:857). The proposal that will involve the greatest implications for the grid operators is for the calculation of the grid operators' capital costs to be changed from a real annuity method to a real linear method. It is proposed that the companies receive compensation for capital costs during the asset's economic life. In the event that the asset can be used for longer than prescribed life, the companies shall be accorded a lower level of compensation for this period. In order to implement this new capital cost calculation, the companies must determine the age of their fixed assets, which will require a resource investment prior to the initial supervisory period subject to this method. In addition to these changes, Ei proposes that the Government stipulate parameters regarding the installations' economic life, i.e., depreciation periods. Ei also proposes that the authority issue Regulations with regard to more detailed matters.

Ei considers that the proposals should enter into force on 1 July 2014. The provisions must enter into force in good time prior to the submission of revenue framework applications for the upcoming supervisory period. According to Ei's Regulation (EIFS 2010:6), such an application must be submitted by 31 March 2015 in this case. In order for the electricity grid operators to be able to determine the age of the networks, the time period before the submission cannot be too short.

The justification for the various proposals is presented in Chapter 4 and 5. A summary assessment, conclusions and proposals are found in Chapter 6.

## 7.1 The electricity grid operators

### 7.1.1 General information

The amendments to the Capital Base Regulation as proposed by Ei involve two different types of consequences; consequences for the companies' revenues and administrative consequences. The proposals submitted in this report, if adopted by the Government, will impact approximately 180 electricity grid operators. The companies' sizes vary greatly from a few dozen customers to over one million customers.

In this report, Ei proposes changes to important parts of the ex-ante regulation of the electricity grid operators' revenue frameworks. The method for examining the grid operators' charges and the principles that should govern this have been changed several times since the deregulation of the electricity market. The grid operators have thus experienced a number of changes to the conditions for running their business operations. The period of four years that the current ex-ante regulation has applied since 2012 cannot be considered long enough to provide the companies with legitimate expectations that the regulation will achieve stability in the future in terms of retaining the same principles and methods. In addition the Government has stated that, should the supervisory model provide individual grid operators an actual return on sales in the future that regularly exceeds or falls below the

calculated revenue frameworks, there will be cause to revisit the question of what constitutes an equitable return.[48]

For the introduction of a different method for calculating capital costs than the one used before the supervisory period 2012-2015 to be acceptable, the most important factor is that such a regulation is also proportional to the objective being pursued. Ei's view is that proportionality should be assessed based on the companies' requirement of an equitable return together with the goal of reasonable charges for the customer group. The change to a real linear method provides the companies with cost recovery and an equitable return.

### 7.1.2 Impact on the companies' revenues

In Chapter 4, Ei noted that the present method entails a risk of the grid operators being overcompensated. The proposed method replacement, from a real annuity method to a real linear method, is therefore intended to provide a reasonable return on the capital needed to operate a business. In particular, Ei's view is that the networks' age needs to be taken into account in a better way when determining compensation for capital costs. The proposal currently being submitted by Ei implies that the revenue framework's size is impacted by the installations' age to a greater degree.

Through the proposed method for calculating capital costs, depreciation periods and the level of compensation the companies receive after the depreciation period has expired, the electricity grid operators obtain stable and predictable conditions for their business operations. These conditions are also achieved through the method established in the Capital Base Regulation, as opposed to the current method which to a large degree is left open to interpretation by authorities and courts. This reduces the business risk for the electricity grid operators.

To illustrate the consequences of the introduction of a real linear method, Table 5 below shows a comparison between revenue frameworks calculated with a real linear method and with an annuity method for the period 2012-2015. The calculation has been made with the assumption of different average ages of the installations. The table also shows the revenue framework determined by Ei for the period with and without the so-called transition method.

Table 5 Revenue framework calculated with real linear and real annuity

| The installations' average age | 30 years old | 25 years old | 20 years old | 15 years old |
|---|---|---|---|---|
| Revenue framework 2012-2015 real linear | 152 billion | 161 billion | 170 billion | 179 billion |
| Revenue framework 2012-2015 real annuity | 181 billion | | | |
| Revenue frameworks in accordance with Ei's permitted adjustments | 160 billion | | | |

Source: Ei

[48] Preparatory Works 2008/09:141 p. 79 f

The table shows that the revenue frameworks for a "semi-old network", i.e. a network that is about 20 years old, would be approximately SEK 170 billion. For the revenue framework calculated with real linear to exceed the revenue framework calculated with real annuity, the installations must be newer than 13 years old on average.

Ei's assessment is that the impact of the proposals will mean that the companies are provided reasonable compensation in accordance with the Electricity Act's requirements. The method for calculating capital costs applied today instead gives companies a too high return. Ei's proposal thus implies that the Government's intentions with an ex-ante regulation are achieved with the proposed regulatory framework.[49]

### 7.1.3 Administrative consequences

The introduction of a real linear method for calculating the capital costs will require the companies to report the installations' age to Ei. They have not been required to do this previously. However, information on the installations' age is only a supplement to the data to which the electricity grid operators already have access, and which they have reported to Ei when applying for a revenue framework prior to the first supervisory period. There are requirements in accordance with the Auditing of Network Operations Ordinance (1995:1145) and requirements in accordance with BFNAR 2001:1 stipulating that the companies are obligated to have information on the installations' age. However, Ei's view is that in some cases it may be administratively onerous for companies to gather information on the installations' age and report it to Ei. Ei has therefore proposed that the authority is given the right to prescribe methods of determining the age of networks when this data is not available. A certain level of standardisation should be possible for some installations in order to facilitate companies and reduce administrative costs. The cost of producing age data for older installations is however a one-time cost as this information only needs to be produced the first time that the new method is applied.

The access to adequate age data can vary among companies. In order to assess the magnitude of the one-time administrative costs, certain assumptions must be made. Firstly, the starting point in most cases is that the companies have age data for more than half of their fixed assets. For companies that do not, however, significant administrative resources will be required to produce this data. It may in fact require the grid operators' staff to go out to a site and find out the year in which the installation was manufactured. In these cases, it can also differ greatly between the companies. For companies operating electricity networks in urban areas, it may be more costly to produce age data than for a company that to a high degree only has electricity networks in rural areas. The size and scope of the electricity networks will also be of importance in this context. Ei's proposal for the authority to be able to issue Regulations will reduce the companies' costs. Such a Regulation could, for example, indicate that other data may be used to determine an installation's age. One example of such data could be the year when a residential area has been built and has therein been connected to the electricity network. Another example could be the year when the installations are considered to have been put into service. These Regulations result in lower costs for companies when producing

[49] Cf. Preparatory Works 2008/09:141 p. 93 where the Government, with regard to the consequences of an ex-ante regulation of the grid operators' revenue frameworks, indicates that revenues should neither be higher nor lower than with the previous regulatory model. As Ei previously noted in the report, however, the regulation has led to substantial increases in revenue for many grid operators.

age data, compared with the option of physically visiting each individual installation. However, Ei cannot say in advance how companies will act in each individual case. It may therefore be assumed that the companies will both apply Ei's Regulation regarding age determination and that they will also go out to the sites to obtain data. By specifying what the costs will be if a company only accesses the installations' age data on site or only applies a standard rule for determining the installations' age, the highest cost and the lowest cost for the age determination will be provided in the event that this data is not available.

Ei estimates the cost and time for implementation as follows depending on whether an inspection is done on site or if a standard rule can be applied: [50]

Table 6 Estimated resource consumption in the production of age data

| | Person/days – min | Person/days – max | Lowest cost | Highest cost |
|---|---|---|---|---|
| Actual age | 30 | 250 | SEK 75,000 | SEK 625,000 |
| Standard rule | 1 | 10 | SEK 2,500 | SEK 25,000 |

The size of the electricity grid operator is of great significance in the context of calculating costs. Ei has estimated here that the 10 largest companies will have the highest costs for actual age according to the table above and that 100 companies have the lowest costs for actual age, and that the remaining approximate 70 companies have the highest cost under the standard rule. This estimate implies a total cost of SEK 15.5 million for the electricity grid operators.

If a company has information on an installation's age, the administrative costs may vary. Firstly, it can be assumed that many companies have this information organised in a digitised register. In these cases, the companies probably need to modify their IT system so that a report can be submitted to Ei when applying for a revenue framework. Ei estimates that it requires between one person-week and four person-weeks to accomplish such a change. In the event that the data is not available in digital format, this information instead needs to be compiled in a digital register. Ei estimates that this task, where applicable, will require at least four person-weeks of work and at most sixteen person-weeks.

Table 7 Estimated resource consumption regarding modifications to IT system

| | Person/days – min | Person/days – max | Lowest cost | Highest cost |
|---|---|---|---|---|
| Cost IT system | 5 | 20 | SEK 12,500 | SEK 50,000 |
| Manual processing | 20 | 80 | SEK 50,000 | SEK 200,000 |

Furthermore, Ei assesses that the 10 largest companies will have the highest costs for IT system according to the table above and that 100 companies have the

[50] Payroll cost (wages and payroll taxes) per person/day of SEK 2,500. Based on an average wage for a private civil servant of SEK 36,210 per month.

lowest costs for IT systems, and the remaining approximate 70 companies have the highest cost under manual processing. This estimate implies a total cost of SEK 15.75 million for the electricity grid operators.

In addition, the fact that Ei can issue Regulations regarding what costs the electricity grid operators can control and which index to use when these costs are recalculated with respect to changes in the price situation will make any judicial processes more streamlined and less extensive. Ei's view is that these proposals do not result in any administrative costs for the companies.

Ei's proposals are not expected to impact small companies any differently than large companies. The costs primarily associated with the proposals are related to the costs of determining the age of the electricity networks. These will vary with the size of the company and the extent to which data is already collected at the respective companies.

## 7.2 The customers

Through the regulatory method for calculating capital costs being established in the Regulation, the ex-ante regulation of the electricity grid operators' revenues becomes more predictable and thus the customers' network tariffs become more predictable.

The regulation proposed accurately reflects the companies' regulated capital costs and the companies' book capital costs. This contributes to customers perceiving the model as more transparent as it takes into account the companies' actual costs to a greater extent than at present. This makes the model easier to understand than a model where capital costs are calculated using real annuity, i.e. based on a more standardised approach. Since the model takes into account the installations' age, it implies a reduced risk that the customers will pay for the same installation more than once.

If the installations are used longer than the regulated depreciation periods, part of the social benefit gained from not replacing functional installations too early will fall to the customers with this proposed model. They will pay a lower network tariff than if the companies had invested in completely new installations too early. The total capital cost compensation that the companies will receive as long as the installations are in use will roughly correspond to the total capital cost compensation that the companies would have received if the depreciation period had been correctly chosen from the beginning.

With the application of a real linear method, the capital costs decrease with the installations' age and the operating and maintenance costs are expected to rise with the installations' age. From a customer perspective, it is the total costs that are relevant for future network charges. These are likely to remain at a fairly constant and stable level.

## 7.3 The Swedish Energy Markets Inspectorate

The decisions regarding the revenue frameworks can be appealed to a general administrative court, and in the current regulatory framework there are no detailed provisions on the methods to be used in determining the revenue frameworks. This means that, at present,

it is to a high degree left to the courts to determine this in cases where the companies appeal Ei's decisions. Ei has in its dealings with the court processes concerning the revenue frameworks for the years 2012 to 2015, reported process costs in excess of SEK 10 million, including counsel fees. These costs are expected to decrease somewhat with the proposed amendments to the Capital Base Regulation, where the possibility of appealing all parts of the method is diminished. Ei estimates these reduced costs at SEK 1 million.

Ei has proposed that the authority is permitted to issue more detailed Regulations on how the networks' age is to be determined in the event that specific data is not available. In such cases, Ei may need to process more data than is currently the case. Ei's assessment is that this corresponds to a cost of SEK 869,000.

Ei's view is that the proposed amendments to the Capital Base Regulation will result in both reduced costs for processes and increased costs for supervision. Overall, however, this will not lead to increased resource requirements for the authority.

## 7.4 The Swedish Courts

With the current absence of a more detailed regulatory framework for what exact methods to use in the ex-ante regulation of the grid operators' revenue frameworks, much has been submitted to be developed in case law.

Through the proposals now being presented by Ei, a method for calculating capital costs, depreciation periods, the compensation received by the companies after the depreciation period's end, the costs that are to be considered controllable and the index to be used to recalculate these costs will be laid down in Regulations. This means that any future appeals of Ei's decisions regarding revenue frameworks will become more streamlined, which entails a slight unburdening of the courts' workload.

## 7.5 Other consequences

Ei has considered whether the proposals in the report may have an impact on local self-government, crime and crime prevention, equality between women and men or the potential to achieve integration policy objectives. Ei's assessment is that the proposals do not impact any of these goals.

## 7.6 Compatibility with EU law

The proposed regulation is consistent with Article 37, paragraph 1a of the electricity market directive.51 The article states that the regulatory authorities shall have the duty of "fixing or approving, in accordance with transparent criteria, transmission or distribution tariffs or their methodologies".

[51] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC

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