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Assessment of the annual cross-border infrastructure compensation sum

Study commissioned by

ACER

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Final Report – Draft

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Abbreviations

EIP	Energy Infrastructure Package
GTS	Global transit share
ITC	Inter-Transmission System Operator Compensation
LRAIC	Long-run average incremental costs
NRA	National regulatory authority
PCI	Project of Common Interest
RoR	Rate of return
TSO	Transmission system operator
TYNDP	ten-year network development plan

1 Introduction

1.1 Background and scope of the study

According to Regulation (EU) No 714/2009 ('Regulation 714' [1]) the purpose of the Inter-Transmission System Operator Compensation (ITC) mechanism is to compensate Transmission System Operators (TSOs) for costs incurred as a result of hosting cross-border flows of electricity on their networks. When the ITC mechanism was introduced, it replaced previously existing cross-border network access tariffs. By compensating the above costs among TSOs, the network access charges do no longer depend on the particular network user's cross-border trading activity.

The current ITC mechanism was implemented with the entry into force of the Regulation (EU) No 838/2010 ('Regulation 838' [2]) on 3 March 2011. Annex A of Regulation 838 sets out binding guidelines on the ITC mechanism. The ITC mechanism shall comprise two components, namely the compensation of the costs of losses incurred by national transmission systems as a result of hosting cross-border flows of electricity and the costs of making infrastructure available to host cross-border flows of electricity. The latter component shall be based on an annual cross-border infrastructure compensation sum which shall be apportioned among TSOs. This compensation sum is referred to as "ITC infrastructure fund" in the remainder of this report.

Article 5.4 of said Annex sets the amount of the ITC infrastructure fund to 100 m€/a for the time being. According to point 5.3 of said Annex ACER shall carry out an assessment of the infrastructure of electricity transmission associated with facilitating cross-border flows of electricity. The assessment shall consist of a technical and economic assessment of the forward-looking long-run average incremental costs (LRAIC) on an annual basis of making such electricity transmission infrastructure available for cross- border flows of electricity over the relevant period, and shall be based on recognised standard-costing methodologies.

Based on this assessment, ACER shall make a proposal to the European Commission on the future ITC infrastructure fund. The European Commission shall determine the size of the fund following the proposal from ACER or, if it disagrees with ACER's proposal, ask ACER for a second opinion.

On this backdrop, ACER has commissioned a study to Consentec with the aim to obtain assistance in assessing the ITC infrastructure fund and drafting the above mentioned proposal. This document constitutes the draft final report of this study.

It is essential to note that this study is explicitly confined to the assessment within the currently valid legal framework, as outlined above. Specifically, the methodology for determining the contributions to pay into the ITC infrastructure fund and the compensations to receive from it is firmly laid down in Regulation 838, as is the treatment of losses. For different reasons it may be considered helpful to discuss on a more general level, with a medium to long term perspective, the goals, methods and principles of the ITC mechanism as a whole[1] – but without prejudice as to the appropriateness or necessity of such discussion, this would be beyond the scope of this study.

1.2 Approach and time schedule

The study shall provide both qualitative and numerical analyses. At first, the relevant policy context and the requirements for the infrastructure compensation sum are reviewed. This comprises an evaluation of the existing legal framework as well as current developments. In addition we have invited the transmission system operators (TSOs) and national regulatory authorities (NRAs) of the countries participating in ITC to provide us their opinion regarding the appropriate size of the ITC infrastructure fund. Further input was received during meetings with the European Commission and ENTSO-E, respectively.

The opinions and expectations expressed by the stakeholders were highly diverse. There was no intersection of opinions that would provide clear guidance towards any widely acceptable determination method or even size of the ITC infrastructure fund.

Nevertheless, the concrete arguments brought forward by the stakeholders have been taken into account while conducting the policy review. This means that we do not intend to "an-

[1] The need for a general enhancement of the ITC mechanism has been claimed by several stakeholders that have provided input to our study (cf. section 1.2). Moreover, the European Electricity Regulatory Forum has requested ACER to identify whether the current ITC scheme needs enhancement [3].

swer" specifically to every contribution, but stakeholders should find their points addressed in the course of the analysis in chapter 2 below.

As a next step, methodology options for the determination of the infrastructure fund are developed. This is based on the idea that although the policy context provides for some guidelines and restrictions it leaves room for different ways in which the fund can be determined, and it is not clear "at a glance" which of these options should be preferred. Therefore, different options need to be developed and assessed by means of qualitative considerations and numerical analysis. The numerical assessment shall provide estimates of the ITC infrastructure fund size that the assessed methodical options would yield under present circumstances as well as its prospective future development. In order to obtain the necessary input data ACER has sent questionnaires to ENTSO-E and the relevant NRAs.

We would like to express our gratitude to all stakeholders that provided input to our study so far.

This draft final report contains in chapter 2 the review of the policy context and requirements. Based thereon, chapter 3 develops the methodology options that form input to the further stages of assessment. Chapter 4 reports on the numerical assessment. In chapter 5 we provide preliminary conclusions on the appropriateness of the options and on the suitability of the LRAIC costing approach.

This report will be input for a public consultation. During the consultation period the draft final report will be presented and discussed at a stakeholders' workshop. On the basis of feedback from ACER and the public consultation we will prepare the final report. The study will be completed by the end of 2012.

2 Review of policy context and requirements for the infrastructure compensation sum

2.1 Principal dimensions to consider

In principle, the determination of the infrastructure fund for ITC can be decomposed into two dimensions:

- Scope – the question which share of the TSOs' infrastructure is to be considered relevant for the infrastructure fund under ITC;
- Costing methodology – the question how the relevant share of the TSOs' infrastructure is valued when determining the size of the infrastructure fund.

The advantage of this decomposition is that these two dimensions can be discussed independently from each other without restricting the overall bandwidth of conceivable methodical options. Consequently, this approach has already been proven useful in past studies about ITC (e.g. [5]) as a means to structure the discussion.

Before analysing the policy context along the lines of the dimensions of scope and costing methodology in the remainder of this chapter, we derive in the next section the criteria against which any methodology for determining the infrastructure fund needs to be assessed.

2.2 Criteria

2.2.1 Overview

The requirements for the methodology by which the infrastructure fund is to be determined broadly fall in two categories.

Firstly, any method must comply with the legal provisions defining the ITC mechanism. In particular, this comprises Annex A of Regulation 838 – constituting the most concrete and detailed legal document with respect to the ITC mechanism – as well as articles 13 and 18 of Regulation 714 on which Annex A of Regulation 838 is based.

Secondly, the ITC mechanism (and hence the infrastructure fund as an element thereof) must be coherent with other instruments relating to financing of infrastructure for cross-border

power flows. Two instruments need to be considered here: Congestion management and the proposed Energy Infrastructure Package.

2.2.2 Compliance with legal provisions defining the ITC mechanism

Article 13 of Regulation 714 lays down high level requirements for the ITC mechanism. Three clauses are particularly relevant for the size of the ITC fund:

- Article 13.1 sets out that ITC shall compensate for "costs incurred as a result of hosting cross-border flows of electricity".
- Article 13.3 adds that compensation payments shall reflect "cost actually incurred".
- More detailed definitions are given in article 13.6: "The costs incurred as a result of hosting cross-border flows shall be established on the basis of the forward-looking long-run average incremental costs, taking into account losses, investment in new infrastructure, and an appropriate proportion of the cost of existing infrastructure, in so far as such infrastructure is used for the transmission of cross-border flows, in particular taking into account the need to guarantee security of supply. When establishing the costs incurred, recognised standard-costing methodologies shall be used. Benefits that a network incurs as a result of hosting cross-border flows shall be taken into account to reduce the compensation received." As we discuss in more detail below, this has implications for both the scope and the costing dimension of the infrastructure fund.

Annex A of Regulation 838 clearly distinguishes between the losses and the infrastructure components established by article 13.6 of Regulation 714. Furthermore, provisions concerning the infrastructure component partly deal with the size of the infrastructure fund and partly with the contributions to and compensations from this fund. The methods for determining contributions and compensations are firmly defined in articles 6.1 and 5.2, respectively. By contrast, the infrastructure fund (referred to as "annual infrastructure compensation sum" in Regulation 838) is treated in a more open way:

- For the time being, article 5.4 sets the fund to 100 m€/a.
- Article 5.3 (referred to by article 5.1) demands for and defines the cornerstones of the assessment which this study provides input to:
    - The costing principles are adopted from article 13.6 of Regulation 714.

- Regarding the scope of the infrastructure fund, the assessment shall consider by which sources the infrastructure is financed: "Where infrastructure is financed by sources other than charges for access to networks applied in accordance with Article 14 of Regulation (EC) No 714/2009 the assessment of costs of making infrastructure available for cross-border flows of electricity shall be appropriately adjusted to reflect this." This implies some focus on infrastructure financed by network access charges, while it remains to be interpreted how an "appropriate adjustment" for other sources of financing could be implemented.
- The geographical scope of the infrastructure fund is defined to comprise Member states and third countries participating in the ITC mechanism as well as transmission systems of TSOs who have concluded so-called multi-party agreements.

Besides the direct implications of each of the above mentioned articles and paragraphs, there are two overarching aspects with relevance for our further analysis. The first one is the relation between Regulations 714 and 838. Regulation 838 is the more specialised provision, specifying the current ITC mechanism within the requirements set by Regulation 714. This means that the principles defined by Regulation 714 need to be respected not only by any new method for determining the infrastructure fund according to articles 5.1 and 5.3, but that also the currently valid annual fund size of 100 m€ *de facto* constitutes an interpretation of the goals and principles of Regulation 714.

The second overarching aspect is that Regulation 838 requires an assessment of the infrastructure fund size (articles 5.1 and 5.3), whereas the methods for determining the contributions to and compensation from this fund are firmly laid down in articles 6.1 and 5.2, respectively. One may argue – and many stakeholders responding to our request did so – that the appropriateness of the ITC mechanism needs to be evaluated in terms of the absolute net financial positions of the ITC participants. However, the only degree of freedom within the current legal framework, i.e. the fund size, merely scales these net financial positions in a proportional way, i.e. the relative positions of the participants will continue to be derived according to the currently defined methods. Consequently, the fact that the combination of the fund size (degree of freedom) and the relative contributions and compensations (fixed) needs to be consistent with the requirements of Regulation 714 in terms of ITC, constitutes a restriction for the assessment of the infrastructure fund within the current legal framework. This may justify, if not demand for, some form of methodical simplicity, i.e. the method to be proposed

for determining the fund size under Regulation 838 along with the assessment approach as such should be proportionate with regard to the above mentioned restriction.

2.2.3 Coherence with other instruments

Congestion management

At borders where the network users' demand for transmission capacity exceeds the amount of capacity that the TSOs can safely make available, the TSOs earn congestion revenues from allocating the transmission capacity by means of auctions. In this respect TSOs receive income related to cross-border exchange and, consequently, cross-border flows of electricity. It is obvious that the origin of such income is similar to the origin of ITC payments. For this reason the coherence of ITC with congestion income has always been a prominent topic in the discussion about an appropriate ITC mechanism. The bandwidth of positions is large: Some stakeholders argue that all congestion income should be set off against ITC compensation claims in order to avoid double compensation. Others argue that both instruments should be treated separately as they fulfil different purposes.

Irrespective of a potential need for a fundamental discussion about the relationship between ITC and congestion management, we recall here that this study is confined to assessing the ITC fund under the restrictions imposed by the currently valid legal framework. In the following we therefore analyse in which way the legislator has interpreted the requirements as to the coherence of ITC and congestion management. Any discussion about potentially different interpretations would require an amendment of Regulation 838 and thus be out of the scope of this study.

As stated in section 2.2.2, article 5.3 of Annex A of Regulation 838 requires the infrastructure fund to be appropriately adjusted to reflect infrastructure financed from other sources than network access charges. Such other financing sources comprise

- congestion revenues, since article 16.6 of Regulation 714 connects these revenues with network investment for the increase of interconnection capacity as well as with the calculation and/or fixing of network tariffs; and
- private investment in cases of direct current interconnectors that have been granted an exemption according to article 17 of Regulation 714.

Hence the legislator has established a connection between congestion revenues and the scope of the ITC infrastructure fund. In principle, and having regard to the different options for using congestion revenues according to article 16.6 of Regulation 714, this could be interpreted in different ways:

- **Narrow interpretation** – According to article 16.6, first subparagraph, point b, congestion revenues may be used for network investment in order to maintain or increase interconnection capacity. Such investment is then explicitly financed by congestion revenues and not by network tariffs. It would, therefore, constitute a double compensation if such investments were stated as "costs incurred through cross-border flows" and included in the ITC infrastructure fund.

- **Wide interpretation** – According to the second subparagraph of article 16.6 congestion revenues may be considered as income when setting network tariffs. One could argue that this implicitly reduces the extent to which infrastructure is financed by network tariffs. Following this logic, the total cost of the transmission infrastructure – of which the cross-border related part shall form the ITC infrastructure fund – would need to be reduced by this share of congestion revenues. Effectively, only the remainder, which is financed through network tariffs, should be eligible for the fund.

  However, a number of arguments render this wider interpretation questionable.

  There is a certain degree of diversity among European countries regarding the number and kinds of components by which TSOs' cost are recovered. Besides "ordinary" charges for using the network some TSOs raise separate charges for auxiliary services or partly cover their cost through the balancing mechanism. Defining the scope of the ITC infrastructure fund would, consequently, become subject to the interpretation and "labelling" of country specific income sources. Moreover, defining the fund via tariffs, many if not most of which are based on historic cost, would contradict the requirement to use LRAIC as cost assessment principle.

  Network tariffs finance more than infrastructure cost, as TSOs incur several other kinds of cost, e.g. for procuring ancillary services. Consequently, in cases where congestion revenues are (partly) used to lower network tariffs, it is not straightforward to determine the share thereof that is used to cover cost of making infrastructure available for cross-border flows. A respective solution might require deep country-specific analyses, depend on

country-specific accounting rules and ultimately contradict the requirement to apply standard-costing methodologies for assessing the ITC infrastructure fund.

It is important to recall that in the current legal framework only the ITC infrastructure fund size is open for reassessment, while the method for determining the relative compensations and contributions is fixed. By including the congestion revenues into the determination of the ITC infrastructure fund, one would effectively define the method for determining the relative compensations and contributions as European sharing key for at least a part of the congestion revenues. Generally, this would constitute a premature fixation of an issue that has been the subject of controversial discussions about coordinated (e.g. flow-based) congestion management for years. It is very unlikely that the method defined in Regulation 838 for determining the relative compensations and contributions to the ITC infrastructure fund happens to constitute the most suitable method for sharing congestion revenues. In fact, we would consider this key inappropriate as it is based only on flows (which is consistent with the cost recovery approach of ITC), whereas congestion revenues are based on the value of exchanges and hence of flows, which should and can be reflected in the definition of an appropriate sharing key.

We conclude that the narrow interpretation is applicable in the current legal context. It means that congestion revenues shall be taken into account in an indirect way, namely by adjusting the amount of infrastructure to be considered in the ITC infrastructure fund.[2]

However, some stakeholders, including ACER, have requested us to also estimate the effect of adopting the wide interpretation. We therefore include this aspect in the list of sensitivity analyses as part of the numerical assessment in section 4.2.

In any case, Regulation 838 does not provide for a direct deduction of congestion revenues from some preliminary cost figure in the process of deriving the ultimate infrastructure fund size.

[2] "Indirect" here refers to the fact that the adjustment is made in terms of the amount of assets financed by congestion rent, irrespectively of the level of the congestion rent. There is no direct deduction of congestion rent from some initial cost figure, but rather an adjustment of the scope (i.e. asset amounts) eligible for the ITC infrastructure fund.

The proposed way of linking ITC and congestion revenues in the "new" method for determining the infrastructure fund size (i.e. the one to be proposed according to articles 5.1 and 5.3) appears to be consistent with the way in which the current ITC infrastructure fund is defined in article 5.4 of Annex A of Regulation 838. In particular, the current fund size is set to a constant amount of 100 m€/a. If congestion revenues had to be directly set off against ITC compensation claims, then these 100 m€ would have to be the result of subtracting the Union wide annual congestion revenues from a larger initial amount. But given that firstly, these total congestion revenues amount to around one order of magnitude higher than 100 m€/a, and secondly, annual congestion revenues undergo notable changes between subsequent years, the variation of the ITC infrastructure fund size between subsequent years would have to be in the same order of magnitude as the fund size itself. Clearly, if such approach had been the basis of the current fund, the fund size would have been defined in a dynamic way. But the current fund size is static, because the amount and annual cost of infrastructure financed by congestion revenues develops by far slower compared to the fluctuation of the amount of annual congestion revenues.

Energy Infrastructure Package

The Energy Infrastructure Package (EIP) – currently in the status of a proposal – aims at promoting the timely development of trans-European energy networks in order to achieve relevant EU policy objectives [4]. More specifically, it defines so-called Projects of Common Interest (PCI) that shall mainly be financed via the network access charges of those countries that benefit from the respective investment (article 13.1 of the EIP). This means that on the one hand the EIP proposes a distinct mechanism for financing PCIs such that it would be logical to not consider them in the ITC mechanism. On the other hand, Regulation 838 would not provide any means for such exclusion as article 5.3 of its Annex A only allows for adjustments relating to infrastructure that is not financed by network access charges.

This has the following implications:

- There appear to be valid reasons for considering an amendment to Regulation 838 when the EIP comes into force. It is, however, out of the scope of this study to discuss the future role and design of ITC in parallel to the EIP.
- Rather, the purpose of this study is to perform an assessment of the ITC infrastructure fund within the currently valid legal framework.

Consequently, the EIP will not be considered in the remainder of this study.[3]

2.3 Scope

As introduced above, the question of the scope of the infrastructure fund relates to the share of total TSOs' infrastructure that needs to be considered when determining the fund size.

The geographical scope, which is defined in general terms in article 5.3 of Annex A of Regulation 838, concretely comprises 34 countries for the time being (table 2.1).

AL	AT	BA	BE	BG	CH	CZ	DE	DK
EE	ES	FI	FR	GB	GR	HR	HU	IE
IT	LT	LV	LU	ME	MK	NI	NL	NO
PL	PT	RO	RS	SE	SI	SK		

Table 2.1: Countries within the geographical scope of infrastructure fund (as of 2011 and 2012)

Undoubtedly only a certain share of the transmission networks' infrastructure of these 34 countries shall be considered in the infrastructure fund.

As discussed above (cf. section 2.2.3, subsection on congestion management), article 5.3 of Annex A of Regulation 838 requires the assessment of the ITC infrastructure fund to be appropriately adjusted to reflect infrastructure financed from other sources than network access charges. In the course of this study the TSOs, via ENTSO-E, have been requested to provide information on the infrastructure amounts falling in this category. However, the requirement to "appropriately adjust" the assessment still needs to be interpreted. While a complete exclusion of such infrastructure would be one way of adjustment, the wording of Regulation 838 leaves room for other options as well. We come back to this issue when describing the methodology options in section 3.2.2.

More general requirements as to the scope of the infrastructure fund are defined in article 13.6 of Regulation 714. It clarifies right at the beginning that ITC is (only) about "costs incurred as

[3] This interpretation of the task of this study has been confirmed by ACER and European Commission staff.

a result of hosting cross-border flows". This defines a kind of filter which all cost components mentioned later in the respective clause need to pass. Leaving aside losses, which are treated separately in Regulation 838, hence being out of the scope of this study, this relates to two groups of infrastructure: "investment in new infrastructure" and "an appropriate proportion of the cost of existing infrastructure, in so far as such infrastructure is used for the transmission of cross-border flows, in particular taking into account the need to guarantee security of supply". Despite this somewhat uneven level of detail between new and existing infrastructure, the structure of the entire clause makes clear that the inclusion of any infrastructure in the ITC fund is restricted to the share thereof that is used for hosting cross-border flows.

2.4 Costing methodology

As the specification of the scope of infrastructure to be covered by the infrastructure fund makes some editorial distinction between new and existing infrastructure (cf. previous section), one could raise the question if the costing methodology could or should also be differentiated between new and existing assets. For instance, one could argue that costs of existing assets are determined within the respective national tariff systems anyway, whereas a forward-looking approach may be most suitable for new investments. However, both Regulation 838 and 714 are clear that all costs for ITC shall be determined on the basis of forward-looking long-run average incremental cost (LRAIC):

- The first clause of article 13.6 of Regulation 714 sets out that LRAIC shall form the basis of the cost assessment and then lists the three cost elements to be taken account of, namely new infrastructure, losses and an appropriate proportion of the cost of existing infrastructure.
- Article 5.3 of Regulation 838 picks this requirement up by demanding that the assessment of the infrastructure fund shall consist of an "assessment of forward-looking long-run average incremental costs on an annual basis".

An interpretation of the term "forward-looking LRAIC" will be part of chapter 3.

Interestingly, article 5.5 of Annex A of Regulation 838 asks ACER for an opinion on the suitability of LRAIC as costing principle for ITC (which this report also provides input to, see section 5.2). Presumably this article relates to past discussions on the suitability of LRAIC in

particular for valuing existing infrastructure. Nevertheless, the currently valid legal provisions clearly prescribe LRAIC as only costing method for ITC.

3 Methodology options for further assessment

3.1 Principles

The purpose of this chapter is to develop a range of options for the methodology to determine the infrastructure fund that fulfil the requirements as discussed in the previous chapter. We will structure the discussion by continuing the decoupling of

- Costing – i.e. definition how the cost of some given infrastructure shall be determined for ITC purposes; and
- Scope – i.e. determination of some "key" that defines which share of the total infrastructure shall be considered in the infrastructure fund.

For practical reasons it has been proven useful and widely acceptable in the past to determine the scope in terms of asset amounts (in kilometres and/or MVA) for a set of asset classes, and to weight these amounts with unit cost per asset class according to the costing methodology.

At the outset, however, it is important to understand that the currently valid legal framework implicitly defines some high-level principles that need to be considered in any case.

Firstly, Regulation 838 restricts the assessment of alternative options to the size of the infrastructure fund, while the method for determining the contributions to and compensations from the fund is fixed. On the one hand, this single degree of freedom can be interpreted as a restriction of the range of opportunities to "improve" the present ITC mechanism, should this be considered desirable. In fact, several stakeholders have expressed to us quite fundamental concerns about the appropriateness of the present mechanism. However, whether these arguments are justified or not, it is obvious that they could not be appropriately reflected by altering only the size of the infrastructure fund while leaving the relative contributions and compensations untouched.

On the other hand, the limitation to a single degree of freedom calls and allows for a proportionate, i.e. reasonably simple, method for determining the fund size. Any sophisticated approach with high implementation effort would not be proportionate at least as long as the method for determining contributions and compensations remains unchanged. In particular, this renders most of the cost allocation methods for ITC that have been proposed and discussed in the past irrelevant for the current study. The reason for this is that these methods are

based on the assessment of compensations (e.g. With-and-Without-Transits) or both contributions and compensations (e.g. Average Participations, Marginal Participations) per individual ITC party. Hence the total size of the infrastructure fund is only a by-product obtained by adding up the country-wise compensations or contributions. Using this by-product for the total fund size while ignoring the country-wise figures it is composed of would constitute an inconsistency. Consequently, the key by which the scope of the ITC fund is determined should be defined on a global basis and not be composed of country-by-country assessments.

The second high-level principle stems from the fact that Regulation 838 in its entirety (including its Annex A) is, by definition, consistent with the principles for ITC as defined in Regulation 714 (cf. section 2.2.2). Specifically, by enacting Regulation 838, the legislator has deemed the combination of the interim ITC infrastructure fund size of 100 m€/a and the method for determining contributions and compensations a consistent interpretation of the requirements defined in Regulation 714. This needs to be taken into account when assessing alternative options for determining the fund size while – necessarily – keeping the other methods unchanged.

3.2 Options for LRAIC

3.2.1 Conceptual considerations

As concluded in section 2.4 forward-looking LRAIC shall be the only costing methodology for determining the infrastructure fund size. We discuss in this section how the "headline" LRAIC should be interpreted in detail and what degrees of freedom exist in this context that could contribute to a variety of options for the ITC fund.

We note that a previous study we undertook jointly with Frontier Economics already analysed possible interpretations of LRAIC in the context of ITC [5]. In the following we draw on the findings of that study and discuss adaptations to the present legal context. We also cross-check our interpretation with material from the telecommunications sector as the LRAIC principle has reportedly been inherited from there when drafting ITC principles (e.g. [6]).

The term "long-run" implies that no costs should be excluded because they are not variable in the short run. In particular, investment costs are clearly to be included in LRAIC.

The term "average" can be interpreted in two, non contradicting ways. Firstly, a common interpretation in the telecommunications sector is that cost should be determined as an average across all provided "services". Transferred to the ITC mechanism this would clarify that the "service" of hosting cross-border flows should not be separated from any other function that the respective infrastructure fulfils, but that the total cost of providing all "transmission services" should be shared pro rata by cross-border and other functions. Secondly, it points towards annuities, i.e. constant annual cost over the entire lifetime of an asset. This is underlined by the explicit reference to the "annual basis" in article 5.3 of Annex A of regulation 838.

The term "incremental" points out that the cost assessment shall assume a situation where additional transmission capacity is added to the grid, regardless of whether a new or an existing piece of infrastructure is being assessed. This implies that the cost shall not necessarily be determined for the very network element in question, but for a new investment that would provide the same capacity with current, efficient technology.[4] At the same time the general structure and topology of the existing network are not questioned, as these form the starting point which the increment relates to. Consequently, the ITC infrastructure fund shall be based on asset amounts of the actual network being valued with unit cost on the basis of LRAIC. This is also in line with Article 13.3 of Regulation 714 requiring ITC to reflect costs actually incurred.

The term "forward-looking" implies replacement cost (as opposed to historic cost) as the basis of the assessment.

As discussed in [5] a key question with respect to LRAIC is to which extent joint and common cost should be taken into account. In this context it is important to note that ensuring precise cost recovery for TSOs is a matter of national network access charges, and according to article 14.3(a) of Regulation 714 ITC payments and receipts shall be taken into account when determining these charges. This means that precise cost recovery has lower priority for ITC, such that more emphasis can be laid on aspects like consistency and objectivity in acknowledging and distributing in a reasonably fair manner costs incurred in carrying cross-

[4] This is referred to as "modern equivalent asset" in [6].

border flows. This points towards a "thin" definition of LRAIC with the following cost elements:

- The LRAIC assessment should comprise the direct cost of an investment, i.e. asset cost, land cost, installation, testing and commissioning expenditure.
- There should be no allocation of joint or common cost (e.g. project management overhead across a number of projects, corporate centre, control centre, ancillary services).
- In addition to the capital cost, incremental annual operating cost should be calculated as a fixed percentage of the direct investment cost. We propose to apply a value of 2 % (in line with [7]).

In order to arrive at annual cost, the capital outlay of the investment needs to be transformed into an annuity. This requires data on depreciation periods and real[5] rates of return.

Most of the above considerations on LRAIC apply to any method for determining the infrastructure fund in the current legal framework. We recommend, however, that one aspect be left open for the time being and rather be used to develop alternative options – namely the question of country-specific versus standardised figures.

- Country-wise figures could be applied with respect to the unit investment cost (capital outlay), the depreciation period and the rate of return. This would put some priority on "correct" cost levels in the sense that the affected TSO's actual cost (as considered in the network access charges) would be approximated. Consequently, the figures for depreciation periods and rate of return should be consistent with the method for determination of the respective national tariff.
- Standardised (average) figures, i.e. identical unit cost for LRAIC across all relevant countries, would express the acknowledgement that the precision of cost recovery is of relatively low importance for ITC. This is even more so as the effect of showing particularly high or low cost on one country's net financial position is limited in the current legal framework. The reason for this is that any change in country-specific cost will only change the total fund size, while the relative compensations and contributions will remain

[5] Using real interest rates is consistent with the fact that capital costs are considered at replacement cost level.

constant.[6] In fact, depending on how the average unit cost figures are determined, the results may even be identical to those obtained with country-wise cost figures. As regards the depreciation periods, the standard figure(s) could be chosen with the aim to reflect actual asset lifetimes rather than bookkeeping regulations. This would make the ITC infrastructure fund size less dependent on decisions on depreciation principles that were taken in a national (tariffing) context.[7]

3.2.2 Questionnaire

Based on the above considerations we developed a questionnaire to NRAs requesting country-specific input data for the computation of LRAIC unit cost. This questionnaire and accompanying notes are documented in annex A.

3.3 Methodology options for the infrastructure fund size

Bearing in mind the general principles set out in section 3.1, namely

- the aim of a proportionate, relatively simple approach based on a global key for determining the relevant scope; and

[6] By contrast, with cost allocation methods that calculate the total fund by adding up country-wise cost components, an increase or decrease of the "own" unit cost has a direct impact on the compensation claim. Consequently, using country-wise instead of standardised unit cost figures does not only lead to a proportional change of net payments (by altering the total fund size), but also changes the relative position of the ITC parties (cf. [5], p. 59). By principle, such effects cannot occur in the current legal framework.

[7] Presuming that depreciation periods for tariffing are in most cases shorter or equal to actual asset lifetimes, such standardisation would also help avoiding a systematic overestimation of LRAIC. When determining national tariffs, a shorter depreciation period yields higher cost of younger assets, but at the same time a larger share of (older) assets would not yield any capital cost at all. In the case of a homogeneous age structure the total cost would, on the long run, be independent of the depreciation period. If, on the contrary, LRAIC unit costs are applied to value all existing assets, then a shorter depreciation period systematically yields higher total cost.

- the understanding that the combination of the current ITC infrastructure fund size (100 m€/a) with the fixed method for determining compensations and contributions constitutes a consistent interpretation of Regulation 714;

we develop in this section two options (with some sub-options each) for determining the scope of infrastructure to be considered under ITC. These can be broadly characterised as follows:

1. The "incremental" approach takes the second of the above principles as its main guideline, i.e. it is based on the idea that Regulation 838, including the current fund size, is a valid interpretation of Regulation 714, and the infrastructure fund should develop from this starting point.
2. The "absolute" approach is based on the view that one may independently interpret the relevant provisions of Regulation 714, and that the results for the first year of its adoption should be consistent but not necessarily identical to the current fund size.

Along with the detailed description of these two approaches we discuss with which of the LRAIC options outlined above they could be combined. Therefore, the following subsections ultimately deliver the set of methodology options for the entire determination of the infrastructure fund, encompassing both costing and scope components.

3.3.1 Incremental approach

This approach can be outlined as follows:

- At the time of entry-into-force of Regulation 838 (March 2011) the current ITC infrastructure fund size of 100 m€/a constituted the "appropriate proportion of the cost of existing infrastructure" according to article 13.6 of Regulation 714.
- Every development after that date, i.e. decommissioning of existing infrastructure and commissioning of new infrastructure, leads to an adjustment of the infrastructure fund, taking into account that only a share of the infrastructure is attributed to hosting cross-border flows.

While in principle the precise day of entry-into-force of Regulation 838 would be relevant for distinguishing between "existing" and "new", we consider it appropriate for practical reasons to apply a year-by-year separation ("existing" = 2010 or earlier, "new" = 2011 or later).

In practice, it would be difficult and onerous to try and properly decide for each investment project whether it constitutes an extension of the grid or a replacement of existing infrastructure. Therefore, we propose a simpler process to implement the above ideas:

- Every investment leads to "new" infrastructure and may lead to an increase of the infrastructure fund, with the following restrictions:
  - To the extent that the investment is financed by other sources than the national network access charges, an "appropriate adjustment" is necessary. We propose here to completely deduct such other sources of financing from the cost of the investment.[8]
  - Only the share of the investment related to hosting cross-border flows may be counted for ITC. As stated above, a global (not country-wise or even project-wise) key should be applied to determine this share. The key should be simple to determine, bearing in mind the fact that relative contributions and compensations remain unchanged. In fact, some similarity to the way in which contributions and compensations are determined would certainly be desirable.

    The formulae for determining the compensations reflect cross-border flows by means of "transit" as defined in article 1.6 of Annex A of Regulation 838. In order to distinguish between cross-border and "other" use of the transmission system, one could argue that the other use is to serve domestic load (as defined in article 1.8 of said Annex). In particular, in a network without any cross-border flows all remaining flows would occur for the purpose of serving domestic load. This leads to the following definition of a "global transit share" GTS:

[8] Note that for the entire existing infrastructure the "appropriate adjustment "of non-tariff based financing is included in the start value of 100 m€/a.

$$GTS = \frac{\sum_{i=1}^{N} T_i}{\sum_{i=1}^{N} (T_i + L_i)} \quad (3.1)^9$$

with N number of ITC participants

T_i transit of participant i

L_i load of participant i

It is important to note that the GTS contributes[10] to the ITC mechanism fulfilling the prerequisite of Regulation 714/2009 demanding that "benefits that a network incurs as a result of hosting cross-border flows shall be taken into account to reduce the compensation received". This is implicitly achieved by adopting the definition of transits, which is based on netted flows (i.e. the result of flow contributions in both directions) on interconnectors.

In principle, one could consider a differentiation between interconnector lines and other assets, i.e. interconnectors would be weighted with 1 and other investments with the GTS. This would express the position that interconnectors are by definition built for cross-border flows. However, the GTS is indeed a global estimate, which is valid on average, but does not necessarily fit precisely to particular investment projects.

- Existing infrastructure is written off in a general way, thereby reducing the fund size. Besides, its costs need to be updated to reflect the replacement cost principle. Consequently, the starting value of 100 m€/a is adjusted every year by means of two steps:
  - Write off: Assuming a standard depreciation period D, $1/D$ of the 100 m€ are subtracted every year. This reflects that every year – under the simplified assumption of a homogeneous age structure – $1/D$ of the existing assets reach the end of their depreciation period.
  - LRAIC update: The remainder is multiplied with the ratio of current unit cost and unit cost of 2011 in order to reflect LRAIC developments over time.

[9] Note that this factor is contained in the formula for determining the load factor according to article 5.2(2) of Annex A of Regulation 838

[10] In addition, the method for the compensation of losses is defined in Regulation 838/2010 such that potential reductions of losses through cross-border flows are taken into account.

As regards LRAIC options (cf. section 3.2), the existing infrastructure component is a lump sum without country-wise differentiation. Consequently, it can only be valued with standardised unit cost. Moreover, the average structure of asset classes across all countries must be applied as weighting factors to transform the standardised unit cost per asset class into one global unit cost encompassing all asset classes.

By contrast, the relevant share of new investments could, in principle, either be valued with country-specific or with standardised unit costs, taking account of the asset classes of the individual projects. However, applying standardised unit cost also for new investments would ensure consistency with the valuation of the existing infrastructure.

The determination of the infrastructure fund F_{inc} according to the incremental method can be summarised by the following formula:

$$F_{inc,t} = 100Mio\left(1 - \frac{t-2011}{D}\right)\frac{UC_{global,t}}{UC_{global,2011}} + GTS_t \cdot \sum_{i=1}^{k}\left(Q_i\left(1 - q_{other,i}\right) \cdot UC_{i,t}\right) \quad (3.2)$$

with

t	year under assessment
D	standard depreciation period
k	number of new investment projects (2011 or later)
Q_i	quantity (in km or MVA) of new investment i
$q_{other,i}$	relative share of investment i financed by sources other than national network access charges
GTS_t	Global Transit Share of year t
$UC_{global,t}$	global unit cost in year t
$UC_{i,t}$	unit cost of asset class of investment i in year t

3.3.2 Absolute approach

This approach can be outlined as follows:

- There is no distinction between existing and new infrastructure.
- Article 13.6 of Regulation 714 is interpreted such that both the relevant share of new infrastructure and the "appropriate proportion" of existing infrastructure should be consistently determined by applying the global transit share *GTS*.

This means that first the entirety of transmission assets is valued in terms of LRAIC, taking account of an "appropriate adjustment" to reflect infrastructure not financed by national network access charges. Then, this global cost figure is multiplied with the GTS to obtain the infrastructure fund size.

Due to the roughness of this approach, the implementation of the "appropriate adjustment" for infrastructure not financed by national access charges is not as straightforward as with the incremental approach, where new infrastructure can be treated project by project. We discuss practical options and consequences in the context of the numerical assessment in section 4.2.3.

As regards LRAIC options (cf. section 3.2), both country-wise and standardised unit cost would be applicable with the absolute approach, in principle. However, there may be an issue with the execution of the country-wise option: There may be countries where assets of some particular class exist, but no new projects of that class have taken place in recent years. This may render it difficult to determine a LRAIC estimate for this asset class and country. However, other countries may have seen new projects of that class recently such that a plausible standardised LRAIC figure could be determined by averaging across these countries.[11]

The determination of the infrastructure fund F_{abs} according to the absolute method can be summarised by the following formula:

$$F_{abs,t} = GTS_t \cdot \sum_{i=1}^{k} \left(A_i \cdot UC_{i,t} \right) \tag{3.3}$$

with

t	year under assessment
GTS_t	Global Transit Share of year t
A_i	Quantity (in km or MVA) of asset class i, after "appropriate adjustment" for financing by other sources than network access charges
k	number of asset classes
$UC_{i,t}$	unit cost of asset class i in year t

[11] Note that this issue does not apply to the incremental approach where country-wise unit cost would (as an option) only be applied to new investments, such that the availability of recent cost data would be guaranteed.

Generally, we would expect that, at least in the next several years, the fund size determined by the absolute approach will be larger than the outcome of the incremental approach,[12] which would develop from the starting value of 100 m€/a. Depending on the extent of the difference this could be interpreted as a violation of the principle that the combination of the current fund size and the method for determining contributions and compensations constitute a consistent implementation of the requirements of Regulation 714 (cf. section 3.1). A methodology leading to an abrupt large change of the infrastructure fund size, while the relative payments remain constant, may not be appropriate.

However, there may be a way to amend the absolute approach in order to avoid such rejection: As a wider interpretation of the "incremental" element of the LRAIC principle, one could restrict the scope of the absolute approach to infrastructure that has been commissioned after a particular reference year. The determination of the relevant share of infrastructure could either be done on the basis of detailed asset information or, in a more pragmatic way, by adopting the idea of a standardised depreciation period (and homogeneous age structure) from the incremental approach:

$$F_{abs,restricted,t} = F_{abs,t} \cdot \frac{t - t_{ref}}{D} \qquad (3.4)$$

with D standard depreciation period

t year under assessment

t_{ref} reference year

As regards the selection of the reference year there is no unambiguously "correct" solution. One possible position would be that infrastructure built after the entry into force of the first electricity market directive in 1996 should be relevant for ITC. In the numerical simulation we will use this as a starting point, but also consider alternative reference years.

3.4 Summary of options

In the previous sections we developed three methodical options:

[12] This expectation stems from the fact that most ITC methods discussed in the past that were somehow based on a bottom-up evaluation of network assets resulted in larger fund sizes. The numerical assessment in section 4.2 confirms the expectation.

- Incremental approach – equation (3.2)
- Absolute approach – equation (3.3)
- Restricted absolute approach – equation (3.4)

These will be further assessed in the following numerical analysis.

4 Numerical assessment of methodology options

This chapter contains two sections. In section 4.1 we describe how we obtain the data base for the numerical assessment and analyse the properties of the data received. In section 4.2 we turn to the assessment of the ITC infrastructure fund size for the methodology options set out in chapter 3.

4.1 Assessment of data base

4.1.1 Introductory remarks

We consider 2011 as the base year of the numerical assessment as this is the latest completed year as of conducting the assessment.

ACER originally requested us to carry out the numerical assessment for 2011, 2012 and 2013. In the course of the study, however, it turned out that the availability of data imposes restrictions on the analysis.

- There are no reliable forecasts of the development of cross-border flows and related indicators, because cross-border flows depend on numerous uncertain factors such as weather conditions. In order to estimate the volatility of flow patterns between subsequent years it is rather appropriate to use data from exemplary historic years.
- There are no reliable European-wide forecasts of the development of the grid infrastructure for the next two years. The relative increase of the asset amounts compared to the existing levels will be small within this short period, such that uncertainties of authorisation or construction processes may have a relatively large impact. By contrast, there is a sound pan-European plan for the development of the transmission grid within the next decade, namely the ten-year network development plan (TYNDP, [8]).

Therefore, in accordance with ACER and in line with the views expressed by ENTSO-E (from which we requested the data relevant for analysing different years), we assess

- the short term volatility of flow patterns by comparing cross-border flow data of 2011 and 2010 (as part of a series of sensitivity analyses); and
- the impact of prospective network expansion by means of forecasted asset amounts of 2022.

Some of the data used in the following analysis has been classified as confidential. Therefore, evaluations on country level are presented in an anonymous way.

We would like to thank ENTSO-E and the NRAs for their effort in providing the data.

4.1.2 Asset volumes

4.1.2.1 Base year 2011

Differentiation by asset classes

For the determination of asset volumes (and, subsequently, their valuation with unit cost), we distinguish six asset classes, in principle [7]:

- **Class A**: Transmission AC lines and cables with voltage > 300kV;
- **Class B**: Transmission AC lines and cables with voltage ≥ 220kV and ≤ 300kV;
- **Class C**: Transmission AC lines and cables with voltage < 220kV;
- **Class D**: Transmission DC lines and cables of any voltage;
- **Class E**: Transformers transforming between voltages of assets in class B and class A, or between voltages of assets in class A, or between voltages of assets in class B; and
- **Class F**: Transformers transforming between voltages of assets in class C and either class B or class A.

For practicability reasons the assessment effectively only takes account of asset classes A, B, D and E. This is done because the data on asset amounts we received by ENTSO-E does not contain asset class C. The asset class C substitute figures of the former ETSO study (see next subsection on determination of asset amounts) yield large differences between countries. Presumably they were prepared on the basis of inconsistent interpretations (all class C assets of the country vs. TSO's own assets vs. assets affected by cross-border flows). Due to this lack of consistent data class C needs to be ignored. Consequently, class F is ignored as well because it comprises transformers connecting class C lines to higher voltage levels.

The omission of classes C and F in the calculations for this study shall not constitute a prejudice as to the consideration of these assets in the future ITC infrastructure fund. In justified

cases the share of transmission lines below 220 kV that are affected by cross-border flows (and, consequently, the respective class F transformers) could be included in the determination of the fund.[13]

Determination of consistent asset amounts

The data we received from ENTSO-E contains data for 2011, 2010 and (for lines) 2009. However, the data do not cover all countries, and the missing ones vary from year to year. In order to obtain a data set comprising all countries participating in the ITC mechanism, we used, for each country, the most recent year for which data was given. Remaining gaps were filled with data of 2007 from a study we conducted for ETSO in 2008.[14]

We checked whether it would improve the accuracy of the data base if figures from earlier years were scaled up to reflect the average development of asset volumes over time. For this purpose we analysed the differences between years for those countries where both 2011 and 2007 data exist. It appears that, due to the different contexts in which the data of 2007 and more recent years were generated, the differences do not only reflect the actual network development, but are also influenced by distorting factors (such as different wording of underlying requests, different persons involved, different internal data sources, etc.). We therefore consider it most consistent and robust to use the replacement figures from earlier years as is.[15]

4.1.2.2 Estimation of development between 2011 and 2022

It is obvious that the future development of the asset amounts can only be estimated with limited accuracy. But this is also clearly acceptable for the goal of this assessment, which is to inform a decision about methodology options.

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[13] This appears consistent with the fact that the current ITC mechanism takes into account flow measurements on cross-border lines below 220 kV.

[14] ENTSO-E, being the successor of ETSO, granted us permission to use these data for the present study.

[15] Note that such considerations are only relevant for the assessment in the present study, where some roughness is acceptable. We understand that any binding ITC infrastructure fund size should be based on complete data for a given base year.

ENTSO-E confirmed that for this purpose the TYNDP [8] constitutes the most suitable consistent set of information. The TYNDP provides information on the foreseen increase of asset amounts on pan-European level. There is also information on individual investment projects, but this does not comprise asset amounts. The TYNDP focuses on projects of pan-European significance. It is accompanied by six Regional Investment Plans each containing a subset of these plus additional projects. Further projects may only be stated in national development plans [8, p. 58]. For the present study we focus on global figures as given in the TYNDP itself.

Figure 7.3 of the TYNDP states the increase of asset volumes for transmission lines. We add these to the base year asset amounts of classes A, B and D, respectively.[17] Regarding transformers (class E) we scale the base year amount by the global relative increase of line lengths according to the TYNDP.

4.1.2.3 Total asset volumes considered for this study

Resulting from the data sources and approaches as described in the previous subsections, we arrive at the following asset volumes as the basis for further steps of the assessment.

For 2011 the total line length of asset classes A, B and D across the 34 countries participating in ITC amounts to ca. 300,000 km, while the total transformer capacity of asset class E amounts to ca. 340,000 MVA.

The expected growth between 2011 and 2022 amounts to ca. 17 % on average across all asset classes. Regarding the line lengths, asset class D (HVDC lines) is expected to increase by almost a factor of 5, while asset class B is expected to remain practically constant, and asset class A yields an increase of 24 %.

[17] The appropriateness of this approach is confirmed by the fact that the total current grid length as stated on p. 62 of the TYNDP is similar to the total amount that we determined for the base year.

4.1.3 LRAIC

4.1.3.1 Data base and calculation details

LRAIC estimates are based on data requested from the NRAs of the 34 countries participating in the ITC mechanism. Until end of August 2012 we received data from 25 NRAs. 23 of these data sets were complete enough to allow for the computation of LRAIC unit cost figures at least for some asset classes.

Although this data base is not complete, we consider it sufficient for the purpose of this study, which is to inform a methodical decision rather than the determination of a binding ITC infrastructure fund size.

Missing numbers were replaced by the asset volume weighted average of those countries and asset classes for which the required input data was provided.[18]

One NRA from outside the Euro zone provided cost data in the national currency. We converted these to Euro by using the average exchange rate of 2011.[19]

Some NRAs provided nominal rates of return. In order to transform these into real rates (cf. section 3.2.1), we subtracted the country specific inflation rate.[20]

4.1.3.2 Results

Bandwidths of country wise figures

The real rates of return (RoR) based on country specific data show a considerable bandwidth between ca. 2 % and almost 8 % (fig. 4.1), with a median of 5.7 %. For the sensitivity analy-

[18] The weighting by asset volumes ensures that even if all unit cost figures were replaced by the average per asset class, the resulting total cost of the transmission grid would remain the same.

[19] Source: www.oanda.com

[20] Inflation rates were either provided by the respective NRA or taken from Eurostat Inflation Dashboard (http://epp.eurostat.ec.europa.eu/inflation_dashboard/#, January 2012 [to cover the year 2011]).

ses below we use this median as a starting point, i.e. we first apply an RoR of 5.7 % to all countries and then analyse variations of the RoR around that value.

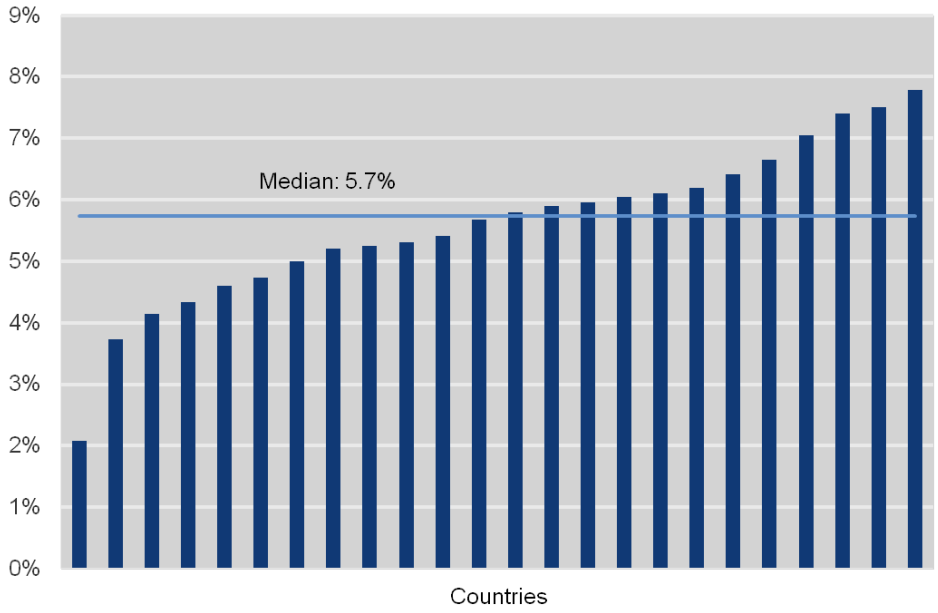

Fig. 4.1: Bandwidth of real rates of return as provided by NRAs

The relative variation of LRAIC unit cost among countries is even larger than that of the RoR. For example, unit cost of asset class A resulting from country-specific input data vary by a factor of 10 (fig. 4.2).[21] Interestingly, a standardisation by applying uniform RoR (using the median of 5.7 %) and depreciation periods (40 years) to all countries does not lead to a major change. In particular, the relative bandwidth does not decrease, but slightly increase (factor of 11.5 between maximum and minimum unit cost level). This means that the variation is mostly caused by differences between the capital outlay figures.

[21] The other asset classes show similar variations.

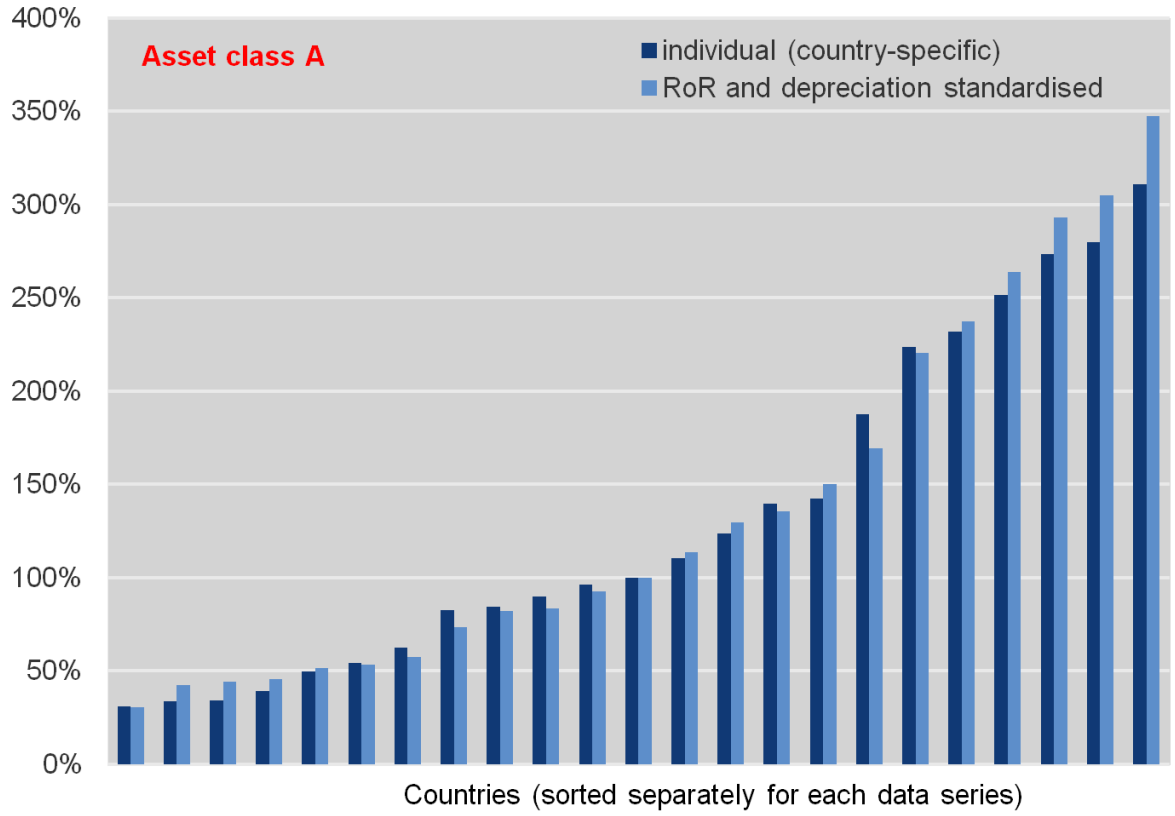

Fig. 4.2: Distribution of LRAIC unit cost per km of asset class A (transmission lines > 300 kV) across countries (100% = median)

The observed extent of relative differences is not entirely astonishing. In a previous study LRAIC unit cost varied by a factor of about 8, although only nine countries were considered [7, p. 31].

Total annual cost on the basis of LRAIC

By weighting the LRAIC unit costs of each asset class with the respective asset amounts we arrive at the total LRAIC based annual costs of the transmission grid. When applying individual country-specific figures, these total annual costs amount to 16.9 bn€/a (fig. 4.3, red column).

A standardisation of RoR and the depreciation period *T* has only little influence on total annual cost (increase of 4.3 % when both parameters are standardised), but constitutes a logical starting point for sensitivity analyses.

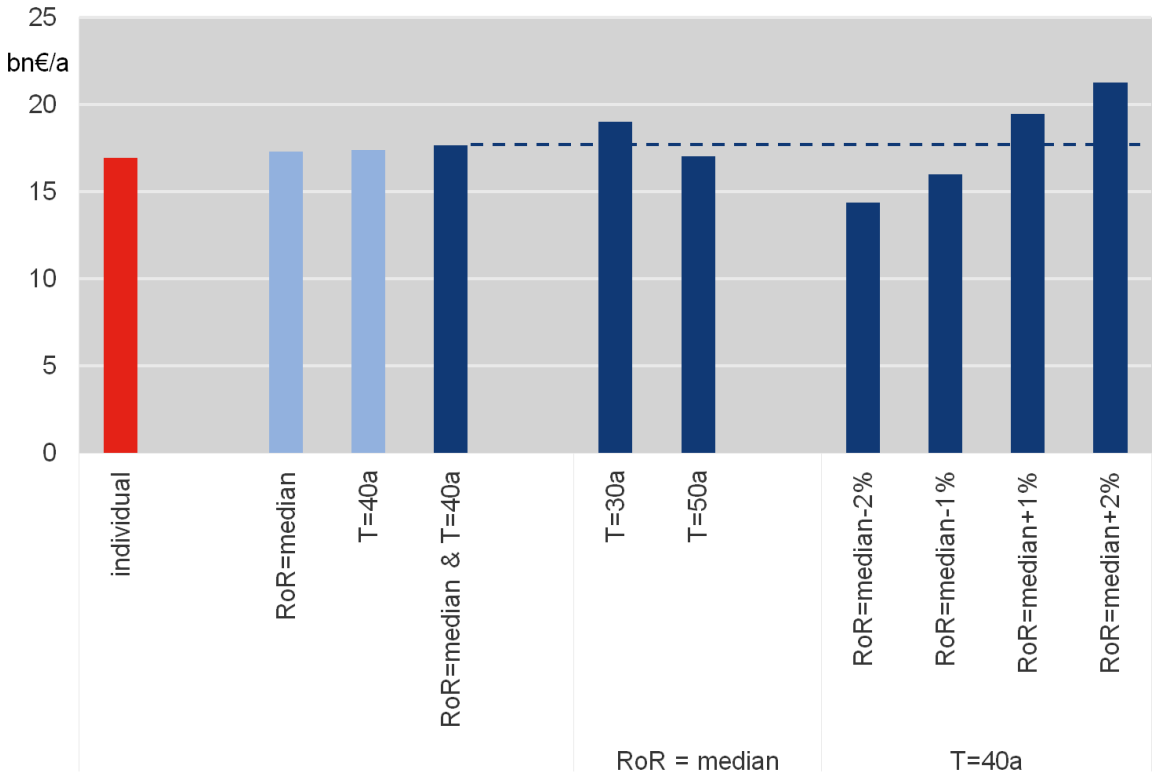

Fig. 4.3: Total annual cost of transmission grid 2011 (34 countries participating in ITC) based on LRAIC – individual data, standardisation, sensitivity analysis

A variation of the uniform depreciation period by 10 years leads to a cost increase of 7.5 % (for T = 30 years) and a decrease of 3.7 % (for T = 50 years), respectively. The sensitivity of total annual cost with respect to a variation of the RoR amounts to about 10 % per 1 % of RoR.

4.2 Assessment of infrastructure fund size

4.2.1 Introductory remarks

The following assessment is divided into two main parts. We first analyse two important factors that have an impact on the ITC infrastructure fund size, namely the Global Transit Share (GTS) and the share of infrastructure financed by sources other than network charges (section 4.2.2). On the basis of this preparatory stage we assess the fund size for the different methodology options (section 4.2.3).

An important element of the assessment is to estimate how the ITC infrastructure fund size may vary over time. We assess time variation in two different, complementary ways:

- **Short term volatility** – Between two subsequent years the development of the grid infrastructure is limited, but the cross-border flow patterns may change considerably, e.g. due to variation of weather conditions (having an influence on peak load and injection from renewable energy sources including the respective geographical distributions), plant availability or fuel prices. We quantify the short-term volatility by means of the GTS differences between the exemplary years of 2010 and 2011.
- **Development within the next decade** – In the medium run the development of asset amounts becomes an important factor. It is obvious that also the cross-border flow patterns will change in this period. However, any forecast of such flows would be of low reliability such that simulation results based thereon would be arbitrary.[22] The same applies to the future development of LRAIC unit cost levels. Therefore, we analyse the estimated medium-term development of the ITC infrastructure fund size by purely taking account of the prospective development of the asset amounts between 2011 and 2022 (cf. section 4.1.2.2).

4.2.2 Preparatory assessment

4.2.2.1 Global Transit Share

As the specification of the GTS according to equation (3.1) is derived from parameters that are used in the current ITC mechanism, we compute the GTS for 2010 and 2011 on the basis of data from the actual ITC implementation that was provided by ENTSO-E. The results are shown in table 4.1.

Year	GTS
2010	6.65 %
2011	7.53 %

Table 4.1: GTS determined from historic data of the current ITC mechanism

[22] This view is shared by ENTSO-E. Specifically, ENTSO-E informed us that simulation results that were obtained in the context of creating the TYNDP are not considered suitable for forecasting ITC results.

4.2.2.2 Infrastructure financed by sources other than network charges

As we discussed in section 2.2.3, "other sources" of financing infrastructure should be taken into account by adjusting the amount of infrastructure to be considered in the ITC infrastructure fund. In principle, it should be possible to state for each individual investment project to which extent, if any, it is financed by sources other than network charges. Consequently, equations (3.2) and (3.3) reflect this aspect as part of the asset amounts.

However, the related data that we received via ENTSO-E during this study does not refer to projects or asset amounts, such that we need to make an approximation in order to anyway estimate the impact on the ITC infrastructure fund for the methods to be compared.

We received two kinds of data: Annual investment cost and congestion revenues. We decided to use the latter for the analysis, for two reasons. Firstly, investment data was provided only for a subset of countries, and secondly, the congestion revenue data includes a distinction between destinations of usage. This allows us to distinguish between the "narrow" and "wide" interpretations as discussed in section 2.2.3:

- For the "narrow" interpretation (our recommended interpretation, base case) we determine the ratio of congestion revenues used for "maintaining or increasing interconnection capacities through network investments, in particular in new interconnectors" (cf. Art. 16.6b of Regulation 714) and the total LRAIC based annual costs of the transmission grid (based on individual country-specific LRAIC unit cost). This yields a share of 1.2 % for 2011.
- For the "wide" interpretation (sensitivity analysis) we consider the above part of congestion revenues plus those congestion revenues used "as income to be taken into account by the regulatory authorities when approving the methodology for calculating network tariffs and/or fixing network tariffs" (cf. Art. 16.6 of Regulation 714, 4th paragraph). For 2011 this amounts to 5 % of the total LRAIC based annual costs of the transmission grid.
- In the following steps of the analysis we adjust these shares for 2011 whenever alternative LRAIC parameters are used.
- In each variant we assume that the respective share determined for 2011 also applies to the year 2022.

4.2.3 Estimated fund size for considered methodology options

Remark: The underlying figures of the diagrams shown in this section can be found in annex B.1.

4.2.3.1 Base case

For the base case we apply individual country-specific LRAIC unit cost, a GTS of 7.53 % (2011 value) and a complete deduction of investment financed by sources other than network charges from the fund. For the restricted absolute approach we set the reference year to 1996 (cf. section 3.3.2).

For the base year 2011 the incremental approach would, by definition, yield an ITC infrastructure fund size of 100 m€/a, while the absolute approach would result in a fund size of 1.3 bn€/a. The restricted absolute approach would yield a fund size of 470 m€/a (fig. 4.4).

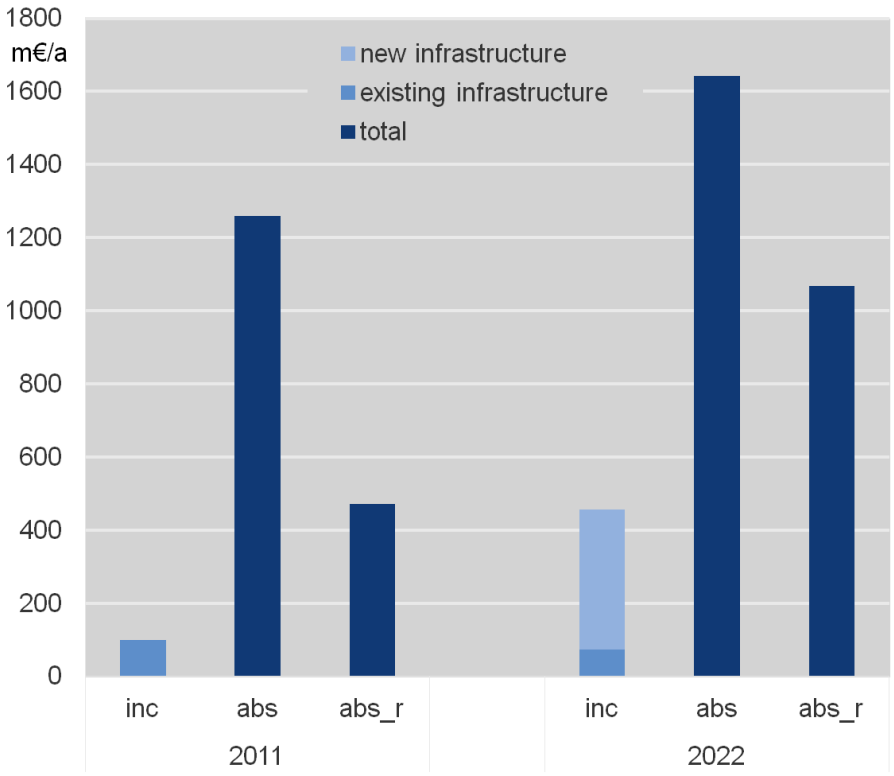

Fig. 4.4: Estimated fund size for considered methods and base case parameters (inc = incremental approach, abs = absolute approach, abs_r = restricted absolute approach)

Between 2011 and 2022 the fund sizes increase for all methods, while the relative bandwidth between the methods decreases. The result of the incremental method will be dominated by the new infrastructure and amount to 460 m€/a. The fund size according to the absolute method shows the smallest relative increase, albeit from a high starting point, and reaches 1.6 bn€/a. The restricted absolute method results in a fund size of 1.1 bn€/a in 2022.

4.2.3.2 Sensitivity analyses

Sensitivity with respect to Global Transit Share (GTS)

As an estimate of the annual volatility of the ITC infrastructure fund size we compare the results for the GTS of 2011 (7.53 %) and 2010 (6.65 %). The results of the absolute and restricted absolute approaches are proportional to the GTS. By contrast, the effect of the GTS on the results of the incremental approach is damped as only the component reflecting new infrastructure is affected (fig. 4.5). In any case the effect of the GTS variation is much smaller than the base case differences between the methods.

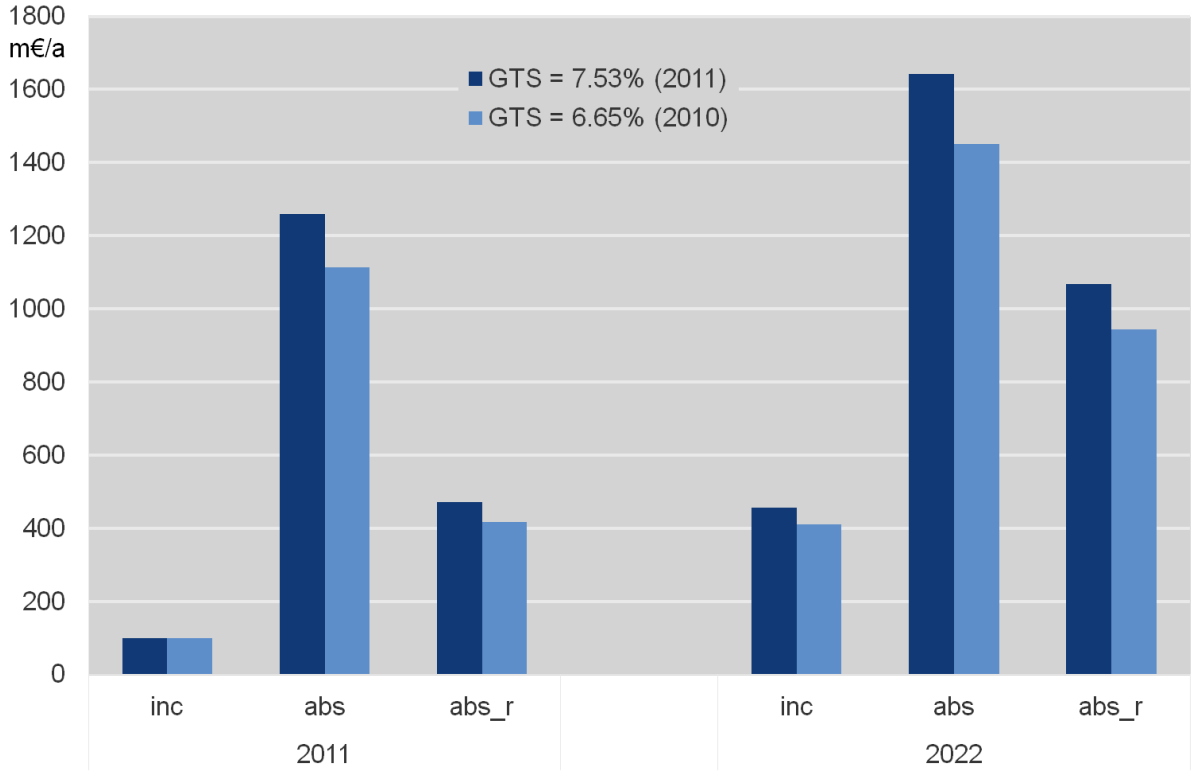

Fig. 4.5: Sensitivity of estimated fund size with respect to Global Transit Share (GTS)

Sensitivity for absolute approach with respect to treatment of infrastructure financed by sources other than network access charges

As discussed in section 3.3.2, the roughness of the absolute approach does not allow for a project wise consideration of infrastructure not financed by national access charges. In the base case calculation we assume that the share of such infrastructure as estimated for 2011 applies to the entirety of the grid. One could raise the argument that this is an overestimation of the impact of such infrastructure, because financing investments by means of congestion rent has been applied less often (if at all) in the past. However, such argument would be less relevant with respect to the restricted absolute approach as this approach ignores old assets anyway.

Moreover, the quantitative impact is minor because the share of infrastructure not financed by national access charges is estimated to only 1.2 % of total annual network cost. Consequently, if one refrains from deducting this share, the results increase by about the same percentage (fig. 4.6).

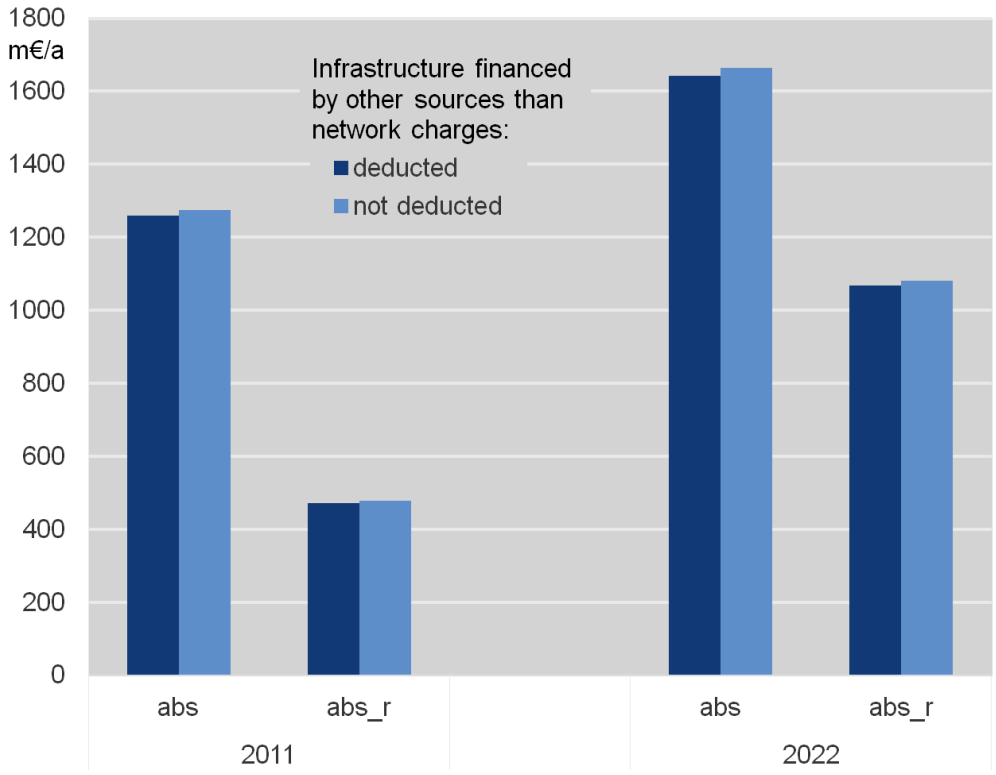

Fig. 4.6: Sensitivity of estimated fund size for absolute approach with respect to treatment of infrastructure financed by sources other than network access charges

Sensitivity with respect to treatment of congestion revenues

As mentioned in section 2.2.3, some stakeholders, including ACER, have requested us to estimate the effect of adopting the wide instead of the narrow interpretation as regards the way to account for congestion revenues when determining the share of infrastructure financed by sources other than network access charges.

Adopting the wide interpretation would yield an ITC infrastructure fund size of about 4 % smaller than the narrow interpretation when applying the absolute or restricted absolute aproach. The impact on the results of the incremental approach is smaller, but increasing over time (along with the gain of relevance of new infrastructure) and reaches about 3 % in 2022.

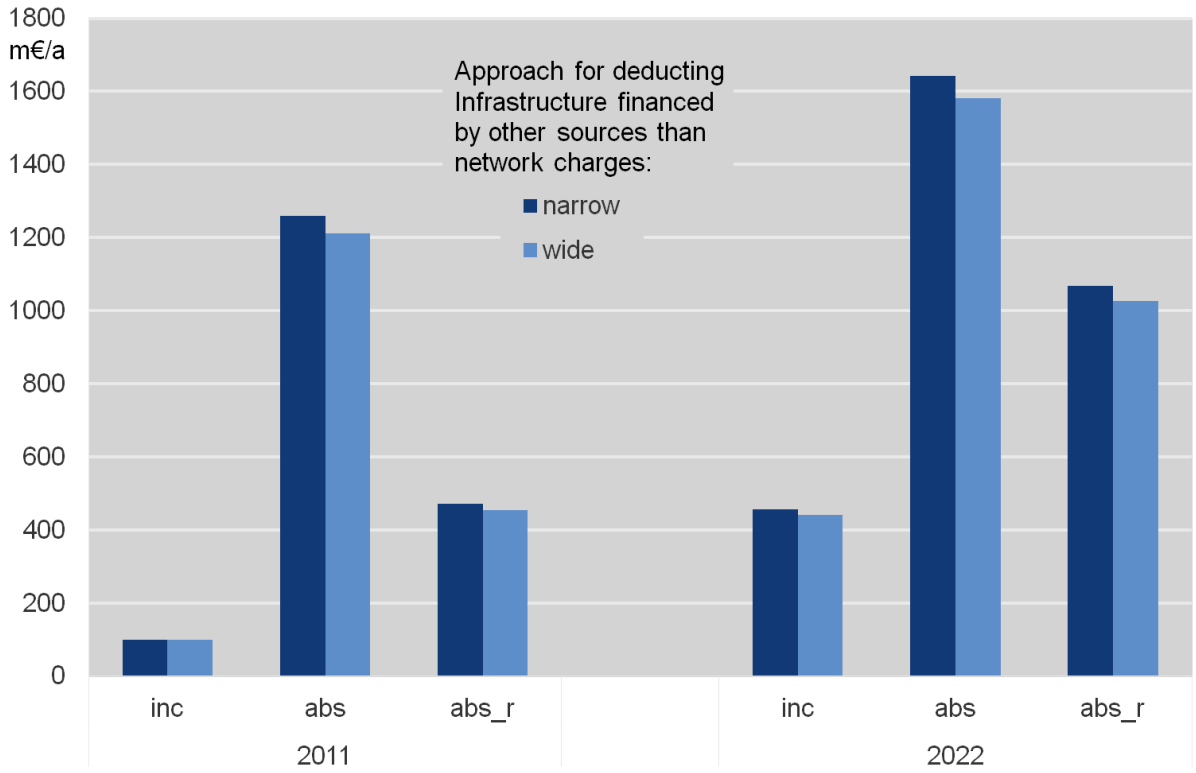

Fig. 4.7: Sensitivity of estimated fund size with respect to treatment of congestion revenues

Sensitivity with respect to LRAIC parameters

Among the parameters of the LRAIC calculation that we varied in section 4.1.3.2 the RoR has the strongest impact on the total network cost (cf. fig. 4.3). When applying the same degree of variation to the estimation of ITC infrastructure fund sizes, the results of the absolute and

restricted absolute approaches deviate by about +25 %/-15 % from the base case (fig. 4.8). Again the impact on the results of the incremental approach is damped, although this effect almost completely vanishes by 2022 due to the dominance of the new infrastructure by then.

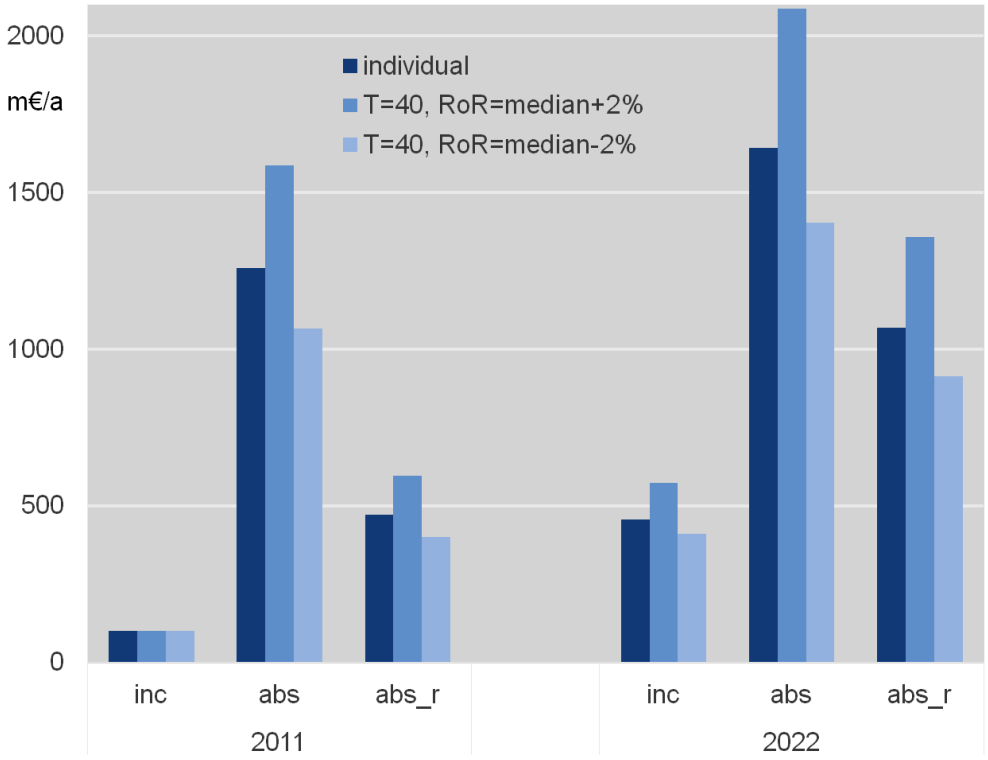

Fig. 4.8: Sensitivity of estimated fund size with respect to LRAIC parameters

Sensitivity for restricted absolute approach with respect to the reference year

It is obvious that the selection of the reference year has a strong impact on the results of the restricted absolute approach. On the one hand this is an intended flexibility of the approach, but on the other hand it could make it difficult to agree on a specific year as there is no objectively "correct" year.

In order to demonstrate the impact, we analyse two alternative reference years, namely 2001 (idea: 5 years later than the base case) and 2010 (idea: passage of Regulation 838).

The results underline the importance of the selection of the reference year, even though the relative impact on the estimated fund size decreases over time (fig. 4.9).

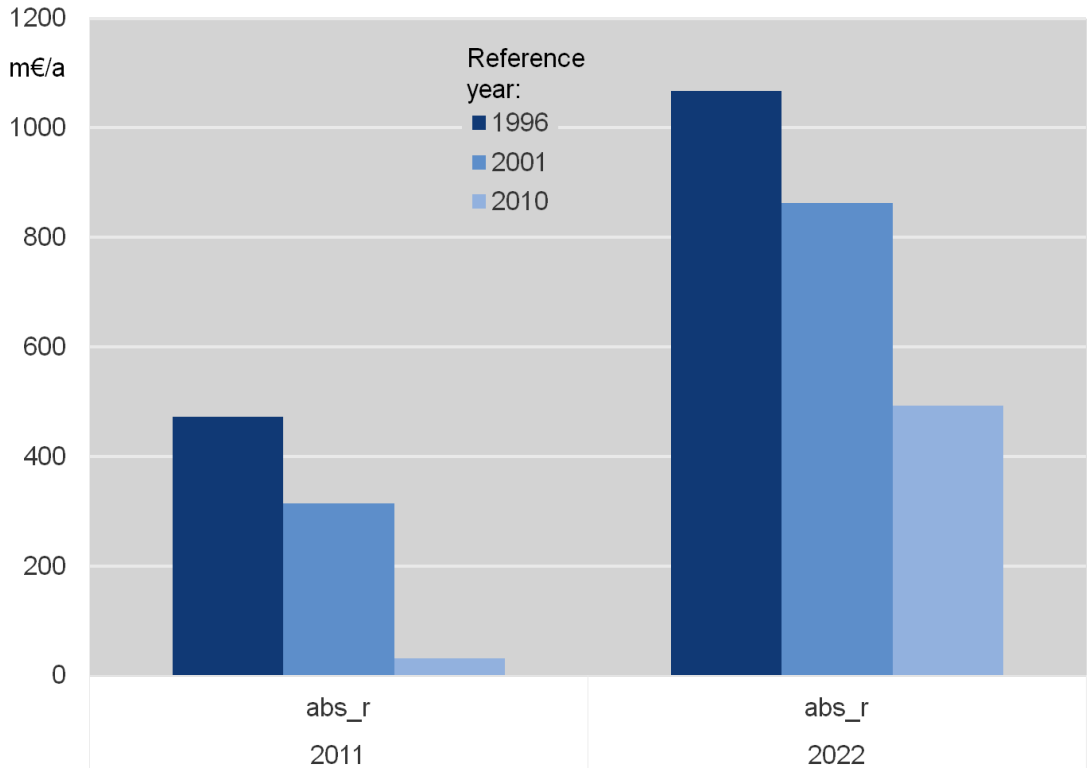

Fig. 4.9: Sensitivity of estimated fund size for restricted absolute approach with respect to the reference year

4.3 Contributions and compensations per country

The methodical approaches for determining the size of the ITC infrastructure fund do not affect the way in which the fund financed and distributed. The methods for determining each country's contribution to and compensation from the fund are laid down in Regulation 838. As a consequence of these methods, the impact of the fund size on contributions and compensations is proportional. Exemplary results for the base case are provided in annex B.2.

5 Preliminary conclusions

5.1 Appraisal of methodology options for determining infrastructure fund size

Generally, the size of the ITC infrastructure fund differs considerably among the three considered methodology approaches. However, the differences decrease over time. The analysed variation of calculation parameters does not affect the relative order of the methods, with the exception of the reference year for the restricted absolute approach.

In relation to earlier discussions about ITC methods the high results of the absolute approach appear to lie outside the usually discussed bandwidth of ITC infrastructure fund sizes. In particular, adopting the absolute approach would lead to an abrupt change of the fund size. Given that the relative payments would remain constant in any case, it is questionable if such abrupt change would be consistent with the fact that the current fund size in combination with the method for determining relative payments constitutes a consistent implementation of the requirements of Regulation 714.

However, this assessment is subject to reservations concerning the level of LRAIC unit cost. Our analyses show large differences of the unit cost level among countries. While in principle such differences may be justified, future updates could affect the average unit cost level and, consequently, the absolute amount of ITC infrastructure fund sizes.

The restricted absolute approach and the incremental approach yield lower results than the absolute approach. Among these two, the incremental approach has the advantage of ensuring continuity with respect to the current fund size in the short run while gradually converging with the other approaches over time. On the other hand, the restricted absolute approach is founded on more independent grounds, because it does not contain any explicit tie to the fixed setting of the current fund size.

5.2 Suitability of LRAIC

It belongs to the scope of this study to provide an opinion as to the suitability of the LRAIC costing principle for determining the ITC infrastructure fund size (cf. point 5.5 of Annex A to Regulation 838).

Regulation 714, on which Regulation 838 is based, prescribes that LRAIC shall be used for assessing the cost to be compensated by the ITC mechanism. Even if Regulation 838 was modified, the principles of Regulation 714 would remain applicable. In order to deviate from LRAIC, Regulation 714 would have to be changed. This implies a certain threshold for the discussion: LRAIC would have to be clearly inferior to an alternative in order to justify a deviation from this costing principle.

One of the motivations for using LRAIC in relation to an international mechanism such as ITC is that it allows, in principle, for a high degree of consistency among the participating countries.

However, this theoretical advantage seems to be difficult to achieve in practice. We presume that one reason for this is that in many countries LRAIC is not practically applied in the field of power network tariffing. This could explain the limited response rate to our LRAIC questionnaire. In any case, actual LRAIC figures do not lead to a reduction of the relative bandwidth of unit cost levels among countries, compared to regulated cost. This was already observed in [7], and the bandwidth of figures in the present study has not decreased.

In principle, these results might be improved, though. For example, an external validation or auditing of country specific LRAIC figures by a single entity appears easier than for regulated cost, because LRAIC are defined in a more standardised way. In this respect the difficulties and heterogeneity that we observe in the present study do not necessarily speak against the suitability of LRAIC as such. Rather, they show that spending more effort on the determination of consistent and complete LRAIC figures may be beneficial. A swing from LRAIC to regulated cost may avoid some issues we face here, but probably bring along new problems as well, e.g. dependence on specific national accounting rules.

From a purely conceptual perspective, i.e. ignoring the relevance of the demand for LRAIC imposed by regulation 714, the most suitable costing method could depend on the selection of the methodology approach for determining the ITC infrastructure fund.

The forward looking perspective of LRAIC would be consistent with the idea of the incremental approach as this approach detaches the valuation of new infrastructure from the historical development of the network. By contrast, the absolute approach considers the entire asset base. In conjunction with the purpose of ITC to compensate for costs actually incurred this would let the regulated (historic) cost base appear more appropriate [5]. With the restricted absolute approach the ITC infrastructure fund would, depending on the selection of

the reference year, be more or less dominated by relatively new infrastructure. In this case the practicability of obtaining reasonably sound cost figures could be the decisive criterion to decide among LRAIC and regulated cost.

References

[1] European Union

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[2] European Commission

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Florence, 22 and 23 May 2012,

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[5] Consentec and Frontier Economics

Study on the further issues relating to the inter-TSO compensation mechanism

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[6] Independent Regulators Group

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[8] ENTSO-E

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Annex

A LRAIC questionnaire

This annex documents the questionnaire mentioned in section 3.2.2 of this report as it was distributed to NRAs in the course of this study (1 June 2012).

Along with the responses to this questionnaire we received some hints for improving the request (e.g. in case it will be repeated in the future). In particular the following hints were very helpful:

- Ideally, LRAIC should be based on the "best available technology" concept, i.e. one would not necessarily determine replacement cost of the actually existing assets, but of new assets that would provide the same capacity. However, depending on the data that is available to an NRA, it may constitute a reasonable approximation to determine the replacement cost of the actually existing assets instead.
- The caption "LRAIC" used for some of the table cells in the questionnaire may be misleading, because these cells actually ask for capital outlay, while ultimate LRAIC figures are computed later on that basis.

A.1 Data sheet

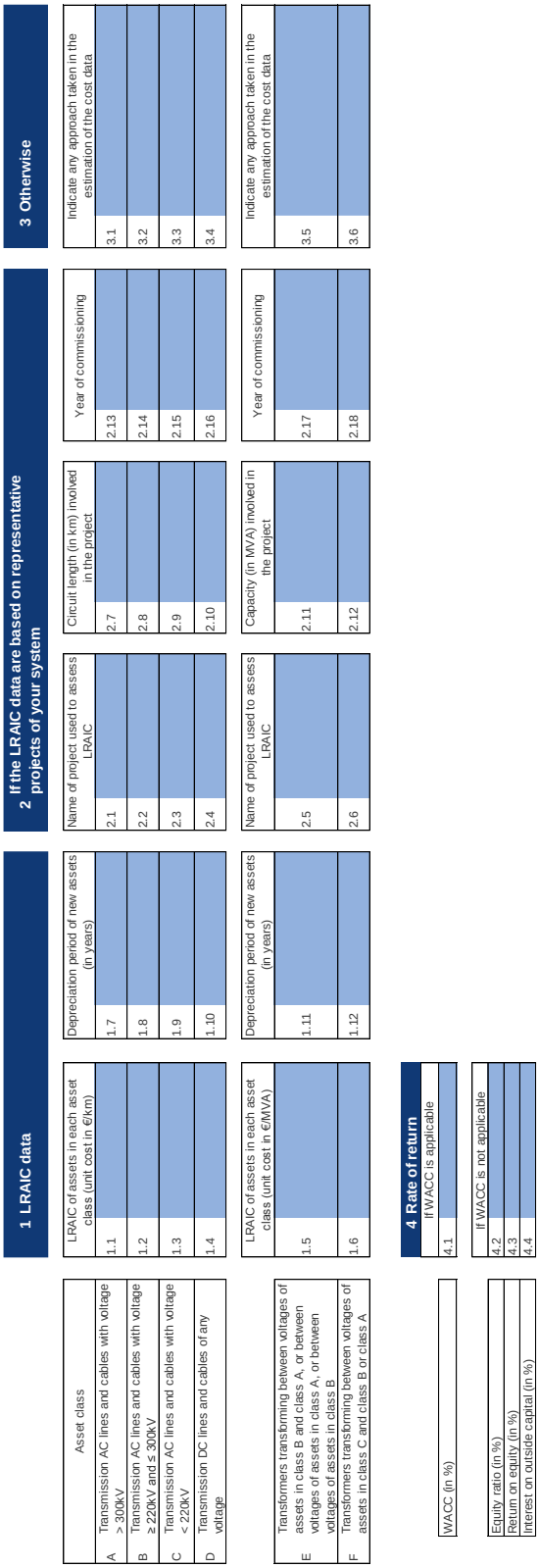

Fig.A.1: LRAIC questionnaire to NRAs as used for this study

A.2 Notes on LRAIC questionnaire to the NRAs of the ITC participants

The purpose of this note is to guide regulators through the questionnaire requesting information on the cost of network transmission assets for the purpose of the assessment of the ITC infrastructure fund size

A.2.1 Introduction

The current Inter-Transmission System Operator Compensation (ITC) mechanism was implemented with the entry into force of the Regulation (EU) No 838/2010 ('the Regulation') on 3 March 2011. Annex Part A of the Regulation sets out binding guidelines on the ITC mechanism, including the definitions of the ITC fund. For the time being, the fund amounts to € 100 Mio p.a. According to point 5.3 of said Annex ACER shall carry out an assessment of the infrastructure of electricity transmission associated with facilitating cross-border flows of electricity. The assessment shall consist of a technical and economic assessment of the forward-looking long-run average incremental costs (LRAIC) on an annual basis of making such electricity transmission infrastructure available for cross- border flows of electricity over the relevant period, and shall be based on recognised standard-costing methodologies.

Based on this assessment, ACER shall make a proposal to the European Commission on the future annual cross-border infrastructure compensation sum. The European Commission shall determine the sum following the proposal from ACER or, if it disagrees with ACER's proposal, ask ACER for a second opinion.

On this backdrop, ACER has commissioned a study to Consentec with the aim to obtain assistance in assessing the annual cross-border infrastructure compensation sum and drafting the above mentioned proposal. The scope of the study includes a numerical assessment.

We have therefore prepared a questionnaire for completion by the national regulatory authorities of the countries participating in the ITC mechanism. The questionnaire serves to obtain information on LRAIC in terms of unit cost; together with further data from ENTSO-E this will constitute the input of the numerical assessment.

The purpose of this note is to provide guidance to regulators filling in the questionnaire. We note at the outset that data provided through the questionnaire will exclusively be used for the

purpose of advising ACER in relation to the ITC infrastructure fund. The data may only be shared between relevant regulatory authorities and ACER.[1]

A.2.2 Country-wise figures

We understand that the ITC mechanism is presently applied among 34 countries. In some countries two or more transmission system operators (TSOs) collectively form an ITC party. We ask the relevant regulators to provide data such that it is relevant for the country as a whole.

A.2.3 Country specific figures

The questionnaire aims at enabling us to calculate country specific annual LRAIC figures, taking account of differences in capital outlay, depreciation period, and rate of return. Please note that this is without prejudice as to the ultimate proposal how to determine LRAIC for the ITC infrastructure fund. At the time of issuing the questionnaire it is still open to which extent the proposed methodology for determining the ITC infrastructure fund will advocate country specific or harmonised parameters.

A.2.4 Asset classes

For the purposes of collecting cost information in relation to the transmission system, we will collect information on assets falling into one of six classes:

- **Class A**: Transmission AC lines and cables with voltage > 300kV;
- **Class B**: Transmission AC lines and cables with voltage ≥ 220kV and ≤ 300kV;
- **Class C**: Transmission AC lines and cables with voltage < 220kV;
- **Class D**: Transmission DC lines and cables of any voltage;

[1] Specifically, the data will not be made available to the transmission system operators or ENTSO-E unless explicit approval for doing so is given by all relevant transmission system operators.

- **Class E**: Transformers transforming between voltages of assets in class B and class A, or between voltages of assets in class A, or between voltages of assets in class B; and
- **Class F**: Transformers transforming between voltages of assets in class C and either class B or class A.

A.2.5 LRAIC principles

Regulators are required to provide, for each asset class from A to F, estimates of the long-run average incremental investment cost of providing additional lengths of a new transmission line or additional capacity of new transformers, respectively.

LRAIC estimates are intended to:

- be representative of the assets typically used on the transmission system in question (for example, in terms of design, construction approach, terrain, etc.); and
- be forward looking – i.e. to provide information regarding the level of costs that will be incurred in relation to such assets in the future (taking into account volatility in input prices).

The estimate could therefore be based on recent experience of the cost of constructing a new transmission line or transformer substation. It is, however, at the discretion of regulators to derive cost estimates from alternative sources if this is considered more appropriate. In any case, the following principles should be respected:

- The cost estimate shall be based on the "best available technology", i.e. the technology that would be used to provide new line or transformer capacity today.
- The cost estimate shall be based on replacement values. This implies that if the estimate is based on an actual investment project from the (recent) past, any development in input prices since the investment date should be incorporated in the LRAIC estimate.
- Cost estimates need to be expressed in terms of unit cost, i.e. cost per km of line (circuit length) or per MVA of rated transformer capacity. Any cost components that are not proportional to line length or transformer capacity shall be incorporated such that their relative share included in total unit cost is representative for an investment project of a dimension (length/capacity) that would be typical for a new investment project in the system considered.

A.2.6 Hints per section of the questionnaire

Section "LRAIC data"

- In cells 1.1 to 1.6 regulators are required to provide LRAIC in terms of unit cost[2] for each asset class. This shall comprise the estimated total direct capital cost (capital outlay) of the following components of a project:
  - asset cost;
  - land related cost (permits, environmental costs, etc.);
  - installation cost; and
  - commissioning cost.

  The cost figures should incorporate, along with asset costs, also the cost of other capital equipment associated with the asset cost.[3] Regarding the unit cost in asset class D (in cell 1.4), unit costs should include the cost of converter stations.

  However, only direct costs should be taken into account – costs borne jointly with other projects or other TSO activities, and overheads of the TSO should be excluded (e.g. project management overhead across a number of investment projects, corporate centre costs etc.).
- Cells 1.7 to 1.12 ask for the depreciation period (in years) of new assets of the respective asset classes. Regulators should provide here the periods used for determining the transmission tariff in their country.[4]

[2] For lines (asset classes A to D), unit cost should refer to circuit (not route) length.

[3] Since the LRAIC should reflect an average line or transformer project from the respective TSO's point of view, the direct network costs should include the cost of other associated equipment related but not directly included in the line or transformer costs, provided that those elements are representative of the construction of the transmission network of the respective TSO.

[4] These depreciation periods may differ from the technical asset life times and, depending on country specifics, also from the periods applied for corporate book keeping.

Section "If the LRAIC data are based on representative projects of your system"

This sections aims to provide background information in cases and for those asset classes where the LRAIC estimates are based on representative investment projects. This shall inform the assessment of variations between countries.

- In cells 2.1 to 2.6 regulators should provide the names of the projects used to derive the LRAIC estimates.
- In cells 2.7 to 2.12 regulators should provide information regarding the dimension of the project chosen, i.e. circuit length[5] (in km) for asset classes A to D and rated capacity (in MVA) for asset classes E and F.
- In cells 2.13 to 2.18 regulators should indicate the projects' commissioning dates.

Section "Otherwise"

If LRAIC estimates are not based on representative projects, regulators are asked to briefly describe in cells 3.1 to 3.6 the approach taken for LRAIC assessment.

For each asset class, either section 2 or section 3 shall be filled in. If representative projects are only used for some asset classes, it is possible to fill in section 2 for these and section 3 for the other classes.

Rate of return

For the determination of annual LRAIC figures data on rates of return are required. These should be consistent with the rules for determining the transmission tariffs. However, real (not nominal) rates shall be provided in any case.[6]

- Cell 4.1 asks for the WACC (weighted average cost of capital) and should be filled in by regulators where a WACC is used for transmission tariffing.

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[5] Please note that length information shall be provided at circuit level (not route length).

[6] Using real interest rates is consistent with the fact that capital costs are considered at replacement cost level.

- In cases where no WACC exists, regulators should provide, in cells 4.2 to 4.4, the equity ratio, return on equity and interest on outside capital, respectively.

B Tables with numerical results

B.1 Fund sizes

The following tables restate the results of the diagrams in section 4.2.3 in tabular form. All numbers are stated in m€.

Year	Method	total	existing infrastructure	new infrastructure
2011	inc		100	0
	abs	1260		
	abs_r	472		
2022	inc		73	383
	abs	1643		
	abs_r	1068		

Table B.1: Estimated fund size for considered methods and base case parameters

		GTS = 7.53% (2011)	GTS = 6.65% (2010)
2011	inc	100	100
	abs	1260	1112
	abs_r	472	417
2022	inc	456	411
	abs	1643	1451
	abs_r	1068	943

Table B.2: Sensitivity of estimated fund size with respect to Global Transit Share (GTS)

		deducted	not deducted
2011	abs	1260	1275
	abs_r	472	478
2022	abs	1643	1663
	abs_r	1068	1081

Table B.3: Sensitivity of estimated fund size for absolute approach with respect to treatment of infrastructure financed by sources other than network access charges

	narrow	wide
2011 inc	100	100
abs	1260	1212
abs_r	472	454
2022 inc	456	441
abs	1643	1580
abs_r	1068	1027

Table B.4: Sensitivity of estimated fund size with respect to treatment of congestion revenues

	individual	T=40, RoR=median+2%	T=40, RoR=median-2%
2011 inc	100	100	100
abs	1260	1586	1066
abs_r	472	595	400
2022 inc	456	574	409
abs	1643	2087	1403
abs_r	1068	1357	912

Table B.5: Sensitivity of estimated fund size with respect to LRAIC parameters

	1996	2001	2010
2011 abs_r	472	315	31
2022 abs_r	1068	862	493

Table B.6: Sensitivity of estimated fund size for restricted absolute approach with respect to the reference year

B.2 Contributions and compensations per country

The following tables indicate, for each of the three methodical approaches (incremental, absolute, restricted absolute), the simulated country-wise contributions to and compensations from the ITC infrastructure fund for the years 2011 and 2022 and base case parameters.

	incremental			absolute			restricted absolute		
	-	+	=	-	+	=	-	+	=
AL	-1.0	0.1	-0.9	-12.5	1.0	-11.5	-4.7	0.4	-4.3
AT	-2.9	8.0	5.2	-36.3	101.3	65.0	-13.6	38.0	24.4
BE	-1.7	3.3	1.6	-21.5	41.3	19.8	-8.1	15.5	7.4
BA	-0.5	2.5	2.0	-6.0	30.9	25.0	-2.2	11.6	9.4
BG	-2.2	0.6	-1.6	-27.9	7.2	-20.7	-10.5	2.7	-7.8
HR	-2.1	3.8	1.7	-26.5	48.1	21.6	-9.9	18.0	8.1
CZ	-5.1	4.9	-0.2	-64.8	62.1	-2.7	-24.3	23.3	-1.0
DK	-2.3	3.7	1.4	-29.3	46.8	17.5	-11.0	17.5	6.6
FI	-1.5	1.9	0.4	-19.2	24.1	4.9	-7.2	9.0	1.8
FR	-16.6	3.1	-13.5	-208.5	38.5	-170.0	-78.2	14.4	-63.8
DE	-7.6	15.8	8.1	-96.3	198.7	102.3	-36.1	74.5	38.4
GB	-2.8	0.6	-2.3	-35.7	7.1	-28.6	-13.4	2.7	-10.7
GR	-0.4	1.6	1.2	-5.3	19.8	14.5	-2.0	7.4	5.4
HU	-1.0	4.0	3.0	-13.0	50.4	37.4	-4.9	18.9	14.0
IE	-0.3	0.0	-0.3	-3.6	0.0	-3.5	-1.3	0.0	-1.3
IT	-13.5	0.4	-13.2	-170.7	5.0	-165.7	-64.0	1.9	-62.1
EE	-0.9	0.7	-0.2	-11.2	9.2	-2.0	-4.2	3.5	-0.8
LV	-0.6	1.1	0.5	-7.8	13.5	5.7	-2.9	5.1	2.1
LT	-0.7	0.6	-0.1	-8.7	7.7	-1.1	-3.3	2.9	-0.4
LU	-1.2	0.0	-1.2	-15.7	0.0	-15.7	-5.9	0.0	-5.9
MK	-0.8	0.7	0.0	-9.9	9.4	-0.6	-3.7	3.5	-0.2
ME	-0.5	1.1	0.5	-6.8	13.3	6.5	-2.5	5.0	2.4
NL	-3.2	5.2	2.0	-40.7	66.1	25.3	-15.3	24.8	9.5
NI	-0.4	0.3	-0.1	-5.2	3.5	-1.7	-2.0	1.3	-0.6
NO	-6.2	0.7	-5.5	-77.9	8.4	-69.5	-29.2	3.1	-26.1
PL	-1.6	2.6	1.0	-20.0	32.9	12.9	-7.5	12.3	4.8
PT	-1.8	0.9	-0.9	-22.6	11.5	-11.1	-8.5	4.3	-4.2
RO	-0.7	0.9	0.2	-9.2	11.5	2.2	-3.5	4.3	0.8
RS	-0.9	2.4	1.5	-11.4	30.2	18.8	-4.3	11.3	7.0
SK	-0.5	6.0	5.4	-6.4	75.0	68.6	-2.4	28.1	25.7
SI	-0.5	4.2	3.7	-6.8	52.9	46.1	-2.5	19.8	17.3
ES	-1.4	2.7	1.3	-17.8	33.8	16.1	-6.7	12.7	6.0
SE	-3.1	5.5	2.3	-39.6	69.1	29.5	-14.9	25.9	11.1
CH	-2.9	10.3	7.4	-36.4	129.5	93.1	-13.6	48.5	34.9
Perimeter	-10.2	0.0	-10.2	-128.2	0.0	-128.2	-48.1	0.0	-48.1
Total	-100.0	100.0	0.0	-1259.6	1259.6	0.0	-472.4	472.4	0.0

Table B.7: Contributions (-), compensations (+) and saldo (=) per country for 2011 (in m€)

	incremental			absolute			restricted absolute		
	-	+	=	-	+	=	-	+	=
AL	-4.5	0.4	-4.2	-16.3	1.3	-15.0	-10.6	0.8	-9.7
AT	-13.1	36.7	23.5	-47.4	132.1	84.7	-30.8	85.9	55.1
BE	-7.8	14.9	7.1	-28.1	53.9	25.8	-18.3	35.0	16.8
BA	-2.2	11.2	9.0	-7.8	40.4	32.6	-5.1	26.2	21.2
BG	-10.1	2.6	-7.5	-36.4	9.4	-27.1	-23.7	6.1	-17.6
HR	-9.6	17.4	7.8	-34.6	62.7	28.2	-22.5	40.8	18.3
CZ	-23.4	22.5	-1.0	-84.5	81.0	-3.5	-54.9	52.6	-2.3
DK	-10.6	16.9	6.3	-38.2	61.0	22.8	-24.8	39.7	14.8
FI	-7.0	8.7	1.8	-25.1	31.4	6.4	-16.3	20.4	4.1
FR	-75.4	13.9	-61.5	-272.0	50.3	-221.7	-176.8	32.7	-144.1
DE	-34.8	71.9	37.0	-125.6	259.1	133.5	-81.7	168.4	86.8
GB	-12.9	2.6	-10.3	-46.5	9.2	-37.3	-30.2	6.0	-24.2
GR	-1.9	7.2	5.3	-6.9	25.9	18.9	-4.5	16.8	12.3
HU	-4.7	18.2	13.5	-16.9	65.8	48.8	-11.0	42.7	31.7
IE	-1.3	0.0	-1.3	-4.7	0.1	-4.6	-3.0	0.0	-3.0
IT	-61.7	1.8	-59.9	-222.6	6.5	-216.1	-144.7	4.2	-140.5
EE	-4.1	3.3	-0.7	-14.6	12.0	-2.6	-9.5	7.8	-1.7
LV	-2.8	4.9	2.1	-10.2	17.6	7.4	-6.6	11.4	4.8
LT	-3.2	2.8	-0.4	-11.4	10.0	-1.4	-7.4	6.5	-0.9
LU	-5.7	0.0	-5.7	-20.5	0.0	-20.5	-13.3	0.0	-13.3
MK	-3.6	3.4	-0.2	-12.9	12.2	-0.7	-8.4	7.9	-0.5
ME	-2.5	4.8	2.3	-8.8	17.3	8.4	-5.7	11.2	5.5
NL	-14.7	23.9	9.2	-53.1	86.2	33.1	-34.5	56.0	21.5
NI	-1.9	1.3	-0.6	-6.8	4.6	-2.2	-4.4	3.0	-1.5
NO	-28.2	3.0	-25.2	-101.6	10.9	-90.7	-66.1	7.1	-59.0
PL	-7.2	11.9	4.7	-26.1	42.9	16.8	-17.0	27.9	10.9
PT	-8.2	4.1	-4.0	-29.4	15.0	-14.5	-19.1	9.7	-9.4
RO	-3.3	4.1	0.8	-12.1	15.0	2.9	-7.8	9.7	1.9
RS	-4.1	10.9	6.8	-14.9	39.4	24.5	-9.7	25.6	15.9
SK	-2.3	27.1	24.8	-8.4	97.9	89.5	-5.5	63.6	58.1
SI	-2.4	19.1	16.7	-8.8	68.9	60.1	-5.7	44.8	39.1
ES	-6.4	12.2	5.8	-23.2	44.1	21.0	-15.1	28.7	13.6
SE	-14.3	25.0	10.7	-51.7	90.2	38.5	-33.6	58.6	25.0
CH	-13.2	46.8	33.7	-47.5	168.8	121.4	-30.8	109.7	78.9
Perimeter	-46.4	0.0	-46.4	-167.2	0.0	-167.2	-108.7	0.0	-108.7
Total	-455.7	455.7	0.0	-1642.9	1642.9	0.0	-1067.9	1067.9	0.0

Table B.8: Contributions (-), compensations (+) and saldo (=) per country for 2022 (in m€)

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