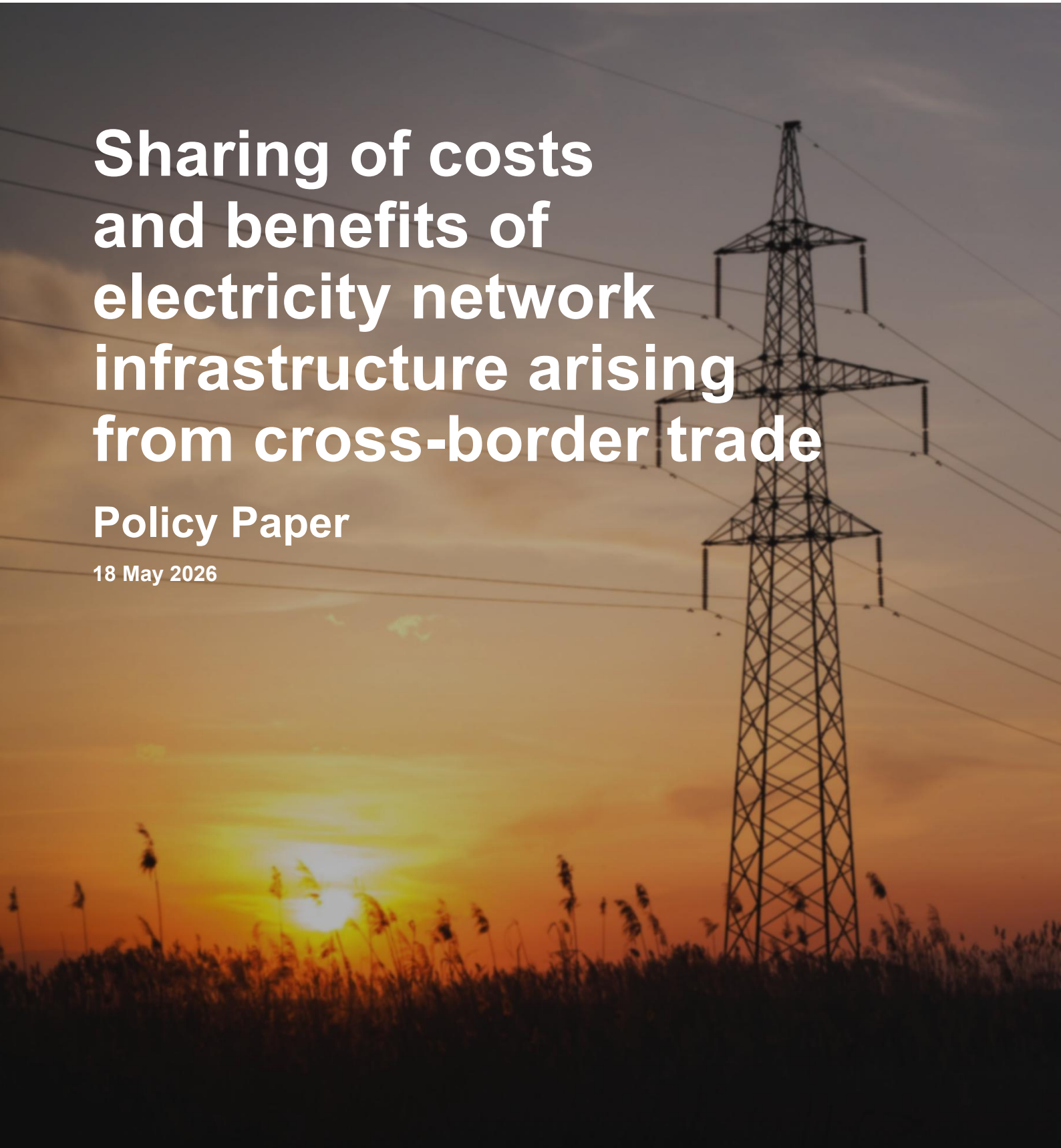
ACER

European Union Agency for the Cooperation of Energy Regulators



Sharing of costs and benefits of electricity network infrastructure arising from cross-border trade

Policy Paper

18 May 2026

Sharing of costs and benefits of electricity network infrastructure arising from cross-border trade

Policy Paper

18 May 2026

Find us at:

ACER

E press@acer.europa.eu
Trg republike 3
1000 Ljubljana
Slovenia

www.acer.europa.eu

Table of contents

1. Executive summary

The Energy Union aims to create a fully integrated and competitive internal electricity market. Such integration requires strong electricity infrastructure that facilitates the free flow of electricity across the EU, reduces energy prices, reduces dependence on external suppliers and increases security of supply through trust and solidarity among Member States. In recent years, it has become increasingly apparent that significant additional investments in electricity infrastructure are needed to meet this objective.

The TEN-E Regulation aims to facilitate the coordinated European network planning and development process for electricity, gas and hydrogen. The process consists of a European identification of infrastructure needs, development of projects through national and European network development plans, selection of projects of common interests and, where necessary, cross-border cost allocation across Member States.

One issue that remains largely unaddressed is the gap between the estimated infrastructure needs and the projects being proposed, which are below the identified needs. While the identification of needs may need improvements to increase the trust in estimated needs, and the magnitude of these gaps may also evolve as it is based on the expectation of the future, a number of them have been identified repeatedly over time as unaddressed.

In this policy paper, ACER addresses one aspect of the potential lack of proposed projects, for which benefits are significant and scattered throughout Europe. For such projects, benefits are spread over many Member States whereas Member States “hosting” the infrastructure would have to pay the full cost, making such projects unattractive for them. An effective multilateral cost sharing framework could better align the payment of infrastructure costs with actual benefits, unlocking such projects. Some Member States have in fact reported a lack of such multilateral cost sharing framework as one of the reasons for not proposing and developing infrastructure projects beyond national needs.

Currently, there are three mechanisms that aim to share the costs and benefits of cross-border infrastructure arising from cross-border trade. The Congestion Income Distribution (CID) mechanism shares congestion income arising from cross-border trade based on the location and size of congestion. The Inter-TSO Compensation (ITC) mechanism compensates Member States for the costs of hosting transit flows. These two mechanisms share a part of the realised benefits and costs arising from cross-border trade among TSOs and are therefore ex-post sharing mechanisms. In contrast, cross-border cost allocation is an ex-ante sharing mechanisms that allocates the cost of a specific infrastructure project based on the expected benefits that such project might bring to the Member States in the future.

These three mechanisms unfortunately fall short of fulfilling the objectives below:

1. Systematically incentivise building cross-border infrastructure of regional and EU interest;
2. Allocate infrastructure costs across countries to reflect the benefits provided by the infrastructure to these countries (covering internal and cross-border flows).
3. Cover all network costs, for new and existing infrastructure, and for CAPEX and OPEX.
4. Reduce uncertainty for network investments via a robust, transparent, and predictable mechanism; and
5. Build a future-proof mechanism, such that it is robust to any future changes in the EU electricity system.

This policy paper explores different options for improving the cost sharing framework. The first two policy options improve these three mechanisms separately while keeping their original intention. Option 3 combines CBCA with a single ex-post mechanism that merges ITC with the congestion income distribution. Option 4 explores a new cost sharing framework with common EU financing of the infrastructure that is used for cross-border trade. The table below summarises these policy options.

Options	Ex-post	Ex-ante
0. DO NOTHING	***Focus on limited improvements that can be achieved within existing legislation***	
1. INCREMENTAL REFORM	***Improve transparency and robustness of ex-post mechanisms. Facilitate multilateral CBCAs***	
	CID: monitoring of CI use **ITC**: improve accuracy in losses calculation; harmonisation of losses' procurement and pricing; revaluation of the ITC fund	**CBCA**: costs allocated in proportion to benefits; remove mandatory link CBCA-CEF; hosting NRAs' to decide on CBCA and CEF requests
2. SIGNIFICANT REFORM	***Identify true infrastructure costs arising from hosting cross-border flows. Simplify CBCA process***	
	CID: same as Option 1 **ITC**: Option 1 + better and more accurate identification of cross-border flows and related costs	**CBCA**: Option 1 + more harmonised and automatic identification of beneficiaries; voluntary or mandatory application
3. COMBINE EX-ANTE AND EX-POST	***Establish a framework that consistently facilitates network investments of broader regional or EU interest***	
	CID & ITC: Single ex-post pay-per-use charge, merging the two mechanisms	**CBCA**: same as in option 2
4. NEW EU FRAMEWORK	***Establish an integrated EU framework for financing and cost allocation of cross-border infrastructure***	
	Common EU network tariff component	Common EU infrastructure development fund

The policy paper also evaluates qualitatively these improvements and how successful they would be in meeting the main objectives defined in this policy paper. Given that all the options would have potentially significant impact on existing network financing and national network tariffs, the paper does not define a preferred policy option. Instead, ACER proposes to perform a thorough quantitative evaluation of these policy options as well as feasibility testing to fine-tune the different design elements of the proposed options.

2. Introduction

Infrastructures supporting electricity cross-border trade (hereinafter cross-border infrastructure) represent a vital component of the European power system and generally consist of both cross-border as well as internal infrastructure that enable or facilitate cross-border trade. They enable reciprocal security of supply among Member States, optimize the utilization of European power generation and leverage the complementary nature of national energy mixes. Their critical importance has been underscored during the energy crisis of 2022-2023, and they are recognized as essential assets in the pursuit of carbon neutrality. Furthermore, cross-border infrastructures serve as a fundamental instrument for the development of forward markets, contributing to the stability of energy prices across

Europe. In a time when access to affordable electricity is paramount in terms of social equity and reindustrialization, the advancement of new cross-border infrastructure projects stands to augment the benefits accrued from the power system for European consumers. In light of these considerations and as underscored in the European Commission's *Action Plan for Affordable Energy* published in 2025, it is imperative that we undertake substantial investments in energy networks in the near future.

The development of cross-border infrastructure occurs amidst a global transformation of the energy system, driven by the challenges posed by climate change. To meet the European Union's decarbonization objectives in the upcoming years, the system must evolve through a scale-up in clean energy and increased electrification. This evolution will necessitate significant changes in national energy mixes, consequently affecting the geography of energy production, transport and consumption. We can also expect greater variability in production, due to the development of intermittent renewable energy, and therefore unpredictability in energy flows.

The development of new cross-border infrastructure in Europe is governed by the Regulation EU 2022/869 (TEN-E) that entered into force in June 2022. This Regulation serves as a pivotal instrument for the identification and advancement of cross-border infrastructure in Europe, as it congregates stakeholders into regional groups to identify and promote the implementation of Projects of Common and Mutual Interest, thus contributing to the development of cross-border infrastructure within priority corridors and thematic areas.

Several mechanisms exist to map and allocate the costs and benefits of cross-border infrastructure. The Inter-Transmission System Operator Compensation (ITC) scheme seeks to compensate for expenses incurred due to transit flows traversing a third country, while the Congestion Income Distribution (CID) process distributes congestion income arising from cross-border trade. The Cross-Border Cost Allocation (CBCA) framework facilitates the distribution of costs and benefits associated with prospective cross-border infrastructure projects before their development. CID and ITC therefore focus on costs and benefits of existing infrastructure, whereas CBCAs are concerned with costs and benefits of planned infrastructure projects. The geographical scope of the three instruments differs. The ITC mechanism covers 35 contracting parties, including both EU Member States and non-EU countries, while CID is applied at EU and regional level. Finally, CBCA applies only to specific projects and generally to those Member States that are expected to receive significant positive impacts from their realisation. Although these three mechanisms may be examined independently, they are interrelated as they all aim to capture the infrastructure costs and benefits arising from cross-border trade.

Electricity cross-border infrastructure is very costly and at the time of investment it is hard to accurately predict the expected costs and benefits. On the other hand, the existing infrastructure also accrues certain costs and benefits and to the extent it is used by cross-border trade also these costs are in part subject to cost sharing. In this respect, the question arises as to whether the three mechanisms described above could be improved. When costs of cross-border infrastructure are not distributed fairly, this may likely lead to a lack of investment incentives. While the countries hosting the cross-border infrastructure are benefiting from it, in a well interconnected market many other countries also benefit and thereby should in principle contribute to the costs. Identifying all benefits and distributing them to different countries is however complex due to inherent complexities of identifying forecasted or realized flows and prices as well as non-monetary benefits. Deficiencies in the aforementioned mechanisms may contribute to this inequitable distribution, prompting inquiries into their improvements as well as into the development of potential new mechanisms that more accurately reflect the costs and benefits associated with cross-border infrastructure. This also raises the question of how to effectively integrate and align both existing and potential new mechanisms.

Establishing new mechanisms would necessitate a judicious balance between national project management and EU energy market integration, while grappling with the complexities of the system and the fundamental uncertainties inherent in network development. Cross-border infrastructure projects are being developed within a complex and uncertain environment that is expected to undergo substantial changes in the future. The overall framework to distribute the costs and benefits of cross-border infrastructure must ensure proper incentives to invest effectively and efficiently as well as to provide investment stability and articulate an ambitious vision for the future of energy markets all whilst maintaining simplicity and clarity. Nevertheless, as any new infrastructure will eventually become an existing one, the framework must therefore correctly distribute the costs and benefits of existing infrastructure. Failing to do so would negatively impact incentives to build new infrastructure.

Finally, ACER is taking note that during the drafting of this policy paper (i.e. 2026), some changes in the CBCA framework are being under consideration of the forthcoming Grids Package. These changes may tackle some of the problems analysed in this policy paper depending on the outcome of the legislative process. Nevertheless, the policy paper aims to provide a broader and more long-term perspective taking into account a bigger framework aiming to provide future proof and consistent cost sharing framework across different legislations.

3. Problem definition

The political objective of Energy Union is to fully integrate electricity markets by removing barriers to trade among Member States and integrate more renewable energy. This however requires a reinforcement of network infrastructure. Yet, the construction and cost allocation of networks remain under national jurisdiction. National system operators build and operate the networks, and national regulatory authorities (NRAs) determine network charges, which are applied to all consumers in a given Member State. As cross-border trade grows—driven increasingly by renewable generation—more electricity flows in the network originate from trades between Member States rather than internal trade. This amplifies the need for stronger networks (when justified by economic and technical assessments) and could raise more frequently the question of how to allocate the associated costs fairly.

There are currently several mechanisms that are aiming to distribute the costs and benefits of infrastructure that arise from cross-border trade. On the benefits side, the congestion income is part of economic surplus arising from cross-border trade and is thus the most explicit benefit of cross-border trade (consumer and producer surplus being the implicit benefits). Inter TSO compensation (ITC) is the mechanism that is aiming to compensate transmission system operators (TSOs) for the costs arising from hosting cross-border flows. The third mechanism is the cross-border cost allocation (CBCA) that is aiming to provide a cost sharing framework for building new cross-border infrastructure. The CBCA provides a framework for regulators and TSOs to reduce the distortions resulting from gaps between investment costs incurred by new projects and the expected socio-economic benefits for hosting countries. It determines how investment costs will be recovered from different Member States.

These three mechanisms were established with the purpose of sharing the costs and benefits of cross-border trade among EU Member States. However, many years of experience shows that they do not perform exactly as intended and there are gaps in each of these mechanisms.

At the most fundamental level, the complete framework consisting of these three mechanisms falls short in achieving one key objective, which is to **facilitate or promote infrastructure investments beyond the national interest and needs.** These mechanisms do not provide an effective framework for sharing the costs of cross-border infrastructure that is used and benefits many Member States. The described limitations become more evident in the following concrete situations:

- Southeast Europe has recently experienced periodic surges in electricity prices much above the average European levels and they would benefit from additional cross-border infrastructure in Central Europe to be able to transport electricity from North or Central Europe to Southeast Europe. However, countries in Central Europe currently have little incentive to build additional infrastructure for the benefit of countries far away.
- Small countries, for which the affordability of new investments can be a challenge, as costs can quickly exceed the benefits. In such cases, even relatively modest projects may represent a disproportionate financial burden compared to the size of the national electricity system or market. For example, Austria, Slovakia, Slovenia and Hungary would need to invest a lot in infrastructure for the benefits of Southeast Europe. As a result, these countries may be reluctant to support investments that primarily serve regional or European needs, even if the wider system benefits are significant.
- Projects connecting countries to large amounts of offshore renewables, where the benefits are uncertain compared to the high costs and may extend to countries that are not immediate neighbours. For instance, the CBA performed for the Bornholm energy island project CBCA

decision[1] showed positive impacts on other neighbouring and non-neighbouring countries; however, due to deficiencies of the CBCA framework, the cost allocation ultimately had to be limited to the hosting countries.

Investing beyond national needs thus requires multilateral sharing of investment costs as well as all the life-time costs of such infrastructure, after the investment has been amortised and needs to be maintained and upgraded.

The following sections describe how these mechanisms also fall short in achieving their individual objectives and would need to be reformed on their own. Nevertheless, addressing the main problem above requires that these mechanisms are consistent. This means that they should, when possible, avoid any gaps (e.g. some costs not being captured by any mechanism) or overlaps (e.g. double counting of costs) in addressing the problem.

3.1. Congestion income distribution (CID)

The framework for congestion income distribution started with third party access and explicit capacity allocation. It was based on bilateral NTC-based capacity calculation on each interconnected border between two Member States and congestion income was determined as the volume of auctioned capacity multiplied by the capacity price determined at the capacity auction. The 50:50 sharing principle was applied which provided simplicity and stability. The same basic principle for congestion income distribution also applies today, although allocated capacity is generalised as commercial flow on the border resulting from capacity allocation, and the auction price is generalised as the price difference on the bidding zone border. However, several new changes to the capacity calculation and allocation have been implemented, such as EU-wide market coupling, regional flow-based capacity calculation and introduction of allocation constraints. These changes have made congestion income distribution significantly more complex.

In many cases commercial flow on the border is flowing against the price difference which causes a negative congestion income on a given border. Existing rules are converting such negative congestion income into positive, which creates a missing congestion income that requires adjustment on all borders such that the sum on all borders remain equal to the total congestion income. Flow-based capacity calculation also complicates the calculation of commercial flows on the border. Finally, allocation constraints also lead to unintuitive distribution of congestion income to borders which need to be corrected with specific rules.

The existing congestion income distribution aims to remunerate past investments and provide congestion income to borders with the highest price difference as it assumes that such borders need the most network investments. However, in terms of investment signal, it may be less accurate in flow-based capacity calculation since the critical network elements (i.e. physical congestion) causing high price difference may not be located close to the border with high price differential but should generally not be located too far away. On the other hand, allocating congestion income to borders with high price differential has one big disadvantage in that it can provide a disincentive for TSO to reduce congestion and maximise cross-border capacities with investments or remedial actions, because by doing so, they would reduce their congestion income and cause higher national network tariffs.

Finally, it has been also observed that in recent years the amount of congestion income being stored in separate accounts has significantly increased.

Based on the above, the framework for congestion income distribution should be re-examined.

3.2. Inter TSO compensation (ITC) mechanism

Inter TSO compensation mechanism aims to compensate TSOs for the costs arising from hosting cross-border flows. It was first applied on a voluntary basis in 2002 and later complemented with an EU legal

[1] https://afg.forsyningstilsynet.dk/h/42c520c9-70bc-4643-93f3-3f63bb755d28/47fc71deca0a4cd2b90b1004509343a4?showExact=true

framework of second and third energy legislative package. The current legal framework is established in the Commission Regulation (EU) 838/2010 and Regulation (EU) 2019/943.

ITC is sharing two types of costs, first are the costs of making infrastructure available to host cross-border flows and the second are the costs of network losses incurred by hosting cross-border flows.[2] The costs of hosting cross-border flows are determined at 100 million EUR (until set otherwise by the European Commission) and collected and distributed among TSOs in proportion to hosted cross-border flows, also taking into account their overall load. The contributions to ITC mechanism (i.e. 100 million EUR) are determined in proportion to the total import or export of each TSO in relation to the absolute values of all net imports and net exports of all participating TSOs. The costs of network losses are established in two steps: in the first step the incremental losses (i.e., with and without transits) resulting from cross-border flows are calculated and in the second step the price of network losses is determined based on national calculation methodologies.

While ITC was aiming to provide a comprehensive ex-post infrastructure cost sharing (compensation) it fell short in several areas.

First the infrastructure fund was never established according to the objective to capture forward-looking long-run average incremental cost for making infrastructure available. This was partly due to diverging interest between Member States, who are net contributors, and Member States who are net beneficiaries. Further, its budget was administratively set at a relatively low level compared to the annual size of grid costs and never adjusted to the volume of grid costs (ITC fund covers only about 1 % of annual grid costs). Consequently, the ITC does not consistently cover all costs in support of cross-border trade.

Second, the amount of incremental network losses is calculated only for a very small number of timestamps and on individual grid models only. This reduces the trust that the network losses are calculated accurately. As regards the costs of these network losses have also been a source of distrust among TSOs and NRAs, because valuation and procurement of losses differ among TSOs and some TSOs report prices calculated based on historical data, some TSOs report prices as approved by NRAs (without ex-post reconciliation) and some report the actual price they paid for network losses.

Finally, the ITC mechanism raises a question on who should pay for the grid utilisation. Today both importing and exporting bidding zones pay. However, this raises the question whether it is appropriate that exporting countries should contribute to the infrastructure costs, as consumers of the exporting countries are contributing twice, first through higher wholesale electricity prices (these increase the producer surplus but reduce consumer surplus), and second because of higher network tariffs that include also ITC contributions (except in cases where ITC costs are attributed to producers). When comparing to other commodity markets, it seems natural that transport costs are always paid by the final consumers (i.e. importing countries) directly or indirectly. For example, in gas network, the end user of importing countries implicitly pays for using the infrastructure of all transiting countries (i.e. the pancaking effect due to entry/exit tariffs).

3.3. Cross-border cost allocation (CBCA) framework

The cross-border cost allocation mechanism, introduced by Regulation 2013/347 and slightly revised under Regulation 2022/869 (the TEN-E Regulation), is an instrument designed to facilitate the implementation of Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs). Once a project becomes a (sufficiently mature) PCI or PMI, project promoters can submit to the concerned NRAs an investment request which includes a request for a cross-border cost allocation. This procedure, while optional, is a mandatory pre-condition to obtaining grants for works from the Connecting Europe Facility (CEF). While the CBCA tool is specifically foreseen by the TEN-E Regulation for PCIs and PMIs, a cross-border cost allocation could in principle be applied for any project with cross-border impact, even those not defined as a PCI or PMI. In fact, in practice, NRAs often engage in cost-sharing arrangements for cross-border infrastructure projects even outside the formal

[2] ITC regulation uses the term cross-border flows and transit flows interchangeably. However, the cross-border flows include any flows resulting from cross-border trade, the transit flows are defined more narrowly to include only the flows between importing and exporting country flowing through a third country.

CBCA process, as coordinated cost allocation is typically necessary whenever infrastructure involves multiple jurisdictions.

The CBCA relies on an ex-ante assessment of investment costs (i.e., CAPEX) to be allocated, as well as benefits, which are meant to be calculated at country level and for the lifetime of the project. While ITC and CID are applied system-wide, CBCA is typically determined on a project-by-project basis. This assessment is inherently subject to a lengthy negotiation process to agree on underlying methodology and assumptions, and the results are always attached with significant uncertainty (as is the case of any long-run projections). Therefore, the estimated costs and benefits cannot be considered as definitive or undisputable values, and often additional scenarios and methodological adjustments are requested during negotiations among the concerned countries before taking a CBCA decision. Uncertainty also comes with assessment of total projects' costs because these are frequently underestimated and may not take into account operational costs[3] or secondary costs such as reinforcing the internal network to enable the estimated benefits, environmental costs, public opposition, etc.

There is also a misalignment between the PCI selection and CBCA processes. PCIs are chosen based on EU-wide CBA analysis, while an assessment that identifies the benefits of individual countries only occur later, when a CBCA request is submitted to NRAs. In addition, the set of benefits taken into account in the PCI selection process is often more limited than the range of benefits assessed when carrying out a CBCA. This means Regional Groups often endorse PCI projects without knowing how costs and benefits will be potentially distributed among Member States, preventing, for example, the early identification of cases where projects with EU or regional relevance would benefit the most from cost-sharing arrangements among the involved countries. The lack of earlier insight and coordination is in fact often highlighted by the parties involved as one of the reasons for late-stage opposition and delays in CBCA decisions.

The high uncertainty around benefits and costs requires therefore a high degree of trust and alignment between the involved Member States. The case-by-case application of CBCAs amplifies these challenges, often leading to different approaches and complex negotiations.

In addition, while EU financial support remains a key facilitator for projects development and could in theory also facilitate the adoption of CBCA decisions, the obligatory sequential approach foreseen in TEN-E which requires a CBCA decision before being considered eligible for European financial assistant, has in practice led to many CBCA requests primarily motivated by the need to satisfy the formal eligibility requirements and deadlines to access CEF funding.

The main intention of CBCA as described in Regulation (EU) 2022/869 is to reallocate a share of the costs from the hosting country (i.e., the investor) to those Member States that will potentially benefit from the project's realisation (i.e., the beneficiaries). This aims to facilitate the investments with regional and European interest, as those often deliver benefits much beyond the hosting countries. In practice, however, this objective has not been achieved. So far there was no CBCA decision on electricity infrastructure projects that would allocate the costs beyond the hosting countries. The practice shows that CBCAs still allocate the costs only to hosting countries and any missing benefits for hosting countries are expected to be covered via the CEF funding.[4] This may partly explain the gap between infrastructure needs and proposed projects, namely that TSOs being potentially not motivated to propose infrastructure projects that do not deliver enough benefits for hosting countries but would deliver positive benefits for the whole EU.

On the other hand, even if cross-border cost allocation would be able to distribute the costs of new infrastructure across multiple benefiting Member States, it would still require to be complemented to share the cost of existing infrastructure across multiple benefiting Member States.

CBCA may also overlap with ITC and CID, given that losses and congestion income are generally factored into cost-benefit analyses when determining beneficiary countries.

[3] Article 16 of Regulation 2022/869 refers to efficiently incurred investment costs, which exclude maintenance costs, even if NRAs might agree to consider other costs in their decision.

[4] For all investment requests (and associated CBCA proposals) submitted from 2014 to 2024, the project promoter(s) expressed an intention to apply for CEF funds for works.

The limitations identified above suggest that the CBCA mechanism, in its current form, is not an effective tool for redistributing investment costs of projects of wider regional or EU interest which require allocation across a wider set of countries based on the estimated project benefits.

3.4. Summary of problem definition

Based on the above analysis, the box below summarises the problem definition based on which the policy options and conclusions in the next chapter will be drawn.

Main problem: Existing cost sharing framework does not facilitate network investments of broader regional or EU interest. Electricity network investments are still largely based on national needs and benefits.

The main problem can be decomposed into several more detailed problems:

1. **Lack of financial incentive to build**, maintain and upgrade cross-border infrastructure beyond national needs and little incentive and trust to pay for infrastructure in other territories.
2. **CBCA is not always adequate.** It usually focuses on CAPEX only. In practice it is limited to unilateral/bilateral projects only, is too cumbersome and complex and suffers from inherent problems of uncertainty (scenarios) and trust.
3. **ITC is outdated.** ITC fund is not connected to actual costs of cross-border infrastructure. There is a lack of trust in volume and costs of network losses.
4. **Rules on congestion income sharing and use are not designed to drive investments in cross-border infrastructure.** In the last years we've observed significant rise in congestion income, not followed by a rise of investments in cross-border infrastructure.
5. **There are gaps and overlaps between mechanisms** because mechanisms were designed separately.

4. Objectives

Massive investment in electricity infrastructure is needed to keep pace with the growth in renewable generation and to support electrification objectives. They will likely exert significant upward pressure on network costs. In the internal market, benefits stemming from transmission network investments are usually not limited to the countries on whose territory they are built, instead these benefits are widely spread across multiple Member States. The traditional way of sharing the costs of cross-border infrastructure (i.e. the so called 'territorial principle') can act as a barrier for their implementation due to the asymmetric distribution of cost and benefits.

Efficiently distributing all the costs and benefits of electricity network infrastructure arising from cross-border trade is key to ensure the necessary (cost-efficient) investments and should pursue the following objectives:

- **Objective 1:** Providing effective financial incentive for building of cross-border infrastructure of regional and EU interest;
- **Objective 2:** Avoiding countries bearing the costs of cross-border trade without reaping commensurate benefits or at least being compensated for all associated network costs (cost of new investments and existing network, CAPEX and OPEX);
- **Objective 3:** Ensuring that cost-sharing better reflects the wider EU benefits of infrastructure and the various types of electricity flows (internal, cross-border, etc.);
- **Objective 4:** Reducing uncertainty for network investments via a robust, transparent, predictable and consistently applied framework for their financing; and

- **Objective 5:** Future proof concept – any change must be robust to any future changes in the EU electricity system.

The revision of the existing mechanisms should result in boosting and speeding up the implementation of the most necessary electricity network infrastructure in Europe. This outcome would come with numerous benefits:

- Achieving decarbonisation goals where grid reinforcements are enablers;
- Facilitating reciprocal security of supply among Member States and enhancing flexibility of the European power system;
- Optimising utilisation of European power generation and leveraging the complementary nature of national energy mixes; and
- Developing markets (e.g. forward market), contributing to the stability of energy prices across Europe for consumers.

5. Policy options

The options outlined in this paper vary in scope, with some of the options addressing existing infrastructure and others applying only to new projects. For more ambitious proposals covering both, the introduction of a transition period would merit consideration. Where possible, these distinctions have been highlighted under each option.

5.1. No regret measures supporting all policy options

While this paper focuses on cost-benefit sharing, some solutions that aim to improve the overall network development would also help more a more effective cost-benefit sharing framework. Here we outline some proposals on infrastructure development that could be considered as no regret measures implicitly impacting also the cost-benefit sharing.

The first step should be to assess electricity infrastructure needs, with the ultimate aim of identifying the best possible solutions to address them. This means also identifying the remaining gaps that today's proposed projects do not address and applying a degree of prioritisation. ACER's first Monitoring Report on electricity infrastructure development finds that grid capacity development in the electricity TYNDP showed that in selected locations, cross-border capacity needs are not being addressed by any concrete project proposals.

Therefore, to enhance the robustness of the overall infrastructure needs identification framework and to better support and inform cost-sharing decisions, focus is needed on improving the quality of scenarios produced for infrastructure planning at European level, on strengthening the existing cost-benefit analysis (CBA) methodology used to assess the benefits of projects, and on identifying which infrastructure needs require more urgent attention. Even though scenarios can never be perfect, increasing transparency, reliability, and replicability of pan-European needs and CBA assessments will always provide added value for decision-making, regardless of broader reforms. On this regard, the ACER and CEER paper on "Challenges of the future electricity system" and the more recent ACER position paper on "Improving and simplifying the legal framework on European grids", recommended:

- That the needs and CBA assessments performed at pan-European level become more transparent, reliable and replicable. This can be achieved through stronger technical orientation and scrutiny by ACER and NRAs of the key methodological aspects underpinning the assessment of needs and CBA.
- The introduction of a complementary step in network planning that would focus on infrastructure needs which remain unaddressed, and to ensure these remaining gaps are identified, prioritised, and finally addressed.

5.2. Option 0: Do nothing

This option only focuses on targeted improvements that can be reached without legislative text changes.

Regarding possible improvements, the congestion income distribution can be improved based on existing legal framework pursuant to CACM[5] and FCA[6] Regulations and corresponding congestion income distribution methodologies. It can improve to certain extent the problems of unintuitive flows and allocation constraints. These improvements are being studied by TSOs pursuant to request from ACER in the Decision No 16/2023[7]. Yet, it is unlikely to change any fundamental aspects of congestion income distribution.

On ITC, this option assumes some incremental improvements to the application of ITC Regulation[8] following ACER Recommendation to ENTSO-E, TSOs and NRAs for methodological improvements in handling losses within the ITC mechanism. These include:

1. Increasing the frequency of snapshots for loss estimation;
2. Using liquid forward-market prices to estimate the cost of losses; and
3. Introducing ex-post reconciliation processes to account for transit loss costs.

As regards the CBCA framework, this option assumes regular updates of ACER recommendations regarding the CBCA framework. The updates will consider the experience gained with the assessment of the investment request and address potential gaps.

Legislative actions for Option 0

This option requires no changes to EU legislation.

5.3. Option 1: Incremental reform of existing mechanisms

Option 1 aims to introduce incremental improvements of the mechanisms in order to address major shortcomings of ITC and CBCA, while preserving the general framework.

5.3.1. CID

For congestion income distribution, no incremental improvements have been identified. This means that the methodology for congestion income distribution pursuant to CACM and FCA Regulations would continue to be applied in a similar framework as today. However, when it comes to congestion income use, this option assumes the regular monitoring of the use of congestion income. This would increase the transparency and identify instances where the use of congestion income is not in line with EU law, namely Article 19(2) of Regulation (EU) 943/2019.

5.3.2. ITC

Option 1 assumes the ITC mechanism is modified to make the calculation of network losses more robust and accurate. This would involve using more granular data on the measured volume of losses (up to calculation in all market time units) and ex-post reconciliation of costs of network losses. The need for such changes is driven by the two following concerns: first, the costs of network losses due to transits have risen sharply (799 million EUR in 2024, which is lower than the 1.2 billion EUR spike in 2023, but still fivefold compared to 2018); and second, there are significant divergences in the national pricing approaches for network losses (which in 2024 ranged from 56 EUR/MWh to 259 EUR/MWh). These

[5] Regulation (EU) 2015/1222 establishing a guideline on capacity allocation and congestion management.

[6] Regulation (EU) 2016/1719 establishing a guideline on forward capacity allocation.

[7] ACER Decision No 16/2023 on the TSOs' proposal for amendment of the congestion income distribution methodology.

[8] Regulation (EU) No 838/2010 on laying down guidelines relating to the inter-transmission system operator compensation mechanism and a common regulatory approach to transmission charging.

differences mainly reflect different ways how losses are reported (estimated, approved or realised costs) and how they are procured (forward market, day-ahead market).

Option 1 proposes to further harmonise the procurement and pricing of network losses by ensuring that reporting and procurement are carried out in the same way across all Member States. The aim is a more harmonised, hence fairer costs for European consumers and more mutual trust that the costs compensated are justified. Two possible approaches are proposed. The first is to harmonise the procurement strategy and to define the time window and ways how network losses are procured (e.g. every November for the next calendar year for fixed share of predicted losses). The second is to predefine the reference price of network losses considered in ITC (e.g. average forward price in November for the next calendar year) and then TSOs could still have freedom in how they would run the procurement, but they would have to internalise the risk that their actual procurement costs deviate from the reference price.

Option 1 also aims to reevaluate the infrastructure fund, as implemented in 2010 and currently still settled at 100 Mil. EUR. The aim of this re-evaluation is to better reflect the true costs of making infrastructure available for transits (cross-border flows), which should include maintenance and grid reinforcement costs as well as it should not disregard depreciation of the assets. In 2012, ACER has commissioned a study from Consentec that provided some options how to reevaluate this fund.[9] Option 1 therefore proposes another attempt to evaluate the size of infrastructure fund.

5.3.3. CBCA

To ensure a more balanced distribution of costs between hosting countries and benefiting countries, and to strengthen the incentive for hosting countries to proceed with the investment, Option 1 proposes allocating costs in proportion to the estimated benefits across all significant beneficiary countries. In this sense, the 10% threshold referenced in ACER's CBCA recommendation should be lowered when supported by the benefit distribution.

Given the ex-ante nature of the assessment, Option 1 proposes to limit CBCA only to benefits which can be easily and undisputedly quantified, monetized, and attributed to specific countries. The example of such benefits is consumer surplus, producer surplus and congestion income. To ease the estimation of other benefits such as security of supply a common methodology to estimate these benefits is needed before they can be considered in CBCA. Conversely, wider systemic or non-monetizable benefits, such as greenhouse gases reduction, that are harder to attribute and monetise at national level, should instead not be considered in the CBCA and potentially covered through other instruments such as EU funds.

Option 1 also proposes to remove the performing of CBCA as a condition for applying for CEF funding. This mandatory link does not reflect the distinct purposes of CBCA and CEF: the CBCA aims to re-allocate costs in cases of significant asymmetrical distribution of benefits, while CEF should be intended to address affordability issues (through grants of works for the hosting countries which must make upfront investments) or to address situations when benefits are too widely dispersed to be accurately allocated. Nevertheless, there are also cases where both CEF and CBCA are needed. For instance, when a project promoter considers that part of the costs should be borne by other countries (through CBCA), but the project needs additional financial support to cover the upfront investments. Instead of the mandatory link between CBCA and CEF, Option 1 proposes the following:

a) A mandatory "hosting NRA scrutiny" step should be introduced for the concerned PCI. This step would involve an initial assessment by the hosting NRAs only, based on the investment request (and possibly CBCA proposal) submitted by the project promoters, to evaluate the project's CBA and determine whether CBCA, CEF support, or neither is needed for the project's realisation. If the hosting NRAs consider that a CBCA is required, NRAs, together with the project promoters should initiate the CBCA process, involving all the other affected NRAs and project promoters;

[9] https://acer.europa.eu/sites/default/files/documents/Official_documents/Public_consultations/PC_2012_E_15/Consentec_ACER_ITC-Fund_FinalReport_Draft.pdf

b) Decouple CBCA and CEF processes, allowing project promoters to apply for CEF without a CBCA decision when only CEF support is deemed necessary by the hosting NRAs;

c) Allow for a two-step CBCA process, in cases requiring both CBCA and CEF. A preliminary CBCA to identify cost-sharing and the financial gap for CEF, followed by a final CBCA reflecting the granted CEF support.

Option 1 establishes clearer rules to align cost-sharing with measurable benefits and ensure a more balanced distribution of costs between hosting and benefiting countries, while still allowing the parties involved to manage uncertainty through the use of multiple scenarios.

In addition, ACER Recommendations No 02/2023 already highlights the importance of clearly specifying ex-ante the conditions and terms under which predefined adjustments of the cost allocation should be implemented at a later stage. According to ACER Recommendations, CBCA decisions should define conditions for such adjustments, distinguishing between uncertainties that justify those adjustments (e.g., significant cost variations, infrastructure unavailability), and uncertainties that do not (e.g., changes in scenarios or assumptions used to compute benefits). This general principle should therefore be enshrined in the Regulation, so to ensure that each CBCA decisions systematically identifies and frames any relevant ex-post adjustments.

Legislative actions for Option 1

Based on the above, Option 1 requires a review of Regulation (EU) 2019/943 and Regulation (EU) 838/2010 for ITC, Regulation (EU) 2022/869 Articles 16 and 18 for CBCA and Regulation 2021/1153 for CEF.

5.4. Option 2: Significant reform of existing mechanisms

This option aims to keep the original intention of the three mechanisms but has the ambition to reform any aspect of each mechanism that is required to achieve their original objectives as well as to make these mechanisms more consistent with each other.

5.4.1. CID

Same as in Option 1, no suitable significant improvements have been identified for congestion income distribution. Thereby Option 2, is the same as Option 1 as regards congestion income distribution and therefore it assumes existing congestion income distribution rules.

ACER notes that different solutions to congestion income distribution also exists outside Europe, but after their evaluation, those are at the moment considered not suitable for the European context. Most notably, in many US markets the congestion income is mostly distributed to retailers (load serving entities) who receive free congestion revenue rights (CRRs), which allows these retailers to use congestion income to reduce the retail prices to end consumers in those areas which have higher wholesale price due to congestion. Such a solution could help reducing price differences between EU Member States caused by congestion. However, in the context of sharing the costs and benefits of cross-border infrastructure, this solution would not contribute to that objective.

5.4.2. ITC

As a baseline, this option includes improvements to ITC from Option 1. In addition, this option adds reforms to ITC which aims to achieve its original objective, which is to compensate TSOs for all the costs arising from hosting cross-border flows. It thus aims to identify what are the true infrastructure costs that arise from hosting cross-border flows.

The first additional element of this option is to clearly identify cross-border flows. In comparison to current ITC, which was developed more than 15 years ago, the methodologies for identification of flows are now much more advanced. Namely, the methodologies used for congestion income distribution, calculation of scheduled exchanges and sharing the costs of remedial actions allow to clearly identify the physical flow arising from cross-border trade on each network element contained in the EU-wide common grid model. Such identification would thus no longer rely on commercial flows (schedules) but rather on actual physical flows, while the sources and sinks are also clearly identifiable based on net

position of each bidding zone. This allows ITC to be extended to include any cross-border flow and not just pure transit flows as is the case of current ITC.

The second additional reform of ITC under Option 2 is to clearly identify the actual network costs arising from cross-border flows. This can be done similarly as in option 3 which is to (i) calculate the proportion (percentage) to which each network element is used by cross-border flows compared to internal (domestic) flows and (ii) to allocate the total annual cost of infrastructure in a given Member State in the same proportion, where the part attributed to cross-border flow would need to be recovered from the ITC mechanism (i.e. ITC payments). See option 3 for more details on these calculations.

Finally, this new identification of infrastructure costs also includes a proportional part of network losses, so there is no longer the need to calculate incremental network losses arising from cross-border flows. This would mean that costs of losses are split proportionally between domestic and cross-border flows, whereas today cross-border flows are assumed to create incremental losses which are much higher due to quadratic relationship between network flows and network losses.

5.4.3. CBCA

Building on Option 1, Option 2 proposes a harmonised and automatic process to identify, already during the PCI selection process, the countries that are likely to benefit from the specific infrastructure project. This step should be as incontestable as possible and it would enable earlier understanding and involvement of the relevant actors in the CBCA, ensuring that all countries are involved from the beginning. This aims to address a key obstacle often highlighted by project promoters as well as NRAs from beneficiary countries, that result in late-stage opposition and delays in CBCA decisions. Additionally, it would help inform PCI decisions with early insights on benefit distribution.

Option 2 also assumes that the process referred to in the paragraph above uses consistent and standardised methodologies and assumptions, such as fixed scenarios, common metric to assess benefits, a common reference grid configuration. As it was the case of ITC mechanism, this option may result in some difficult discussions when defining the standard methodology and assumptions, but this step is necessary in order to simplify the process and to increase the likelihood of a successful outcome by reducing the risk of disagreements later in the project cycle.

Like in Option 1, also Option 2 proposes decoupling CBCA and CEF processes and allocating costs in proportion to the estimated benefits across all significant beneficiary countries and to limit CBCA only to benefits which can be easily and undisputedly quantified, monetized, and attributed to specific countries.

Taken together, the changes described above would already allow for a more informed selection of EU PCI projects and national CBCA decisions, while keeping the ultimate decision on CBCA at national level.

These elements could be complemented by additional, more mandatory steps, offering progressively stronger degrees of systematicity depending on the level of certainty and harmonisation sought. Such as requiring all mature PCIs to undergo a CBCA, with the beneficiary countries to contribute to the investment costs borne by the investing countries on the basis of the estimated future benefits they are expected to receive, and in proportion to those estimated benefits. In this case, the 10% threshold for identification of beneficiary countries can be removed because of the mandatory decision making. While the obligation for beneficiary countries to contribute based on the estimated benefits would be binding, the underlying cost estimates would remain subject to scrutiny and validation by NRAs, as well as to potential ex-post adjustments in the event of cost overruns[10]. This aims to achieve cost allocation across wider areas in proportion to the projected benefits.

Overall, Option 2 aims to strengthen the alignment between cost-sharing and quantifiable benefits and to ensure a more balanced distribution of costs between hosting and benefiting countries. Unlike Option

[10] Under this more automatic and harmonised approach, the additional scrutiny step described under Option 1 would no longer be necessary. Moreover, the decoupling of CBCA and CEF would also not be required, as this approach would systematically ensure that costs are first allocated on the basis of estimated benefits, while CEF could subsequently be used to address affordability constraints.

1, it addresses uncertainty through a more standardised approach, such as by requiring all parties to use a fixed scenarios and a common metric and assumptions to assess benefits, and by introducing — depending on the level of ambition — a more mandatory decision making.

Similarly to Option 1, the proposed changes would apply exclusively to infrastructure projects under development for which no CBCA process has been initiated before the entry into force of the new provisions, as well as to projects to be proposed in the future.

Legislative actions for Option 2

Based on the above, Option 2 requires a review of Regulation (EU) 2019/943 for congestion income distribution and ITC, Regulation (EU) 838/2010 for ITC and Regulation (EU) 2022/869, Article 16 for CBCA.

5.5. Option 3: Combining ex-ante and ex-post cost benefit sharing

The main driver for a fundamental reform of infrastructure cost-benefit sharing is to establish a framework that consistently facilitates network investments of broader regional or EU interest, namely those investments that go beyond national needs and benefits, including cases where a project might not otherwise be proposed today. Member States that need to invest are seeking a firm ex-ante cost sharing arrangement that guarantees contributions from other Member States at the time of investment so that they are not faced with the risk of actual accrued benefits, which may be larger or smaller than the projected ones at the time of investment. Regulatory authorities of investing countries therefore seek ex-ante cost sharing commitment through CBCA-like approaches. On the other hand, Member States that benefit from the investment and are required to contribute are reluctant to do so without being certain that these benefits will actually occur. The contributors would thus more likely accept the ex-post sharing where the actual benefits are known and cannot be disputed. This fundamental conflict of interests can potentially be overcome with a combination of enhanced CBCA framework complemented by a comprehensive ex-post cost-benefit sharing mechanism

Therefore, Option 3 combines the ex-ante approach represented by the CBCA (based on Option 2) with an ex-post cost-benefit sharing mechanism. While CBCA may increase the application to more investments (depending on the significance of the reform) it cannot alone solve the above conflict of interest. Specifically, it seems very unlikely that beneficiary Member States will commit to ex-ante cost sharing due to fundamental lack of trust on future benefits forecasted by the project promoters. While CBCA should still aim to cover the ex-ante costs of new investments to the extent possible (mostly CAPEX in PCI projects), a complementary ex-post cost-benefit sharing mechanism is proposed to cover the gap (as a sort of safety net) where:

a) Projects are proposed but the CBCA agreement only covers CAPEX and not all other future costs (e.g. operation, maintenance, upgrading); and

b) Projects are not proposed because investors do not believe that CBCA will be successful[11].

An ex-post mechanism would therefore ensure that all projects having cross-border relevance and the related costs are adequately and consistently considered.

5.5.1. The ex-post cost benefit sharing

When designing the ex-post mechanism, we draw parallels from other European infrastructure systems like European road and railroad systems. In these systems, Member States generally cover the costs of new infrastructure on their territory (with potential support of EU funds) and recover part of these costs with ex-post (distance-based) charging based on actual usage of infrastructure from cross-border transport. Here the principle is that every vehicle, be it internal or transiting, pay the same charge (pay-

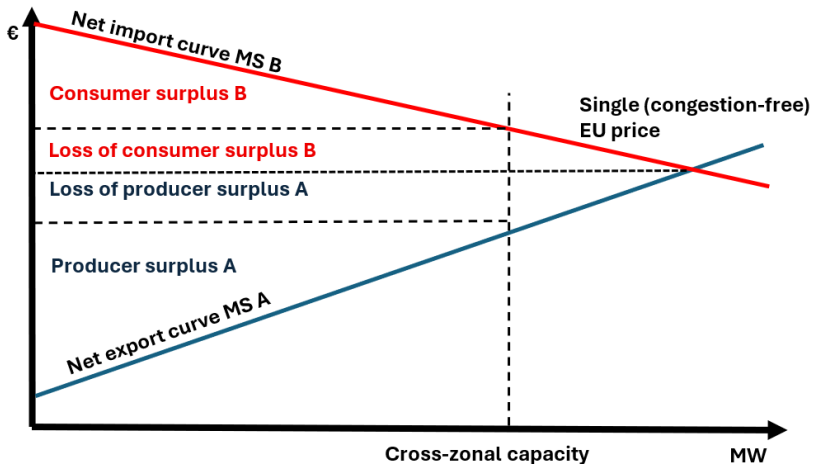
[11] This may involve cases where (i) projects are not at all proposed in the National Development Plan (NDP) and in the European TYNDP; (ii) projects are proposed in the NDP and TYNDP but they are not proposed for PCI selection; or (iii) projects are on the PCI List but a project promoter delays application for investment request.

per-use principle). In analogy, every electron, be it on internal or transit route should pay the same charge for using the electricity infrastructure. This solution was not possible in electricity networks a decade ago, because it was not possible to trace the cross-border electrons and separate them from electrons on internal path. However, in recent years the flow-tracing methodologies have been developed to the extent that enable to identify the flows resulting from cross-border trade on each transmission network element.

The pay-per-use principle in electricity transmission network could be applied as follows:

1. **Collect all explicit benefits of cross-border trade into a single pot.** This is the congestion income. Other benefits of cross-border trade also exist, but they are more implicit and are proposed to be ignored in this mechanism.
2. **Collect all costs for hosting cross-border trade into a single pot.** These costs can be determined by calculating the percentage of network use by cross-border flow (ratio between cross-border flow and the total physical flow).
3. **The costs of hosting cross-border flows are the total network costs[12] of a certain TSO in a given year (as approved by NRA) multiplied by the percentage used by cross-border flows.** Note that only a fraction of these costs is to be covered by ex-post mechanisms, so NRAs/TSOs have no incentive to inflate these costs as they would hurt national network tariffs more than the common pot. All the investments costs recovered from CBCA or CEF should be excluded from such national costs.
4. **If the total congestion income exceeds the total cross-border costs**, then share the remaining congestion income in accordance with existing CID principles.
5. **If the total congestion income does not cover the total cross-border costs**, then share the remaining cross-border costs in proportion to the benefits Member States receive from cross-border trade (i.e. consumer surplus calculated in market coupling - see Figure 1).

Figure 1: The economic surplus of cross-border trade



Source: ACER

In this ex-post mechanism, all the calculations are done at market time unit level (i.e. 15 minutes) with actual data from the network and market coupling. Most notably the level of cross-border flows can be quite accurately computed by (i) using the EU-wide common grid models (latest available) that contain all elements of the transmission network, (ii) use generation and load shift keys (GLSKs) used in capacity calculation, (iii) then calculate PTDF factors using CGMs and GLSKs and finally, (iv) use the

[12] These are pure network costs like operational, maintenance and reinforcement costs, but exclude costs like ancillary services and congestion management.

final/realised net positions of bidding zones (import/exports) and multiply them with PTDF factors. Such methodology to calculate the cross-border flow is already used in the CID methodology, in some regional cost sharing methodologies for remedial actions and it is generally implied in flow-based market coupling to estimate the impact of imports and exports on critical network elements to prevent their congestion.

This mechanism would be automatic and mandatory, and it would replace the ITC mechanism and the rules on congestion income sharing and use. Thereby the main difference between Option 2 and 3 is that in Option 2 the ITC and CID remain two completely separate mechanisms, which implies that Member States would claim the costs of cross-border trade irrespective of the benefits they already receive via the congestion income. Option 3 aims to rectify this drawback by first using the congestion income to pay for the claimed costs and only the costs that are not covered by congestion income would be redistributed among Member States.

How does the complementary approach address the conflict of interest between hosting countries wanting ex-ante certainty and benefiting countries wanting ex-post certainty?

Option 3 combines the ex-ante and ex-post approach in cost sharing. It allows for the application of CBCA based on Option 2, while the costs of cross-border trade that could not be captured by CBCA would be guaranteed to be captured by the ex-post mechanism. The ex-post part would give Member States that are required to contribute to infrastructure costs far away from their territory more comfort since the benefits that they would be paying for are not disputable.

The remaining problem that needs to be solved is to give cost sharing certainty to Member States that are required to invest (de-risking the investment).[13] This problem can be partly solved by forecasting the outcome of the ex-post mechanism (such forecasting is similar as performing CBA for CBCA). Yet, even with good forecasting, some uncertainty for the hosting Member States remains, namely that the usage of the network by cross-border flows is lower than expected, thereby increasing the share to be recovered through national tariffs.

Such risk could, if needed, be addressed with a specific risk premium, such that the amount of costs entering into common pot from new investments are increased by a certain risk premium that aims to cover the risk of unexpectedly low utilisation from cross-border flows. In such case, the ex-post mechanism would allow that the portion of investment costs attributed to cross-border flows, would be increased by a certain factor (e.g. by 10%). This premium could also account for other costs such as environmental costs, public opposition etc., that investing Member States face, but beneficiary Member States do not. The risk premia received by investing Member States could then be used as financial incentive and to convince the public that investments of EU interest provide financial reward to domestic network users in a form of lower network tariffs.

A lighter version of this option could apply the ex-post mechanism in a more targeted way, focusing on PCI projects[14]. This could increase the acceptance of the mechanism due to its more targeted application. Thereby, the ex-post sharing would cover only those costs not already covered through CBCA agreements. This would mean the CAPEX of PCIs not covered by CBCA, and OPEX of any infrastructure, whether a PCI or not. The scope of OPEX could vary; from at least the losses costs (as in ITC) to any operational costs of infrastructure after amortisation (maintenance, upgrades, staff, etc.).

Legislative actions for Option 3

Option 3 requires a review of Regulation (EU) 2019/943 for congestion income distribution and ITC, Regulation (EU) 838/2010 for ITC and Regulation (EU) 2022/869, Articles 16 and 18 for CBCA.

[13] Note that investment is risk free for the project promoters, which get full cost recovery, be it from national tariffs or from cost sharing arrangements.

[14] In this context, this proposal should also be assessed in conjunction with the PCI selection process, with a view to examining whether the current selection process framework sufficiently ensures the identification of all projects with EU-wide and regional cross-border relevance.

5.6. Option 4: A new cost-benefit sharing framework

This option assumes a completely new framework of cost sharing that does not rely on existing mechanisms or their improvements. Option 4 therefore proposes to replace existing mechanisms with a new cost-sharing framework that aims to address the problems defined in the problem definition. In this option we list two different sub-options how a new framework could replace existing mechanisms.

These sub-options aim to fully socialise all the costs arising from cross-border trade and does not aim to allocate them in proportion to the benefits that countries receive from cross-border trade. Finally, ACER is also aware of the solution to address the infrastructure cost sharing with a framework of injection charges, where countries aim to recover the costs arising from cross-border trade with injection charges levied on producers exporting electricity to other countries. After some evaluation, ACER considers that this option would not address the main problems as it represents a potential solution only for exporting countries but offers no solution to transiting or importing countries that also need to invest and recover the costs of cross-border infrastructure. For this reason, this option is not further analysed in this paper.

5.6.1. Option 4.1: Common EU infrastructure development fund

Option 4.1 assumes a centralisation of all funds to finance infrastructure of regional or EU interest. At the input side it collects all congestion income which represent explicit benefits of cross-border trade as well as the CEF fund into one single investment fund. This investment fund could be complemented with other possible funds such as potential loans by EIB, etc.

Similarly to the CEF fund, the common infrastructure fund would select the projects of highest regional or EU interest, based on a transparent and agreed upon methodology, and allocate specific funds to such projects to cover a portion of investment costs in proportion to the expected cross-border benefits. This would mean that the higher the regional or EU benefits of a specific project, the larger will be the proportion of costs recovered from the EU common infrastructure fund.

The motivation behind this option is the problem that congestion income is not always channelled into new investments. While high congestion income in recent years indicate the need for significant investments of regional or EU benefits, we observe that a large portion of congestion income is not used for this purpose due to many reasons. Nevertheless, some historical investments have been made based on expectation of future congestion income and thereby this option would require some transitional solution to transfer the non-amortised part of these investments under the new financing regime. In this context the question arises of socialising the congestion income on internal bidding zone borders inside a Member State (which is fully generated by network users inside that Member State). On the one hand, it may not be fair to socialise such congestion income across the whole EU and thus implicitly punish Member States that opted for internal bidding zones to manage congestion. On the other hand, significant congestion income on internal bidding zone borders indicates a strong need for investments and the threat of socializing such congestion income may provide a strong signal for investments. Therefore, if congestion income on internal borders would also be socialised, Member States would be strongly incentivised to develop infrastructure to remove those congestions and finance them from such fund.

This option would provide a financing framework for new infrastructure (mainly CAPEX). It therefore leaves a gap in financing the costs of existing infrastructure as well as all operational costs (e.g. network losses). It should thus be complemented with ex-post mechanism similar to ITC, which would capture the remaining infrastructure costs not covered by the CAPEX of new infrastructure (e.g. operational costs, maintenance, upgrading).

The governance of this fund is also important in order to ensure independent and impartial decisions on the allocation of funds. Such impartiality could be achieved by an independent board where members of the board are fully independent and are selected in an open procedure and nominated by European Commission, ACER (subject to BoR approval) or both.

Finally, it must be noted that the option of a common EU infrastructure development fund described in this section is also compatible with the framework described under option 2, as it could complement CBCA, while ITC would continue covering the costs associated to losses for existing infrastructure.

5.6.2. Option 4.2: Common EU network tariff component

Option 4.2 is similar to Option 4.1 as it aims to recover a portion of infrastructure costs from each Member State that arise from cross-border trade, but it does so via common EU network tariff. There are two possible choices:

a) **The ex-ante approach.** In this approach all the investment costs in proportion to the benefits which are attributed to cross-border trade would be gathered at EU level similarly to Option 4.1. This approach would need to be complemented with ex-post mechanisms to recover the costs of existing infrastructure and operational costs.

b) **The ex-post approach.** In this approach all the actually incurred network costs at national level would be split similarly as in Option 3 to obtain the national costs arising from cross-border trade. They include any costs incurred (which include new and existing infrastructure as well as CAPEX and OPEX).

In both approaches the costs would be collected at EU level. Then NRAs/ACER would assess whether these costs are reasonable, efficient and proportionate and finally determine a network tariff component to be paid by all EU consumers that would recover these costs in a given regulatory period. This network tariff component would then be added to national network tariffs and then collected and redistributed at EU level.

Because congestion income is the explicit benefit of cross-border trade, it makes sense that in both approaches, the congestion income is added to the European tariff determination and thus reduce the total cross-border network tariff to be charged to EU consumers.

In principle, the process described under option 4.2 could also be designed to be cost-reflective, or even incorporating time-of-use elements, meaning that the structure of the EU network tariff component would reflect the underlying cost of the infrastructure used. As a result, contributing countries could pay different tariffs.

Legislative actions for Option 4

Option 4 requires a review of Regulation (EU) 2019/943 for congestion income distribution and ITC, Regulation (EU) 838/2010 for ITC and Regulation (EU) 2022/869, Article 16 for CBCA.

6. Evaluation of policy options

6.1. Evaluation of Option 0 ('Do nothing')

Benefits of this option

The benefits of Option 0 are that it requires no legislative change, thereby avoiding lengthy legislative and implementing discussions, and it allows the focus to remain on better application of the current framework. This option ensures stability and predictability for stakeholders already familiar with these mechanisms and for investment decisions taken in the past and presently.

Drawbacks of this option

The drawbacks are that the improvements achievable under the current framework have a very limited scope. Progress would also depend on voluntary uptake, such as ENTSO-E's role in ITC. If there would be sufficient incentives to take-up voluntary improvements those should have already occurred. Under this option, the main shortcomings identified in cost-benefit sharing would persist.

Evaluation against the objectives

Because CBCA under status quo only works effectively for cost sharing among hosting countries, this option does not provide effective incentives for building of cross-border infrastructure of regional and EU interest (Objective 1). It does not effectively address the cases where Member States need to build new infrastructure which entails a large share of benefits accruing outside the hosting Member States and may also result in a negative national net benefit. Therefore, this option would also not contribute to Objective 2 as Member States would be required to bear the costs of cross-border trade without reaping commensurate benefits or at least being compensated for all associated network costs. Similarly, Option 0 does not ensure that cost-sharing reflects the wider EU benefits of infrastructure and the various types of electricity flows (Objective 3). Consequently, this option does not reduce the uncertainty for network investments with regional and EU interest as it does not provide a robust, transparent, predictable and consistently applied framework for their financing (Objective 4). Finally, Option 0 does not seem to be future proof (Objective 5), especially because the objective of a true EU Energy Union requires the significant buildup of electricity infrastructure for the common EU benefits. Thereby the cases where MSs are asked to invest for the common interest will only increase and Option 0 will not be able to remove financial disincentives for such investments.

6.2. Evaluation of Option 1 ('Incremental reform of existing mechanisms')

Benefits of this option

Option 1 introduces legally binding changes giving certainty to its effect. Regular monitoring of congestion income use would improve transparency on the use of congestion income. In the ITC, the costs of losses and infrastructure would be calculated and allocated more accurately, with fairer burden-sharing across Member States. Finally, targeted amendments to the CBCA framework would simplify the process using clearly quantifiable, monetised benefits. It would also ensure that CBCA is triggered only when deemed needed by hosting NRAs and help facilitate the process where a greater number of MSs could be involved in the CBCA to reflect the benefits.

Drawbacks of this option

In case of ITC, a more granular calculation of losses would likely increase the administrative costs related to that, requiring the right balance between accuracy and increased administrative costs. Also, the agreements on the price of losses and the infrastructure fund may be challenging and would require a firm legal framework which is a challenge also. This option limits the scope of negotiations, which may be detrimental to the expression of Member States' specific views. On the other hand, CBCA would still remain subject to potentially lengthy (ad-hoc) negotiations. Even agreeing among the hosting NRAs that CBCA or CEF funding is needed could be difficult. In overall, while Option 1 would mitigate some of the problems, it keeps the fragmented nature of the three mechanisms and is thus unlikely to ensure

full cost coverage for making cross-border infrastructure available and the allocation of costs in a way that fully reflects the usage and benefits.

Evaluation against the objectives

While Option 1 would provide some improvements of the cost benefit sharing framework, it will likely still fall short in providing effective financial incentives for building of cross-border infrastructure of regional and EU interest (Objective 1). This is because the CBCA framework in this option is still not able to effectively facilitate cost sharing in a wider regional or EU context to reflect regional or EU benefits – in practice it will still likely be applied successfully only to hosting countries. On the other hand, reformed ITC would still be based on the old concepts of calculating network losses and predefined fixed ITC fund which does not provide a comprehensive cost benefit sharing that would accurately capture the costs of cross-border infrastructure and share it based on accrued benefits.

Based on these findings, Option 1 would not be able to avoid entirely that countries bear the costs of cross-border trade without reaping commensurate benefits or at least being compensated for all associated network costs (Objective 2). Similar conclusion applies to Objective 3: Option 1 would not fully ensure that cost-sharing better reflects the wider EU benefits of infrastructure and the various types of electricity flows. While Option 1 would to some extent reduce the uncertainty for network investments via a robust, transparent, predictable and consistently applied framework for their financing (Objective 4), it might not reduce the uncertainty to the extent needed to remove the financial disincentives to invest in cross-border infrastructure. Finally, Option 1 does not seem to be future proof (Objective 5), as it does not sufficiently address and remove the financial disincentives to invest in cross-border infrastructure.

6.3. Evaluation of Option 2 ('Significant reform of existing mechanisms')

Benefits of this option

In case of ITC, this option aims to mitigate the gaps of existing ITC regulation by focusing on all cross-border physical flows and by identifying actual incurred costs of infrastructure instead of some administratively set fixed number. The CBCA mechanism would become automatic and, depending on the level of ambition sought, more mandatory, providing a more stable and predictable approach with costs more closely aligned to the benefits calculated ex-ante, thus increasing transparency and removing some disincentives for hosting countries to build beyond national interest and share the costs through CBCA. Option 2 allows capturing CAPEX, OPEX, and maintenance costs for both existing and new infrastructure. Thereby Option 2, if properly, designed could significantly mitigate the existing problems.

Drawbacks of this option

The reformed ITC would require more comprehensive modelling and data collection as well as difficulty to agree on all aspects during legislative process. For CBCA, the introduction of a harmonised and automatic CBCA process will need to be carefully designed to avoid the risk of contributors opposing projects with significant EU or regional benefits during the PCI selection process. Because of the intrinsic uncertainty about CBA calculations coming from scenario-based modelling, it may be hard to make the CBCA mandatory and for the non-hosting countries to commit to pay for the costs based on uncertain benefits in the future. Finally, even with well-designed and ambitious CBCA, Option 2 presents the issue that the three mechanisms would remain separate, limiting the potential for a fully integrated and coherent framework. As explained above, the separation of congestion income and ITC keeps the ex-post sharing of benefits and costs separate, which leads to MSs receiving funds from ITC even if their congestion income is sufficient to cover these costs. This separation also implies a large sum of money being settled among TSOs though the ITC, which would provide additional instability for network tariffs.

Evaluation against the objectives

Option 2, when properly designed and implemented, and assuming scenario-based CBAs are trusted by investors and contributors, would provide an effective financial incentive for building of cross-border infrastructure of regional and EU interest (Objective 1). It would capture all costs of cross-border

infrastructure, and these would be shared through one of the three mechanisms. For this reason, Option 2 would also avoid that countries bear the costs of cross-border trade without reaping commensurate benefits or at least being compensated for all associated network costs (Objective 2).

Option 2 would better reflect the wider EU benefits of infrastructure and the various types of electricity flows (Objective 3). However, since the benefits (i.e. congestion income) sharing would not be netted with the costs claimed in ITC, Option 2 still falls short in meeting this objective. Similarly, Option 2 would reduce the uncertainty for network investments via a robust, transparent, predictable and consistently applied framework for their financing (Objective 4), but may partially fall short because of the uncertainty for network tariffs due to separate application of congestion income and ITC. Finally, Option 2 may not be a fully future proof concept for the EU electricity system (Objective 5) because it keeps the complex and separate frameworks for congestion income distribution and ITC. Thus Option 2, if implemented, may likely require further simplifications and coherence.

6.4. Evaluation of Option 3 ('Combining ex-ante and ex-post cost benefit sharing')

Benefits of this option

The benefit of this option is that it consistently combines ex-ante and ex-post cost-benefit sharing, balancing the interests of hosting Member States, who gain certainty, with those of beneficiaries, who benefit from cross-border trade. Compared to Option 2, it provides a more comprehensive approach for capturing CAPEX, OPEX, and maintenance costs for both existing and new infrastructure. At least the ex-post part of the mechanism is automatic and mandatory, offering a stable, rules-based framework, while retaining flexibility to operate ex-ante (focusing on investment) or ex-post (focusing on actual costs). The main benefit of this option is that it combines two existing ex-post sharing mechanisms into one and thereby netting the main benefits of cross-border trade (congestion income) with the costs of cross-border trade. It consequently requires much less redistribution among Member States and national network tariffs (only the costs not covered by congestion income needs redistribution).

Drawbacks of this option

The drawback is that this approach is more complex to implement and reach agreement on, and it would require a significant testing and longer implementation timeline. In particular, the impact on national network tariffs is uncertain as Member States would lose congestion income but would obtain costs from cross-border trade. Transition issues may arise, particularly regarding the treatment of existing projects which were based on expectation of future congestion income and whether the loss of congestion income can be replaced by claimed costs for cross-border trade. This option also raises a key question on polluter pays principle, namely who are the Member States that benefit from infrastructure. At the most fundamental level the beneficiaries of cross-border trade are the consumers of importing countries, but one could argue to allocate some of the costs also to producers in exporting countries.

Evaluation against the objectives

Option 3 would provide an effective financial incentive for building of cross-border infrastructure of regional and EU interest (Objective 1). It would capture all costs of cross-border infrastructure, be it through ex-ante or ex-post mechanism. Option 3 would also avoid that countries bear the costs of cross-border trade without reaping commensurate benefits or at least being compensated for all associated network costs (Objective 2).

Option 3 would reflect the wider EU benefits of infrastructure and the various types of electricity flows (Objective 3), since the sharing of costs would be proportional to the benefits either in ex-ante or ex-post framework. Option 3 would reduce the uncertainty for network investments via a robust, transparent, predictable and consistently applied framework for their financing (Objective 4), however the impact on network tariffs is uncertain and would need to be analysed. Finally, while the proposed approach under Option 3 is more complex to implement and will require a significant testing and longer implementation timeline, it appears to be a future proof concept for the EU electricity system (Objective 5). This is because it mimics the pay-per use principle that is traditionally applied in other infrastructure sectors and also because it incorporates both ex-ante and ex-post approaches based on the preferences of investors and hosting Member States.

6.5. Evaluation of Option 4 ('A new cost-benefit sharing framework')

Benefits of this option

Options 4.1 and 4.2 provide a stronger link between congestion income and network investments to make sure that congestion income is more consistently used for infrastructure investments. Option 4 also simplifies the framework for financing and cost sharing of cross-border infrastructure.

Drawbacks of this option

The drawback of this option is that it socialises all the infrastructure costs and ignores that some Member States, which import more electricity, benefit more than others. This may provide bad incentives to efficient infrastructure development and can significantly increase costs. Another drawback of this option is that it takes away all congestion income from Member States and in case of Option 4.1 gives it back only if Member States build new infrastructure. This may be discriminatory to those Member States that have already invested a lot in the past. It may also have a negative impact on network tariffs and might not be efficient as removing all congestions with infrastructure investments is not economically efficient – this means that some congestion income needs to be spent for costs of existing infrastructure. Option 4.2, on the other hand does not suffer from these drawbacks. Option 4.1 would also likely focus on CAPEX only, leaving a gap not only in terms of financing the costs of existing infrastructures but also in terms of covering the operational costs. Options 4.1 and 4.2 are also politically sensitive as they would require an EU layer for funding and network tariffs that currently does not exist and would need to be complemented by a clear governance. Like other options, they also raise transitional problems that may not be easy to address. It is also important to view these options in relation to how projects with EU or regional relevance will be chosen, ensuring that every relevant project is first identified. By contract, the current PCI selection process is based on a voluntarily application by project promoters interested in their projects to become PCI and typically does not include many internal infrastructure projects enabling cross-border investments.

Evaluation against the objectives

Options 4.1 and 4.2 would provide an effective financial incentive for building of cross-border infrastructure of regional and EU interest (Objective 1). They would capture all costs of cross-border infrastructure through a common fund or network tariffs or through complementary mechanisms in case of Option 4.1. Both Options 4.1 and 4.2 would also avoid that countries bear the costs of cross-border trade without reaping commensurate benefits or at least being compensated for some (in case Option 4.1) or all associated network costs (Objective 2).

Options 4.1 and 4.2 would not reflect the wider EU benefits of infrastructure and the various types of electricity flows (Objective 3), since the sharing of costs would be socialised at EU level and not be based on benefits. Options 4.1 and 4.2 would reduce the uncertainty for network investments via a robust, transparent, predictable and consistently applied framework for their financing (Objective 4), however in case of Option 4.1 the impact on network tariffs is uncertain as Member States would lose congestion and only receive it back if they invest in new infrastructure. While Option 4.2 appears to be a future proof concept for the EU electricity system (Objective 5), Option 4.1. would likely raise questions regarding how much congestion income should be channelled towards new investments and thereby into a common fund, and how much would remain available for existing infrastructure. Moreover, this ratio may vary from year to year.

7. Recommendations and conclusion

The description of policy options in Chapter 5 and their evaluation in Chapter 6 show that each policy option has some benefits and drawbacks and that each policy option, except Option 0, would to some extent help address the main problem and related policy objectives.

Option 1, with moderate improvements of existing mechanisms, provides a more predictable outcome and may be implemented easier, but it is unlikely to address the main problem in an adequate way. This is particularly important for those Member States that are required to invest for the benefit of regional or EU interest but not having sufficient national benefit to justify those investments.

Option 2, with significant improvements of existing mechanisms is less predictable when it comes to the impact on national network tariffs, but it could, on the other hand, be able to tackle the main problem. Still with separate sharing of ex-post benefits (i.e. congestion income) and ex-post costs (ITC) it may provide distortions to cost sharing among Member States and fail to fully reach some of the objectives of this policy paper. Further testing would be needed for such option to identify its impact on national tariffs and overall financial flows between Member States.

Option 3 aims to tackle the main downside of Option 2 by merging congestion income and ITC into a single ex-post cost-benefit sharing mechanisms and share the costs in proportion to the actual benefits. Its impact on network tariffs would likely be lower as Member States would lose congestion income but would on the other hand receive significant costs claimed as arising from cross-border trade. Nevertheless, this option is also unpredictable at this stage and would need to be tested and potentially finetuned.

Options 4.1 and 4.2 are also considered to be able to address the main problem but are judged as very ambitious due to a current gap in governance. They may provide some distortions due to full socialisation of costs, not taking into account, which Member States benefit more from cross-border trade (e.g. relying on significant imports due to lack of domestic investments) and which Member States do not need to rely a lot on cross-border trade.

Based on the above analysis, ACER considers that, at this stage, **further analysis and evidence would be beneficial before narrowing down the policy options and recommending a single preferred option.** In particular, a quantitative assessment of the policy options and their potential impact on network tariffs and cost-sharing among Member States would allow for a more informed comparison. At this stage, some options are therefore outlined at the level of principles and could be further specified following a quantitative assessment of key design elements, including their feasibility and implementation complexity.

Based on the above, ACER concludes that all policy options (except Option 0) need further quantitative evaluation and further specification of detailed design elements before a clear conclusion and recommendation can be made. Therefore, ACER plans to organise the work with NRAs and external experts to perform such quantitative evaluation and to revise this policy paper once the quantitative evaluation can provide a clearer picture. Finally, such revision will be able to take stock of the legislative changes currently being developed under the so-called Grids Package and adapt policy options to take into account the remaining needs for legislative change, if any.