Florence School of Regulation

Consultation on the main implementation aspects of a possible scheme for incentive regulation to promote efficiency and innovation in addressing system needs

This consultation is run by the Florence School of Regulation (FSR) at the European University Institute on behalf of the EU Agency for the Cooperation of Energy Regulators (ACER).

The purpose of this consultation is to seek the feedback of national regulators, transmission system operators (TSOs) and other stakeholders on some implementation aspects of the incentive-based regulatory scheme to promote efficiency and innovation in addressing system needs, presented in a previous report by the FSR, available at: https://www.acer.europa.eu/en/Electricity/Infrastructure_and_network%20development/Infrastructure/Documents/Benefit_based_regulation_2023.pdf, and summarised in Section 3 below.

This note is structured as follows. Section 1 presents the background to the development of the proposed regulatory scheme, while Section 2 highlights the challenges that such a scheme aims to address. Section 3 contains a summary illustration of the proposed scheme. Section 4 provides information on the previous consultation on the proposed scheme. Section 5 discusses some implementation issues and introduces the current consultation.

1. Background

In April 2023, ACER commissioned the FSR to outline a benefit-based incentive scheme for (electricity) transmission infrastructure and to present its main features at the 9th Energy Infrastructure Forum in Copenhagen in June 2023. The presentation delivered by the FSR at the Forum is available at: https://circabc.europa.eu/ui/group/88886b79-cdea-4633-a933-8b191efb335b/library/f584257a-e4be-4a55-8c1d-dbbfdada8ca7/details.

Point 8 of the Forum's conclusions indicates that "*The Forum requests ACER and CEER to analyse key barriers and develop recommendations for national incentive schemes to promote innovation, anticipatory investment and efficient electricity networks for the system integration of renewables*".
Therefore, after the Forum, ACER launched a new procurement procedure for a more extensive study on the topic. As the result of this procedure, in September 2023 ACER retained the FSR to continue to work on the topic, including by consulting national regulators, TSOs and, eventually, other stakeholders on a scheme '*to promote innovation, anticipatory investment and efficient electricity networks',* as developed in the previous study and presented in the FSR Report available at: https://www.acer.europa.eu/en/Electricity/Infrastructure_and_network%20development/Infrastructure/Documents/Benefit_based_regulation_2023.pdf.

Other relevant publications on the matter include:

- European Commission, Directorate General for Energy, *Do current regulatory frameworks in the EU support innovation and security of supply in electricity and gas infrastructure?*, March 2019, available at: https://op.europa.eu/en/publication-detail/-/publication/6700ba89-713f-11e9-9f05-01aa75ed71a1/language-en/format-PDF/source-96288082.

- CEER, *Status Review Report on Regulatory Frameworks for Innovation in Electricity Transmission Infrastructure*, October 2020, available at: https://www.ceer.eu/documents/104400/-/-/8c2aace7-5601-8723-4d45-337073af38d5.
- ACER, *Position on incentivising smart investments to improve the efficient use of electricity transmission assets*, November 2021, available at: https://www.acer.europa.eu/sites/default/files/documents/Position%20Papers/Position%20Paper%20on%20infrastructure%20efficiency.pdf.
- CEER, *Report on Regulatory Frameworks for European Energy Networks 2022*, January 2023, available at: https://www.ceer.eu/documents/104400/-/-/2a8f3739-f371-b84f-639e-697903e54acb.
- Brunekreeft G., *Improving regulatory incentives for electricity grid reinforcement*, a Study for Autoriteit Consument en Markt (ACM) by Constructor University Bremen, June 2023, available at: Improving regulatory incentives for electricity grid reinforcement (acm.nl).
- ACER, *Report on Investment Evaluation, Risk Assessment and Regulatory Incentives for Energy Network Projects*, June 2023, available at: ACER_Report_Risks_Incentives.pdf (europa.eu).

2. The current challenges

The scheme proposed by the FSR, and whose implementation aspects are the subject of this consultation, aims at addressing the two aspects of the current regulatory setting in need of improvements, as identified by ACER in its Position Paper of November 2021, referred to in the previous section:

- the capital expenditure (CAPEX) bias, which is the result of differences in the regulatory treatment of operational expenditure (OPEX) and CAPEX, creating a favourable environment to invest in CAPEX-heavy solutions; and
- the lack of incentives for TSOs to opt for more efficient solutions, including those at minimal (total) cost.

In addressing these aspects, the FSR formulated the following considerations:

- While ACER refers to the opportunity of introducing benefit-based incentive regulation, the aspects referred to above concern costs and the way in which they are allowed and rewarded under the current regulatory framework.
- A comparison between costs and benefits is the regular and traditional regulatory test for any investment or process in a regulated environment. The regulator should be satisfied that any investment or process proposed or undertaken by the regulated entities, and which is paid through the allowed revenues recognised to such entities, delivers positive net benefits, i.e. benefits higher than costs, to network users and, ultimately, to consumers, present and future.
- It is however often true that benefits are more difficult to identify and uncertain than costs, as they depend on the future state of the world and of the system, and therefore are more difficult accurately to estimate and monetise[1]. Costs are typically easier to define. However,

[1] One type of benefits which could be, at least in part, easily monetised are those represented by the congestion income related to an increases in the interconnection capacity between neighbouring market zones in the Internal Electricity Market. However, please note that:

in approving new investments or processes, and the related allowed revenues, regulators can limit themselves to assess whether benefits exceed costs; they do not need to come to a precise assessment of the level of net benefits (unless financial constraints require some sort of ranking of investments and processes based on their net benefits[2]).

- At some stage, the regulator(s) should 'take a view' as to the beneficial nature of the proposed investment or process and approve it. At that point, the costs of the proposed investment or process are included in the allowed revenues, as depreciation and return on capital, in the case of investments, and/or as allowed revenues to cover OPEX, in the case of processes. In this way, the TSO(s) would have a cost-recovery guarantee and the risk of the world turning in a way of making the investment or process no longer beneficial is transferred from the TSO(s) to the system. Leaving such a risk with the TSO(s) would increase the cost of capital[3]. The system is better placed to absorb such a risk.
- It seems to be too strict a regulatory approach to focus only on those system needs where benefits are easily quantifiable and monetisable. There might be other system needs which, if addressed, would be greatly beneficial for grid users and consumers, even though the benefits might not be easily quantifiable, let alone monetisable. However, these difficulties do not seem a good reason to neglect them.
- Since, as indicated above, benefits are typically difficult to estimate, translating them into a metric to define monetary incentives for the TSO(s) might be generally challenging.
- Finally, there is an asymmetry of information between TSOs and regulator(s) and the latter would have heavily to rely on the former for the assessment of the benefits to be delivered by the different possible investments and processes. There might therefore be a propensity for TSO(s) to over-estimate the benefits if such an assessment were to be used for determining the level of monetary incentives awarded to them.

Moreover, while the focus is usually on promoting innovative and more efficient investments, system needs might also be addressed by solutions mostly based on changes in operational procedures, rather than on investments, and therefore the aim should be, more generally, to promote innovative and more efficient solutions to address system needs, rather than just innovative and more efficient investments.

The TOTEX approach, in which CAPEX and OPEX are treated symmetrically, has been proposed to overcome the CAPEX bias. In its proper implementation, the TOTEX approach involves predefining a CAPEX-OPEX structure and remunerating the TSO(s) on the basis of this structure (therefore with a fixed ratio between the allowed revenues to cover OPEX – the 'fast' money – and the allowed revenues

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a) the congestion income only represents part of the total benefits delivered by the increased interconnection capacity, as it does not include the changes in the (welfare) surplus enjoed by market participants, and, correspondingly, it only provides an indication of the marginal value of the interconnection capacity once it is increased, and not of the value of such capacity increase;

b) the congestion income crucially depends on the difference in market prices between the market zones connected by the interconnector and, therefore, might experience significant variations over time.

[2] However, even in this case, regulators need only to come up with the ranking of beneficial projects or processes on the basis of the net benefits which they deliver, and not with the exactand absolute valuation of such net benefits for each project or process.

[3] It is true, though, that low-cost investments typically involve a limited risk and processes might have a low share of sunk costs.

to cover CAPEX – the 'slow' money), irrespective of the actual cost structure of the solutions chosen by TSOs. In such an implementation, the CAPEX bias is, in fact, overcome, but only within the regulatory period during which this CAPEX-OPEX structure is maintained constant. At the end of the regulatory period, the regulator is likely to revisit the CAPEX-OPEX structure, thus creating a sort of CAPEX bias again. Moreover, some of the implementations, while labelled as TOTEX, do not keep the CAPEX-OPEX structure fixed, even within a regulatory period, thus completely failing to address the CAPX bias.

The proposed approach addresses the CAPX bias at its root, by envisaging incentives commensurate to a share of the difference between the full costs of alternative solutions, assessed in net-present-value terms. In this way, the composition of these costs is irrelevant and CAPEX and OPEX are treated in a fully symmetrical way.

It is important to emphasise that the proposed approach, outlined in the next section, is not expected or intended to replace all existing regulatory frameworks and incentive schemes, but rather to provide regulators with an additional tool to overcome the CAPEX bias and other regulatory distortions promoting CAPX-heavy solutions to system needs.

3. A possible incentive-based scheme to promote innovative and efficient solutions to system needs

On the basis of the considerations outlined above, the following scheme to promote innovative and more efficient solutions to system needs was presented at the Copenhagen Forum and further detailed in the above-mentioned FSR Report:

1) The regulator identifies the system needs to be addressed. This should be a general rule, as new investments or processes should always aim at addressing an identified need[4]. The TSO(s) might bring system needs to the attention of the regulator, but it is ultimately the latter that should confirm them.
2) The regulator defines a standard way of addressing each identified system need or set of needs. The consideration of sets of needs recognises the fact that some of such needs could be interlinked, and addressing them as a set could be done at lower costs than aiming at the same needs separately. Again, the TSO(s) might assist the regulator in the definition of such a traditional standard solution.
3) The regulator, possibly upon the proposal of the TSO(s), would determine the costs related to the traditional standard way of addressing the need or set of needs, the corresponding allowed revenues and the period over which such allowed revenues would be awarded[5]. These costs would include OPEX and CAPEX.
4) The regulator would also invite the TSO(s) to come up with a more efficient way of addressing the need(s), together with an estimate of the associated costs, which is presented to the regulator for its review and endorsement.
5) Allowed revenues would then be set to:

[4] In the output-based or performance-based regulation, system needs are typically framed in terms of measurable output or performance. In the proposed scheme we prefer the more general reference to system needs.

[5] This could be according to the standard regulatory practices, for example of allowed revenues to cover CAPEX to be awarded for the length of the economic life of the assets.

- cover the costs of the more efficient, innovative solution proposed by the TSO(s), as defined by the latter in advance and endorsed by the regulator;
- include an incentive, represented by a share of any positive difference, in net present value terms (NPV), between the allowed revenues which would be required to cover the cost associated with the standard way of addressing the need(s) identified by the regulator and the allowed revenues which would be required to cover the cost of the preferred way identified by the TSO(s), where this difference is assessed over a time horizon equal to the economic life of the longest-living asset in the standard way of addressing the system need(s).

Therefore, the overall allowed revenues would be capped at the level corresponding to the costs of the standard way of addressing the need(s) identified by the regulator.

6) In case the solution proposed by the TSO(s) fails to address the identified system needs, the incentive might not be paid and the allowed revenues might in fact be reduced to reflect the underperformance of the solution.
7) If the regulator also wants to incentivise the timely deployment of the new investments or processes, the scheme could be calibrated so that the incentive is reduced in case of delays in commissioning the new investments or in implementing the new processes.

With respect to the proposed scheme, it is worth noting that the incentivising properties of the scheme crucially depend on:

a) the regulator defining in advance the standard way of addressing the identified need(s) and the related costs and not adjusting them in response to the choices of the TSO;
b) the degree of benefit sharing determined by the regulator[6].

In particular, the higher the costs defined by the regulator for the standard way of addressing the identified need(s) and the higher the share of the cost saving awarded to the TSO(s) as an incentive, the stronger the inducement for the latter to seek lower-cost, more efficient solutions.

There are several similarities between the implementation features and challenges of the proposed scheme and those of other incentive-based regulatory approaches, including the most traditional RPI-X approach. These are elaborated in Section 5 below.

Finally, as with other incentive-based approaches, such as RPI-X regulation, the proposed scheme could also be used to prompt TSOs continuously to seek more efficient, innovative solutions to the identified needs and reveal the costs of such solutions. Eventually, these solutions may become the standard way of addressing the needs and used as a reference by the regulators in subsequent regulatory periods.

[6] I.e., the share of the cost saving that the TSO(s) will be allowed to retain as incentives. The remaining part will be transferred to network users, and, ultimately, to consumers, through a reduction in network charges.

4. *The consultation on the proposed scheme*

Between October and December 2023, the FSR ran a consultation involving regulators, TSOs and other stakeholders on the incentive-based scheme outlined above. A webinar to provide clarifications on the proposed scheme was organised on 24 November 2023.

Around 35 respondents participated in the consultation. They generally shared the view that the proposed scheme could provide valuable incentives to TSOs to opt for more efficient, innovative solutions, while highlighting that the implementation of such a scheme might pose some significant challenges, including in terms of:

- The definition of system needs and of the identification of the traditional standard solution;
- The interlinkages between the different system needs;
- Uncertainty regarding future costs and the need to take such uncertainty into account when designing the proposed scheme;
- The relationship of the proposed scheme with output-based regulation;
- The calibration of the sharing factor and the profile with which the incentive is paid.

Comments were also made by many respondents in the TSO community regarding the role of TSOs in the identification of system needs, with a number of respondents highlighting that only the TSOs possess the information for such an identification and that, therefore, they should be in the driving seat for this process. In this respect, there is no doubt that TSOs currently have the best information regarding the state of the system and therefore are best placed to identify the system needs. However, since such an identification, which will then call for solutions to be deployed to address the identified needs, will require the costs of such solutions to be covered by the allowed revenues recognised to the TSOs and recovered by tariff, NRAs should approve, or at least endorse, the needs identified by the TSOs.

A related issue is whether the TSOs should be incentivised to prioritise the solutions to the most beneficial needs, realising that these are not necessarily the solution which are the easiest to implement. This is a complex – possibly philosophical – issue and a number of regulators have implemented incentive schemes which aim at rewarding TSOs for implementing solutions addressing the needs most beneficial to the system. A different way of approaching the issue is to consider that TSOs could be directed to prioritise the most beneficial needs, leaving them to identify the best solution to address them.

In the next section we do not further elaborate on this issue, but rather assume that the system needs to be addressed by the TSOs are identified by the regulators, possibly assisted by the TSOs, while the proposed scheme is used to promote the adoption by the TSOs of more efficient and innovative solutions to such needs. In this context, we consider some of the challenges which regulators might face in the implementation of the proposed scheme and on which we seek the input from regulators, TSOs and other stakeholders through the present consultation.

5. *Purpose of this consultation: implementation issues*

This consultation follows up from the results of the previous one and is run on several aspects related to the implementation of the proposed incentive scheme, using two sample cases to illustrate all the elements that a regulator needs to consider for taking an informed decision. We envisage that the sample cases will be mainly for illustrative purposes and therefore will not necessarily refer to actual investments.

The following sample cases, each of them referring to a specific system need, are considered:

- Increasing the transmission capacity between different bidding zones, in order to expand cross-border exchanges (market integration);
- Increasing the connection capacity for onshore renewable-based generation, in order to support the penetration of such generation in the energy system (decarbonisation).

Table 1 illustrates the information and other elements that a national regulatory authority has to acquire, take into account or define in implementing the proposed benefit-based incentive scheme to promote more efficient, innovative solutions to the identified system needs. When relevant, the table contains short descriptions of how the proposed scheme has been applied to the sample cases. These descriptions are meant to increase the transparency of the implementation of the proposed scheme to the sample cases and refer to specific choices with regard to some parameters. These choices are to some extent judgmental and open to discussion. We elaborate on some of them in the following subsections. Table 2 presents how the proposed scheme would be implemented with reference to the two sample cases listed above.

Table 1: Information or elements to acquire and take into account or define by the NRA to implement the proposed benefit-based incentive scheme.

	Information or element	**Description**
1	System need(s) to address	Identification by the NRA(s), possibly supported by the TSO(s), of the system need(s) to be addressed by the TSO(s)
2	Traditional standard solution to address the identified system need(s)	Identification by the NRA(s), possibly supported by the TSO(s), of the traditional standard solution to address the identified system need(s)
3	Techno-economic characteristics of the traditional standard solution	Description of the main technical and economic characteristics of the traditional standard solution to address the identified system need(s): • Investment costs associated with the deployed assets; • Useful life of the deployed assets; • Operation and maintenance costs associated with the traditional standard solution.

4	Notional/regulatory life of the infrastructure involved in the traditional standard solution	Time span over which capital investment is fully depreciated from a regulatory perspective
5	Extent to which the traditional standard solution delivers the identified system need(s)	Share of the identified system need(s) that the traditional standard solution is able to deliver
6	Revenue requirements to cover the capital[7] and operating costs of the traditional standard solution in each year of the notional/regulatory life	Total of a) capital depreciation; b) regulated return on the regulatory asset base; and c) operating costs of the traditional standard solution in each year of the notional/regulatory life. Straight-line depreciation and a WACC of 5.26% (to calculate the return on capital expenditure) are assumed.
7	Net present value of the revenue requirements presented in item 6, using the appropriate discount rate[8]	A (real) social discount rate of 2% is applied to the revenue requirements identified in item 6
8	More efficient, innovative solution to the identified system need(s)	Identification by the TSO(s) of the more efficient, innovative solution to address the identified system need(s)
9	Techno-economic characteristics of the identified more efficient, innovative solution	Description of the main technical and economic characteristics of the traditional standard solution to address the identified system need(s): • Investment costs associated with the deployed assets; • Useful life of the deployed assets; • Operation and maintenance costs associated with the traditional standard solution.
10	Extent to which the more efficient, innovative solution delivers the identified system need(s)	Share of the identified system need(s) that the more efficient, innovative solution is able to deliver
11	Revenue requirements to cover the capital[9] and operating costs of the more efficient, innovative solution in each year of the notional/regulatory life of the traditional standard solution	Total of a) capital depreciation; b) regulated return on the regulatory asset base; and c) operating costs of the more efficient, innovative solution in each year of the notional/regulatory life. Straight-line depreciation and a WACC of 5.26% (to calculate the return on capital expenditure) are assumed.

[7] The return on the capital expenditure is calculated using the WACC.

[8] As indicated later in the text, a discount rate would need to be chosen among possible alternatives.

[9] See footnote 7.

12	Net present value of the revenue requirements presented in item 11, using the appropriate discount rate[10]	A (real) social discount rate of 2% is applied to the revenue requirements identified in item 11.
13	Comparison on the net present values of the revenue requirements of the traditional standard solution (item 7) and of the revenue requirements of the more efficient, innovative solution (item 12), adjusted to the extent that the two solutions deliver the identified system need(s)	The unadjusted comparison is equal to the difference between the value of item 7 and the value of item 12. The adjusted comparison is obtained by raising the net present values of the revenue requirements of both the traditional standard solution and the more efficient, innovative solution by the inverse of the share of the identified system need(s) that the traditional standard solution and the more efficient, innovative solution are able, respectively, to deliver (items 5 and 10 above). For example, if the traditional standard solution can deliver 95% of the identified system needs while the more efficient innovative solution can deliver only 90% of the identified system needs, the adjusted value is calculated by multiplying the net present value of the allowed revenues of the traditional standard solution (item 7) by 1/0.95 and the net present value of the more efficient innovative solution (item 12) by 1/0.9.[11]
14	Definition of the sharing factor	
15	Determination of the net present value of the incentive, by applying the sharing factor (item 14) to the cost difference (item 13)	
16	Determination of the profile of the incentive	Value of the yearly incentive paid during the incentivisation period. An incentivisation period of 2 years and a constant annual incentive over this period is assumed.

10 See footnote 8.

11 An alternative adjustment approach would multiply the net present value of the allowed revenues of the traditional standard solution by the share of the identified system need(s) that the more efficient, innovative solution is able to deliver, divided by the share of the identified system need(s) that the traditional standard solution is able to deliver (in our example 0.9/0.95). This value would then be reduced by the allowed revenues of the more efficient, innovative solution. It is important to note that this alternative approach would provide a different result than the one proposed in the table.

		A WACC of 5.26% (to calculate the actual value of the incentive from the net present value previously obtained – item 15) is applied.

Table 2: Application of the proposed regulatory scheme to two sample cases.

	Information or element	**Increasing the transmission capacity between different bidding zones**	**Increasing the onshore connection capacity for renewable-based generation**
1	System need(s) to address	Increase in the cross-border capacity by 600 MW (the two neighbouring countries are connected by three lines, one of them is more heavily congested then the other two)	Increase in the connection capacity for onshore renewable-based generation by 100 MW (the deployment of an onshore wind farm causes congestion in a nearby segment of the transmission grid, whose capacity must be expanded)
2	Traditional standard solution to address the identified system need(s)	Deployment of a new, 300 km-long, single circuit, 400 kV overhead line parallel to the most congested interconnection line Upgrade of the two substations at the end of the new line and deployment of a new 400/220 transformer	Deployment of a new, 50 km long, single circuit, 220 kV overhead line parallel to the existing one Upgrade of the two substations at the end of the new line
3	Techno-economic characteristics of the traditional standard solution	Investment costs: 182,374,000 euro (145,500,000 euro for the overhead line; 32,048,000 euro for the upgrade of the 2 substations; 4,826,000 euro for the new 400/220 transformer) Useful life of the assets deployed: 40+ years Operation and maintenance costs: 1,823,740 euro/year (1% of CAPEX)	Investment costs: 30,718,000 euro (21,450,000 euro for the overhead line; 9,268,000 euro for the upgrade of the 2 substations) Useful life of the assets deployed: 40+ years Operation and maintenance costs: 307,180 euro/year (1% of CAPEX)
4	Notional/regulatory life of the infrastructure	40 years	40 years

	involved in the traditional standard solution		
5	Extent to which the traditional standard solution delivers the identified system need(s)	100% of the time	100% of the time
6	Revenue requirements to cover the capital and operating costs of the traditional standard solution in each year of the notional/regulatory life	447,181,048 euro	75,320,536 euro
7	Net present value of the revenue requirements presented in item 6, using the appropriate discount rate	322,953,858 euro	54,396,442 euro
8	Identification by the TSO of the more efficient, innovative solution to the identified system need(s)	Deployment of a dynamic line rating system over the three existing interconnection lines (overall length: 700 km) Deployment of a phase shifting transformer over the more congested line	Deployment of a dynamic line rating system over the existing line (length of the line: 50 km)
9	Techno-economic characteristics of the identified more efficient, innovative solution	Investment costs: 37,000,000 euro in year 1; 7,000,000 euro in year 11, 21 and 31 Useful life of the assets deployed: 10 years for the DLR system, 40 years for the PST Operation and maintenance costs: 1,000,000 euro/year (10% of CAPEX for DLR, 1% of CAPEX for PST)	Investment costs: 1,000,000 euro in year 1, 11, 21, 31 Useful life of the assets deployed: 10 years Operation and maintenance costs: 100,000 euro/year (10% of CAPEX)
10	Extent to which the solution delivers the	73% of the time	90% of the time

	identified system need(s)		
11	Revenue requirements to cover the capital and operating costs of the more efficient, innovative solution in each year of the notional/regulatory life of the traditional standard solution	133,242,000 euro	8,526,000 euro
12	Net present value of the revenue requirements presented in item 11, using the appropriate discount rate[12]	95,054,363 euro	5,989,911 euro
13	Comparison on the net present values of the revenue requirements of the traditional standard solution (item 7) and of the revenue requirements of the more efficient, innovative solution (item 12), adjusted to the extent that the two solutions deliver the identified system need(s)	Unadjusted comparison: 227,899,496 euro Adjusted comparison: 192,742,402 euro	Unadjusted comparison: 48,406,531 euro Adjusted comparison: 47,740,985 euro
14	Definition of the sharing factor	20%	20%
15	Determination of the net present value of the incentive, by applying the sharing factor (item 14) to the cost comparison (item 13)	Unadjusted net present value of the incentive: 45,579,899 euro Adjusted net present value of the incentive: 38,548,480 euro	Unadjusted net present value of the incentive: 9,681,306 euro Adjusted net present value of the incentive: 9,548,197 euro
16	Determination of the profile of the incentive	Unadjusted yearly incentive: 23,373,966 euro/year to be paid for 2 years	Unadjusted yearly incentive: 4,964,699 euro/year to be paid for 2 years

12 See footnote 8.

		Adjusted yearly incentive: 19,768,163 euro/year to be paid for 2 years	Adjusted yearly incentive: 4,896,315 euro/year to be paid for 2 years

Beyond the information to be collected from the TSO(s) or to be proposed by TSO(s), there are three aspects on which the regulators would need to decide in order properly to implement the proposed incentive scheme:

- The discount rate to be used to obtain the net present values of the allowed revenues required to cover the costs of the alternative solutions to address system need(s) – items 7 and 12 in the above Table;
- The sharing factor, determining the share of the difference in the net present value of the allowed revenues between the two solutions, representing the cost saving delivered by the more efficient, innovative solution, which is left with the TSO(s) as incentive – item 14 in the above Table;
- The time period over which the incentive is paid to the TSO(s) and the profile of such payments – item 16 in the above Table.

There are also more general implementation issues which have raised concerns among regulators, TSOs and other stakeholders:

- The need to identify the system need(s);
- The need to identify a traditional standard solution to the identified system need(s);
- The need to assess and validate the more efficient, innovative solution proposed by the TSO(s) and its costs;
- The way in which uncertainty about the future costs of the more efficient, innovative solution are taken into account in the proposed scheme.

In what follows, each of these aspects is discussed in turn.

5.1 The discount rate

The more efficient, innovative solution to system need(s), which benefit-based regulation is meant to promote, is likely to be characterised by a profile of costs over time which is different from the profile of costs of the traditional standard solution[13]. Therefore, one of the critical aspects in the implementation of the proposed regulatory scheme is the choice of the discount rate to be used in order correctly to compare, in net present value terms, the revenue requirement implications of the two solutions.

In reality, there are both an annuitisation and a discounting process to be performed in implementing this regulatory approach.

In fact, on the one side, the proposed scheme rests on the determination of the revenue requirements associated with both the traditional standard solution and the more efficient, innovative solution over

[13] It is to be expected that the more efficienct, innovative solution will be less CAPEX-intensive than the traditional standard solution and therefore the costs of the former will be more widely spread over time than the costs of the latter.

the life of the longest-lived asset which is part of the traditional standard solution. Regulation typically recovers investment costs by including, in the revenue requirements, an annual element comprising depreciation (the return of capital) and the remuneration of the outstanding capital (return on capital). Such an annuitisation process should be performed using the weighted average cost of capital (WACC) which the regulator typically applies to the business under consideration.

On the other side, once the annual revenue requirements are determined (covering both the initial capital costs and the annual operating and maintenance costs) for both the traditional standard solution and the more efficient, innovative solution, they need to be discounted to obtain their net present values.

Such a discounting could be performed by using one of many possible discount rates, including:

- The WACC;
- The social rate of time preference (SRTP);
- The (real) discount rate of 4% recommended by ACER to be used for the cost-benefit analysis of energy infrastructure[14].

The SRTP is a measure of the society's willingness to postpone consumption now in order to consume more later. It is a relevant concept when it comes to comparing two different profiles of allowed revenues which would need to be collected from grid users. By paying sooner or later for the more efficient, innovative solution when compared with what they would otherwise have to pay, grid users would have to adjust their consumption (or savings) accordingly. In this respect, the SRTP seems to be the appropriate discount rate to be used to compute the net present values of the two profiles of the annual revenue requirements for the more efficient, innovative solution and for the traditional standard solution, respectively. The SRTP can be typically approximated by the after-tax rate of return on fixed-income government bonds, which raises at least the issue of the maturity of the government bonds taken as reference. However, a notion of government bond yield is implicit in the WACC used by regulators, as the it includes a return on equity capital which, if determined by using the Capital Asset Pricing Model (CAPM), requires the definition of a risk-free (government bond yield) rate to determine the market risk premium. Therefore, regulators could use the same notion of government bond yield as a proxy for the SRTP[15]. On the other side, ACER does not provide much justification of its choice of value for the (real) discount rate to be applied to cost-benefit analysis, but it seems in line with the discount factor used for energy projects in many other jurisdictions[16].

The SRTP is generally expressed in real terms, although the return on government bonds is paid in nominal terms. The discount rate proposed by ACER is a real rate. In fact, the analysis can be

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[14] ACER (2023), *Position Paper towards greater consistency of cost benefit analysis methodologies*, 22 March 2023, available at: ACER_Consistency of CBA methodologies.pdf (europa.eu).

[15] In its Position Paper towards greater consistency of cost benefit analysis methodologies of March 2023 ACER "*recommends using the same social discount rate of 4%, already used by both ENTSO-E and ENTSOG CBA Methodologies"* (ACER_Consistency of CBA methodologies.pdf (europa.eu)).

[16] See for example chapter 16 on "Current use of cost-benefit analysis" in OECD (2018), *Cost-Benefit Analysis and the Environment: Further Development and Policy Use*, OECD Publishing, Paris, available at: https://www.oecd-ilibrary.org/sites/9789264085169-19-en/index.html?itemId=/content/component/9789264085169-19-en.

conducted either in nominal terms or in real terms, as long as it is done consistently in terms of the assessment of costs and the use of the discount rate.

The WACC, on the other hand, is a well-known regulatory concept, even though different regulators might use different financial market references for calculating it. Here again the analysis can be performed either in nominal terms or in real terms, as long as it is done consistently.

The SRTP is generally lower than the WACC, as it does not involve any reward for risk, beyond what is already incorporated in the rate of return on government bonds. In this context it is not obvious that, in comparing different profiles of allowed revenues which grid users would have to cover through grid charges, risk is a relevant consideration. The fact that risk should not enter this comparison seems to confirm the choice of the SRTP as the best discounting factor. On the other hand, the advantage of the use of the WACC is that, in this case, the rate used to compute the component of the annual allowed revenues related to capital expenditure would be the same as the rate used for discounting such annual allowed revenues, making the computation slightly simpler.

5.2 The sharing factor

As highlighted in Section 3, the regulator would have to define the level of the sharing factor, which could range from 0 to 100%. It is clear that the higher the sharing factor, the greater the incentive for the TSO(s) to implement more efficient, innovative solutions, as a larger share of the cost savings with respect to the traditional standard solution would be retained by the TSO(s) as an incentive. However, the higher the sharing factor, the smaller would be the benefits for grid users in terms of lower grid charges. Eventually, the more efficient, innovative solution will become the standard and grid users will fully benefit from the lower cost of such a solution.

Therefore, in deciding on the level of the sharing factor, the regulator should consider the following trade-off:

- On the one hand, providing strong incentives to the TSO(s) so that the most efficient innovative solution is adopted, significantly reducing the cost of addressing the system needs;
- On the other hand, setting a sharing factor which is not too high, so that grid users receive a sufficiently large share of the savings arising from adopting the more efficient, innovative solution, even before it becomes the standard one.

The optimal level of the sharing factor, considering this trade-off, depends on the extent to which a higher sharing factor would incentivise the TSO(s) to adopt even more efficient and innovative solutions, how much effort would be required for the implementation of such solutions and how much lower the costs of these solutions would be. *Ceteris paribus*, a higher sharing factor would provide greater incentives to the TSO(s) to adopt more efficient and innovative solutions. The same would be the case if such solutions did not require significant effort to be implemented or were characterised by much lower costs than the traditional standard solutions.

It is also possible to envisage a sliding sharing factor, i.e. a sharing factor which changes as the savings provided by the more efficient, innovative solution increase. In this respect, the sharing factor could be progressive – i.e. increasing with the savings – or regressive – i.e. decreasing with the savings. A progressive sharing factor might better compensate the TSO(s) for the greater effort required to implement innovative solutions characterised by much lower costs with respect to the standard solution. A regressive sharing factor may reduce the risk of an incentive payment to the TSO(s) which might be considered disproportionate in absolute terms.

Finally, it might be tempting to define the sharing factor in such a way so that the incentive provided to the TSO(s) by the proposed scheme is comparable to the return on capital that they could obtain by investing in the traditional standard solution. However, it needs to be recognised that the incentive paid according to the proposed scheme and the return on capital on the traditional standard solution are of very different nature. The latter reflects the need for the TSO(s) to reward investors for the capital that they invest in the TSO business. It is therefore not ‘free money’ for the TSO(s). The incentive payment envisaged by the proposed scheme is, instead, ‘free money’, in the sense that it does not reflect, nor it is intended to cover any specific cost of the TSO(s). It rewards the greater effort of the TSO(s) in coming up with more efficient, innovative solutions.

5.3 The incentive profile

Once the net present value of the incentive for TSO(s) is determined, the regulator would need to decide over which period and with which profile such an incentive would be paid.

As this is a regulatory amount, the spread of the incentive over time should plausibly be carried out using the WACC such that:

$$\sum_{t=1}^{T} \frac{I_t}{(1+WACC)^t} = NPV\ of\ the\ incentive$$

where:

I_t is the incentive paid out in year t; and

t = 1, …, T is the period of time over which the incentive is paid.

It is also possible to envisage that all the annual incentive payments are equal ($I_1 = I_2 = \ldots = I_T$).

Note that, despite the fact that any incentive profile which respects the above condition should, in theory, be financially equivalent for the TSO(s), one might expect that the latter prefers to receive the incentive sooner rather than later. This could also be a ‘good deal’ for grid users, if this means that:

- An incentive paid sooner has greater ‘value’ for TSO(s), which might lead to greater effort in identifying more efficient, innovative solutions with lower costs; and
- the cost of the incentive for grid users is reduced, as the time preference for them is not as strong as for the TSO(s).

5.4 Identifying the system need(s)

Beyond the feedback received during the first consultation regarding the role of TSOs in the identification of system needs, already commented in Section 4 above, concerns have been expressed about the complexity of identifying the system needs and the process for such an identification. This is clearly a complex task, but it is an inevitable first step in any system development planning exercise. In fact, it is difficult to imagine such a planning not being aimed at addressing specific system needs, which requires their identification.

Strictly speaking, there is an element of circularity in the identification of system needs and the planning of the actions to address such needs. In fact, the definition of the need(s) depends, to an extent, on the costs involved in addressing them. An example will better illustrate this point.

Consider a situation in which the interconnection capacity between two market zones is considered to be insufficient. This would be the case if the value of expanding such a capacity is higher than the expected costs of such an expansion. In theory, and leaving aside for the moment any issue related to uncertainty and the typical lumpiness of investments in transmission assets, the expansion should be planned up to the point where the marginal value of additional cross-border capacity equals the cost of developing an extra unit of capacity.

Therefore, the definition of the system need(s) in this case, in terms of the additional cross-border capacity which is optimal to develop, depends on the incremental cost of capacity. To the extent that more efficient, innovative solutions to increase cross-border capacity might be able to deliver the additional capacity at lower cost than the traditional standard solution, the optimal level of cross-border capacity might increase – if the costs of the more efficient, innovative solution were known at the time the need(s) are identified.

This circularity is, to an extent, common to most planning approaches and therefore it is neglected at this stage of the assessment of the implementation challenges specific to the proposed incentive scheme.

5.5 Identifying a traditional standard solution to a specific system need

The identification of the traditional standard solution to address specific system need(s) could be another demanding and difficult task and not all regulators in the EU might be properly equipped to perform it. However, reference to the way in which similar needs were addressed in the past could be used to determine the standard way of addressing each need or set of needs. Likewise, network planning might be used as a reference. TSOs may also assist regulators in such an identification, even though they might have an incentive to propose costlier solutions as a reference.

The allowed costs associated with such a standard way of addressing each of the needs or sets of needs might also be estimated on the basis of past experience. Moreover, standard unit costs for individual infrastructure assets and a 'calculator' for energy infrastructure unit investment costs provided by ACER[17] could also be used for this purpose.

5.6 Assessing and validating the more efficient, innovative solution proposed by the TSO(s) and its costs.

More efficient, innovative solutions to address system needs are, by definition, new and little or no experience might be available regarding their technical characteristics, performance and costs, especially if deployed at scale. It is however to be stressed that the more efficient, innovative solutions which the proposed regulatory scheme aims at incentivising are those which are no longer at the research and development stage, but are instead ready to be deployed, even though they might not yet be frequently adopted. In fact, the incentive would not be paid if the chosen solution does not address the identified need to the extent expected. In this sense, TSOs will be incentivised to propose solutions which have already reached a sufficient deployment stage[18].

Regulators would be faced by proposals from TSO(s) regarding such more efficient, innovative solutions and the related costs which they would have to endorse. This could be indeed a challenging tasks for regulators, which might require some specialised technical capability, which not all regulators might have. However, auditing of the costs of such more efficient, innovative solutions and the benchmarking of such solutions proposed by TSOs in different jurisdictions might assist in the assessment and endorsement of the more efficient, innovative solution proposed by the TSO(s) and of the related costs.

5.7 Dealing with uncertainty

Concerns have been raised regarding the way in which the proposed scheme would take uncertainty regarding future costs into account. Here it is useful to distinguish between cost overruns – or underspending – which are due to external factors and those which could have been under the control of the TSO(s). In the first case, adjustment mechanisms might be envisaged, as it is often the case with other incentive-based regulatory schemes. Instead, in the case of cost overruns imputable to the TSO(s), they would not be mitigated within the proposed scheme, but would be left to be absorbed by the TSO(s) – in the same way as cost underspending would be left to the TSO(s) to benefit from.

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[17] In June 2023, ACER published a Report on Unit Cost Indicators and an "Energy Infrastructure unit investment cost calculator", available at: https://www.acer.europa.eu/electricity/infrastructure/network-development/transmission-infrastructure-reference-costs.

[18] Solutions with still an uncertain performance should be promoted with other schemes, such as the pass-through of costs for research and development activities.

5.8 *Consultation questions*

The following questions refers to the incentive scheme to promote more efficient innovative solutions to system needs described in the FSR Report of June 2023 (https://www.acer.europa.eu/en/Electricity/Infrastructure_and_network%20development/Infrastructure/Documents/Benefit_based_regulation_2023.pdf), outlined in Section 3 and whose implementation is exemplified in Section 5 of this consultation.

a) Do you consider that the identification of the system need(s) to which the proposed scheme could be applied poses a significant challenge to regulators, also taking into account that TSOs might support such an identification?
O Yes O No
b) If Yes: do you consider that such a challenge is greater than those associated with general transmission system planning?
O Yes O No
c) If Yes: in which way? ____________________
d) Do you consider that the identification of the traditional standard solution to the identified system need(s) poses a significant challenge to regulators?
e) O Yes O No
f) If Yes: do you consider that the experience in addressing similar system need(s) in the past can assist in identifying the traditional standard solution to such need(s)?
O Yes O No
g) If No: why? ______________________________
h) Do you consider that the definition of the costs of the traditional standard solution to the identified system need(s) poses a significant challenge to regulators?
O Yes O No
i) If Yes: do you consider that the experience and the unit cost indicators for electricity transmission investments provided by ACER could assist in overcoming this challenge?
O Yes O No
j) If No: why? _____________________
k) Do you consider that regulators would find it difficult to assess and endorse the more efficient, innovative solutions to address the identified system needs proposed by the TSO(s)?
O Yes O No
l) If Yes: do you think that such difficulties are greater than those involved in approving new investments to be included in the Regulatory Asset Base?
O Yes O No
m) If Yes: in which respect? _____________________
n) In your views, which discount rate should be used to compute the net present value of the streams of annual allowed revenues related to the traditional efficient solution and the more efficient, innovative solution to the same system need(s)?
O the WACC
O the SRTP (approximated by the interest rate on government bonds)
O the social discount rate of 4% recommended by ACER for cost-benefit analysis
O Other
o) If Other: Please specify ___________________________

p) Please explain the reasons for your choice of the discount rate ___________________

q) Do you consider that the sharing factor should be fixed or should vary – increasing or decreasing – with the extent of the saving delivered by the more efficient, innovative solution?

O Fixed

O Increasing with the savings (progressive)

O Decreasing with the savings (regressive)

r) What level or range for the sharing factor would you consider the most appropriate in the trade-off between providing effective incentives to TSOs and delivering cost-saving benefits to grid users? __________________________

s) Please explain the reasons for your choice for the level or range of the sharing factor __________________________

t) Which profile of the incentive would you consider the most appropriate in the trade-off between providing effective incentives to the TSO(s) and delivering cost-saving benefits to grid users? __________________________

u) Please explain the reasons for your choice for the profile of the incentive to the TSO(s) __________________________

v) Is there any other aspect not mentioned in the previous questions which you consider particularly challenging for regulators in implementing the proposed scheme? Please, justify your answer. __________________________