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Public consultation on the ACER efficiency comparison for natural gas TSOs

Fields marked with * are mandatory.

Introduction

Objective

The objective of this consultation is to gather views and information from stakeholders on the objectives and design of the ACER efficiency comparison (AEC) for natural gas TSOs. The design to be used to complete this task will be finalised by 4 October 2025. Two additional phases of the project will follow to request and validate the TSO data (phase II) and to complete the modelling work (phase III). The input from the consultation will be used by the Agency's when completing the design phase.

The Agency is consulting on two documents providing the objectives and design of the AEC:

- **D02: AEC Objectives and Criteria**
- **D03: AEC Method, Data and Process.**

Stakeholders are invited to read this material. Complementary to these two files, the Agency provides in this consultation document several questions requesting input on specific topics discussed under D02 and D03. Stakeholders who wish to submit input can provide it via the EU Survey tool displays input fields for each of these questions.

Target group

This consultation is addressed to stakeholders, including end consumers (household, industrial, power generation), shippers, environmental and consumer associations, academics and TSOs.

Contact and deadline

Replies to this consultation should be sent using the EU Survey tool:

https://ec.europa.eu/eusurvey/runner/ACER_efficiency_comparison

In addition, stakeholders can provide input related to the consultation documents D02 and D03 that is not covered in the questions. For this purpose, they can submit their input as pdf or word file in a dedicated

section of the survey.

Stakeholders can contact ACER in relation to the public consultation using the email: AEC@acer.europa.eu. The maximum size for submitting files using the EU Survey tool is 1 MB. Larger files can be submitted to this functional mailbox.

The deadline for providing input to the public consultation is **17 July 2025, 23:59 hrs (CET).**

For more information please consult ACER website: Link

Download more information:
AEC_Public_consultation_document.docx

Introductory questions

* **Name and Surname of the contact person**

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* **Name of organisation / company**

IFIEC Europe

Type of organisation

- ○ Government,
- ○ NRAs,
- ○ TSO,
- ○ DSO,
- ○ financial institution (banks, funds etc),
- ◉ industry, environmental and consumer associations,
- ○ academia,
- ○ shipper, supplier,
- ○ other (please specify)
- ○ individual person

* **Country**

- ◉ EU-27
- ○ Other

* **Please specify the country**

- ○ AT - Austria
- ○ BE - Belgium

- ○ BG - Bulgaria
- ○ HR - Croatia
- ○ CY - Cyprus
- ○ CZ - Czechia
- ○ DK - Denmark
- ○ EE - Estonia
- ◉ EU - European Union, for associations covering all EU
- ○ FI - Finland
- ○ FR - France
- ○ DE - Germany
- ○ EL - Greece
- ○ HU - Hungary
- ○ IE - Ireland
- ○ IT - Italy
- ○ LV - Latvia
- ○ LT - Lithuania
- ○ LU - Luxembourg
- ○ MT - Malta
- ○ NL - Netherlands
- ○ PL - Poland
- ○ PT - Portugal
- ○ RO - Romania
- ○ SK - Slovak Republic
- ○ SI - Slovenia
- ○ ES - Spain
- ○ SE - Sweden

Data protection

ACER will process personal data of the respondents in accordance with Regulation (EU) 2018/1725, taking into account that this processing is necessary for performing ACER's consultation tasks. More information on data protection is available on ACER's website and in ACER's data protection notice.

ACER will not publish personal data.

Consent to the processing of personal data

☑ Your personal data may be processed by the Agency.
Please refer to privacy statement to learn about such processing and your rights.

Confidentiality

Following this consultation, ACER will make public:

- the number of responses received;
- company names, unless they should be considered as confidential;

- all non-confidential responses; and
- ACER's evaluation of responses. In the evaluation, ACER may link responses to specific respondents or groups of respondents.

You may request that the name of your company or any information provided in your response is treated as confidential. To this aim, you need to explicitly indicate whether your response contains confidential information. **You will be asked this question at the end of the survey.**

☑ I have read the information on data protection and confidentiality provided in this section.

Consultation Topics and Questions

Topic 1: Transparency and publication requirements

The Agency will promote transparency on the AEC to ensure access to the TSO data used in the modelling, transparency on NRA decisions and availability of the data to stakeholders.

Without a transparent process for data collection, methodology, calculations and reporting, the process value for NRA would be low. To ensure transparency, AEC should maintain the following principles:

1. Clear established data definitions and data specifications prior to the data collection.
2. Independent audits of financial and asset data for each TSO
3. Open access to all T1 data (non-commercially sensitive)
4. Full references and access to any non-TSO reported parameters (T0 data)
5. The methodology should be documented in a reference document that is independently validated by experts prior to calculations
6. Calculations and reporting of results should be independently audited by third party.
7. The individual reporting should specify each step in the process as to enable each NRA to reproduce the input data.

By combining a sound method and model selection, adequate choice of efficiency metrics, regulatory alignment, transparency, due process, and adaptations to new tasks, NRAs can trust the AEC as a legally robust, fair, and enforceable source of information about the economic, quality and capacity performance of their TSO. This strengthens the credibility and acceptance of efficiency targets while minimizing legal risks.

At the same time, the Agency will ensure that the information published is not commercially sensitive for TSOs.

Transparency is discussed in reports D02: section 7.2 and D03: section 5.1. Annex A of D03 contains a list of variables and parameters that would likely be made public as part of the T1 dataset.

1. How do you value transparency across the different stages and results of the AEC? Please elaborate.

Transparency is essential throughout all stages of the ACER Efficiency Comparison (AEC) to ensure the credibility, robustness, and practical relevance of the exercise.

In the current phase of methodology development, ACER should clearly communicate how stakeholder input is considered. This includes gathering input but also providing reasoned explanations for why specific suggestions have been incorporated or disregarded in the final methodology.

During the data collection and validation stage, we welcome the involvement of independent third-party auditors. The obligation resulting from Article 19 of EU Regulation 2024/1789 for gas TSOs to submit accurate and verifiable data significantly enhances the reliability and comparability of the benchmarking results.

While IFIEC Europe does not have direct experience with efficiency modelling techniques, it is imperative that these processes are subject to rigorous verification and external scrutiny. This is crucial to ensure that the modelling results are credible and broadly accepted by stakeholders.

At the stage of publication, it is essential that ACER actively monitors how National Regulatory Authorities (NRAs) in different Member States apply the AEC results. Given the timeline, the first publication of AEC results on 5 August 2027 will likely come after NRAs have already determined the allowed revenues for 2027 and may be finalising or have finalised decisions for 2028. Therefore, we strongly encourage ACER to follow up with NRAs to ensure that the AEC outcomes are effectively integrated into the revenue-setting processes for 2028 at the latest. Also, IFIEC would like ACER to make clear what options NRA's have to incorporate the AEC benchmark results in their tariff-setting methodology.

2. What are the elements of a TSO benchmark where transparency is most important? Please elaborate.

Transparency on the availability and accessibility of non-commercially sensitive data submitted by TSOs across Member States is important. Public access to this data enables industrial consumers, investors, and representative organisations to make informed comparisons regarding the efficiency and cost levels of TSOs in different regions. At the same time transparency empowers stakeholders to hold their TSOs accountable by verifying whether they are managing their network efficiently, non-discriminatory and objectively and that only efficient costs are passed on to users while receiving a reasonable, but not excessive, return on its investments. Consequently, ACER must ensure open access to the predefined datasets that have undergone independent validation submitted by TSOs. This level of transparency not only strengthens the credibility of the AEC exercise but also enforces trust in the regulatory process and contributes to a more competitive and efficient energy system. Transparency and verifiability are also crucial to ensure benchmarking results are sufficiently robust to translate into regulatory decisions and withstand a judicial review.

3. What other approaches to transparency should ACER consider when designing and publishing the AEC? Please elaborate.

ACER should consider:

- Interactive Data Visualization Tools: Providing online, interactive tools that allow stakeholders to filter, compare, and analyse the published T1 data (non-commercially sensitive) across different TSOs and over time. This would make the data more accessible and understandable for a wider audience beyond experts.
- Regular Stakeholder Workshops/Webinars: Beyond the consultation phase, organizing periodic workshops or webinars to explain the methodology, discuss preliminary findings, and gather feedback on the interpretation of results. This fosters continuous engagement and understanding.
- Case Studies on NRA Application: Publishing case studies illustrating how specific NRAs have integrated AEC results into their allowed revenue methodologies, highlighting both successes and challenges. This would provide practical guidance and showcase the real-world impact of the benchmark.
- Clear and Concise Summaries: Accompanying the detailed technical reports with executive summaries and infographics that clearly communicate key findings and their implications for different stakeholder groups, avoiding overly technical jargon where possible.
- Feedback Mechanism for Data Quality Issues: Establishing a clear and easily accessible channel for stakeholders to report potential data inconsistencies or errors even after publication, allowing for continuous improvement of data quality.

Topic 2: Challenges for natural gas transmission networks in the context of decarbonisation

The synthesis document D02, establishing the objectives of the AEC, identifies the key challenges that natural gas transmission networks will face in the future (see sections 2.1 –2.3). These include (1) the likely decrease in natural gas transported volumes; (2) the CAPEX additions resulting from new forms of gas, biogas and LNG connections; (3) the removal of assets for repurposing and, potentially, decommissioning; and (4) the extension or replacement of assets reaching the end of their technical operating life.

4. What are the key features that the ACER should consider when designing a methodology to measure the efficiency of natural gas TSO infrastructure? Please elaborate.

ACER's recognition of implications for the natural gas infrastructure and consequential reduction in transported gas volumes – driven by fuel switching to hydrogen, widespread electrification, and declining demand from both households and industry – is coherent and complete. The methodology should explicitly account for these shifts when assessing cost efficiency.

The role of biomethane within the future gas system remains uncertain. While the EU has set ambitious targets for biomethane production, progress varies widely across Member States. For example, France and Denmark are exceeding expectations with substantial development of biomethane capacity, while the Netherlands, Poland, Romania, and Bulgaria lag behind despite their potential. The AEC could offer valuable insight into how the existing gas network may continue to support biomethane delivery, particularly to industrial sectors that require carbon feedstock and seek to replace fossil-based carbon with biogenic sources.

The decline and expected further decline in transported natural gas volumes, and the recent shift from east–west to west–east gas flows have different implications across Member States, which the methodology should take into account.

Another important design consideration concerns capital expenditure (CAPEX) for new gas forms, including biogas and LNG. ACER should assess whether future investments in gas infrastructure can be deployed more strategically or in ways that avoid unnecessary asset additions. The focus should be on smart, targeted investments that reflect evolving system needs, particularly in light of declining overall gas throughput.

In terms of asset decommissioning, much of the existing infrastructure is dimensioned for peak demand, which may not decline proportionally to average demand due to small-scale consumers remaining connected. While the small consumer base is shifting away from gas, large-scale industrial consumers continue to rely on baseload supply and are expected to remain dependent on gas in the medium term (5–15 years). As a result, large-scale asset decommissioning is unlikely in the short term and will likely occur selectively.

Repurposing existing natural gas infrastructure for the hydrogen network is more efficient, if possible, and is expected to take place primarily in Member States with high existing hydrogen consumption. According to available data, Germany, the Netherlands, Belgium, France, Poland currently account for the majority of industrial hydrogen use in the EU making them also large-scale natural gas users. This regional concentration of hydrogen demand should guide ACER's thinking on where gas infrastructure might be repurposed in the near to medium term.

5. How should the decrease in network utilisation be taken into account when measuring the efficiency of TSOs. Please elaborate.

The decrease in network utilization due to decarbonization presents a significant challenge for TSO efficiency measurement. A simple asset-based output metric, as proposed for the static model, may not fully capture the evolving reality of gas networks. While avoiding penalizing TSOs for factors beyond their control (e.g., declining demand), solely focusing on assets might not incentivize optimal adaptation.
Therefore, we support the inclusion of dynamic efficiency analysis using usage-based outputs as proposed by ACER, where possible. This dynamic analysis, if feasible, would be valuable because it can:

- Reflect TSO Adaptability: Measure how effectively TSOs adapt their network capacity and operations to decreasing demand and changing flow patterns, rather than just their current asset base. This aligns with the need for flexibility in the energy transition23.
- Incentivize Smart Decommissioning/Repurposing: By including usage metrics, TSOs can be incentivized to strategically repurpose or decommission assets in response to declining demand, promoting efficiency in the context of a shrinking gas market. This is a key challenge highlighted in the consultation.
- Capture Long-Term Efficiency: While a static model captures one-year efficiency, the dynamic model with usage-based outputs can provide insights into long-term efficiency trends in a changing energy landscape. This is critical given the long lifespan of gas infrastructure.
- Support Holistic Planning: By linking efficiency to how well TSOs manage their networks given actual utilization, NRAs can gain valuable insights for future network planning that accounts for declining demand.

However, careful consideration should be given to:

- Defining appropriate usage metrics: These should accurately reflect the services provided by the TSO in a decarbonizing context, potentially including new gases like biomethane and hydrogen blends where applicable.
- Weighting of metrics: The weighting between asset-based and usage-based outputs in the dynamic model should be transparent and reflect the evolving priorities of the energy transition.
- Controllability of TSOs: While usage-based outputs are important, it's essential to factor in the extent to which TSOs can actually influence demand patterns and repurposing timelines. The benchmarking needs to be fair and not penalize TSOs for external factors beyond their control.

Lessons from electricity TSOs, where congestion management and smart grid development (which can optimize network usage without extensive new infrastructure) are increasingly incentivized, could also be valuable here.

Topic 3: Legacy investments

The efficiency of natural gas TSOs is largely impacted by legacy investments carried out prior to the liberalisation of the EU gas natural gas sector. Past investments, prior to deregulation, were not always undertaken with an efficiency focus. For instance, pre-deregulation decisions may have been prompted by other owners and for national or non-economic reasons. Furthermore, investments in transition states prior to EU-membership are in some cases subject to hyperinflation or non-market prices for labour or equipment.

These observations, which are valid for gas TSOs and important for incentive regulation of future investments and operations, call for a periodised analysis of the past capex. The relevance of determining the exact investment efficiency for assets that date more than 30 years ago (i.e. prior to the First Directive) and to assure the comparability of their market conditions are likely less important than the comparability of recent investments and new assets. The Agency considers informative to analyse the impact of **legacy investments** in the AEC by providing results with and without legacy investments. For the latter, the

Agency proposes to control for these costs using standardized values to, as discussed in section 6.6 of document D02. The Agency proposes the entering into force of Directive 98/30/EC (First Gas Directive) as the cut-off date to identify legacy investments.
The AEC will include all the legacy investments and, as a sensitivity analysis, the AEC will calculate the same model but with legacy investments neutralized to standardized values to understand the impact on efficiency. When legacy investments are included in the modelling, their value should be reassessed for the purpose of comparison (see 6.5). Opex is not affected by this sensitivity analysis as all assets in use are part of the physical output.

The AEC results calculated with and without legacy investments should be considered by the NRAs when taking a decision on the allowed or target revenue of the TSOs.

6. Is the proposal to address the comparability problem of legacy investments acceptable and effective for the purposes of the AEC? Please elaborate.

> The proposal to address the comparability issue by resetting the investment costs of all TSOs, prior to the entry into force of the First Gas Directive in 1998, to standardised values that reflect unit costs of an average operator is an acceptable and effective approach. However, the historical disparity in investment costs between Western and Eastern European Member States should be considered. A single standardised value might not capture differences in currency value, purchasing power, and local construction costs at the time. It may be appropriate to apply a regionally adjusted inflation or purchasing power correction factor to the normalised values. This would better reflect historical economic conditions. This approach aligns with the principle of "comparing like with like" in benchmarking by attempting to level the playing field for assets acquired under very different historical circumstances.

7. Do you consider the entry into force of the First Gas Directive in 1998 to be an adequate cut-off point for identifying legacy investments? Please elaborate.

> Yes, the entry into force of the First Gas Directive in 1998 is an appropriate and logical cut-off point for identifying legacy investments. This directive marked the beginning of EU-wide harmonisation and regulatory oversight of natural gas infrastructure. It introduced key principles such as third-party access, unbundling, and transparency, which fundamentally changed how gas transmission infrastructure was planned, financed, and operated across Member States. Therefore, investments made prior to 1998 were undertaken in a very different regulatory and market environment and can reasonably be classified as legacy assets for the purposes of the AEC.

8. How should different efficiency levels pre- and post- liberalisation be considered in the TSO allowed revenue methodologies? Please elaborate.

The treatment of pre-liberalisation (legacy) assets in the efficiency comparison should be subject to clear guidance to ensure fair and consistent outcomes. Allowing each TSO to independently decide whether to include or exclude their legacy asset base in the benchmarking exercise introduces the risk of strategic behaviour. For example, a TSO might choose to compare its full asset base (including legacy assets) against another TSO's base that excludes legacy assets or vice versa depending on which approach results in a more favourable efficiency score and, ultimately, a higher allowed revenue.

Such flexibility undermines comparability and may lead to outcomes that are not in the interest of grid users. To mitigate this risk, NRAs should play a role in overseeing these methodological choices, but they should be bound by clear and consistent guidelines issued by ACER. These guidelines should ensure that comparisons are made equal – for example, grouping TSOs with significant legacy assets together for comparison purposes.

While it is important to account for national and system-specific contexts, especially as the energy transition progresses, the methodology must prioritise what is best for the energy system overall. Given that transported natural gas volumes are declining in most Member States, TSOs may face rising costs related to asset decommissioning or replacement, rather than new infrastructure development. This reality should be reflected in how efficiency is assessed and in how legacy assets are treated in the methodologies to calculate allowed revenues. The "roll-over and update" principle applied to some TSO investments in the Netherlands, allowing for ex-post correction of realized capital costs, could offer a relevant lesson here for managing and incorporating past investments into current remuneration frameworks.

Topic 4: Comparability of TSO costs

The AEC proposes a series of measures to enable the comparability of TSOs costs and performance, which are described in sections 6.1-6.7, 7.3 of document D02.

The AEC is proposed to ensure comparability through means of defining a strict functional and asset scope, controlling for joint ownership or operation of assets, structural and organizational differences, standardizing asset depreciation, asset ages for used installations, standardizing capital costs, labour cost corrections, controlling for overhead cost allocation, inflation adjustments, opening balances, price and currency differences, environmental heterogeneity with respect to land use and cover, slope, soil properties, wetness based on spatial asset locations, as well as excluding costs and investments that relate to out-of-scope or exceptional events.

9. Are the comparability measures proposed in the documentation effective and necessary? Is there redundancy or inadequate measure among the instruments?

The proposed comparability measures appear to be broadly effective and necessary for robust benchmarking. Defining a strict functional and asset scope, controlling for joint ownership, structural /organizational differences, standardizing depreciation, asset ages, capital costs, and labour cost corrections are all crucial for "comparing like with like" and addressing the heterogeneity among TSOs. The inclusion of environmental heterogeneity based on spatial asset locations is particularly welcome, as geographical factors significantly impact network costs.
However, careful attention is needed to ensure these measures are adequately implemented and do not introduce unintended biases. There doesn't appear to be obvious redundancy, but the effectiveness of each measure will heavily depend on the granularity and quality of the data collected and the sophistication of the modelling. For example, while standardizing capital costs is necessary, the method of standardization should be transparent and reflect actual regional economic conditions to avoid distorting real costs.

10. Are there some comparability measures in the documentation that are too inappropriate or ineffective in the adjustments? Please elaborate.

The proposed comparability measures in the documentation are generally effective and necessary. These measures aim to ensure a "proper comparison between the different TSOs" by controlling for various forms of heterogeneity.

- Defining a strict functional and asset scope: This is necessary because TSOs have different assets and perform partially different activities. Excluding out-of-scope activities (like system operations, market facilitation, offshore activities, storage facilities, and LNG facilities) ensures a homogeneous perimeter for the efficiency analysis.
- Controlling for joint ownership or operation of assets, structural and organizational differences: TSOs are organized differently, especially concerning overhead and management functions. A uniform allocation key for overhead (indirect) costs to direct benchmarked costs is proposed to ensure comparability and prevent distortions in performance assessment.
- Standardizing asset depreciation and asset ages for used installations: This is crucial to avoid artificial heterogeneity caused by investment cycle timing and the use of nominal (book) values, which can bias against new investments. Using a real annuity spread over the standard techno-economic life of the asset ensures comparability across time.
- Standardizing capital costs (WACC): Necessary because countries have different methodologies for calculating WACC, which can distort the total allowed revenue and capital composition.
- Labour cost corrections: Essential due to variations in labour costs across Europe, which are often heterogeneous and partially uncontrollable. Using a correction factor, such as the LCI-UTIL published by EUROSTAT, aims to ensure comparability of labour costs.
- Controlling for overhead cost allocation: As mentioned above, this is necessary to prevent distortions due to varied internal organization and legacy among TSOs.
- Inflation adjustments: Different inflation rates across countries and baskets of goods/services necessitate a harmonized inflation index (e.g., HICPIGNE) for investments to ensure consistent real values over time.
- Opening balances: Addressing potentially biased opening balances, which could artificially inflate or deflate a TSO's asset base, is important to prevent an "unattainable cost target" for peers.
- Price and currency differences: Converting non-EUR values to EUR using an average exchange rate and excluding taxes, fees, and levies from the benchmarked cost are proposed to neutralize their influence.
- Environmental heterogeneity: Controlling for natural and artificial terrain and infrastructure features (e.g., land use, topography, soil, climate) is crucial as these are exogenous and have different impacts on expenditure.
- Excluding costs and investments related to out-of-scope or exceptional events: This ensures that the benchmark focuses only on activities and costs relevant to the core transmission task and over which TSOs have control.

The effectiveness of these measures relies on the quality of the underlying data and the quality of the methodology. Continuous feedback from TSOs and NRAs during the data collection and validation phases will be vital to identify and refine any inappropriate or ineffective adjustments.

Topic 5: Static efficiency

The proposed efficiency metrics are described in chapter 4 of document D02 and the choice of efficiency analysis methods is discussed in chapter 2 of document D03. The main result of the AEC is a static modelling carried out with DEA. SFA will provide secondary results used for validation.

A static deterministic model is focusing on a single year and uses variables that are not subject to random effects, primarily execution-based outputs and services directly derived from installed assets. The analysis is not sensitive to cost changes over time across Europe. DEA is a method that uses a minimal set of

assumptions and delivers scores also for smaller sample of operators.

The use of DEA for benchmarking TSOs is well established and has been used in TCB (TCB18, TCB21 and E2GAS) and also in the German benchmark for natural gas TSOs (Reference: Swiss Economics, Sumicsid, 4Management (2018) Kostentreiberanalyse und Effizienzvergleich der Gasfernleitungsnetzbetreiber EFG3, Final report for Bundesnetzagentur).

11. Do you consider the proposed approach to provide the primary efficiency measure of the AEC adequate? Please elaborate.

> The proposed approach of using Data Envelopment Analysis (DEA) for the primary static (one-year) efficiency model, with Stochastic Frontier Analysis (SFA) providing secondary validation, appears adequate. DEA is a well-established method for benchmarking TSOs, offering flexibility by not requiring a priori assumptions on cost functions and is suitable for deterministic data7. Its proven use in previous CEER benchmarks (TCB18, TCB21, E2GAS) and the German benchmark for natural gas TSOs lends credibility to its application here.
>
> The focus on asset-based outputs in the static model, rather than utilization-based outputs, is appropriate for a one-year assessment. This helps to avoid penalizing TSOs for declining demand, which is largely outside their control in the short term, and focuses on the efficiency of their existing infrastructure.

12. Do you agree that a static model could provide useful input for NRA regulatory rulings? If not, what other options you would propose? Please elaborate.

> Yes, a static model can provide useful input for NRA regulatory rulings, particularly for assessing the current operational and investment efficiency of TSOs relative to their peers. It offers a snapshot of "best practice" in a given year based on existing assets and operational activities. This can inform NRAs on areas where TSOs might be able to improve efficiency in their current operations and asset management.
> However, a static model has limitations in capturing dynamic aspects of efficiency, especially in the context of decarbonization and changing network utilization. Therefore, while useful, it should not be the sole basis for regulatory decisions. Its input is most valuable when complemented by the dynamic efficiency analysis and other qualitative assessments.
> We would not propose other options instead of a static model, but rather emphasize the necessity of combining it with dynamic analysis and qualitative factors to provide a comprehensive and robust basis for NRA regulatory decisions in a rapidly evolving energy landscape.

Topic 6: Dynamic efficiency

The energy transition is expected to result in lower demand for natural gas. The evolution of demand and entry points depend on many factors, most of them being uncontrollable by the TSO which networks are sized to match the peak network use.

In this context, TSOs with older assets are likely to have over-capacity in a context of decreasing demand while TSO with more recent assets can dimension the assets to the actual demand. In an efficiency analysis, the use of actual demand (gas volume or entry point) used as an output would lead to TSOs with more recent assets appearing as more efficient, as their asset capacity more closely match the actual output.

In an environment of decreasing use of infrastructure having utilisation metrics in a benchmark implies that TSOs are rewarded (or penalized) for bringing the size/capacity of the network in line with decreasing demand.

For that reason, the static (one-year) efficiency model in AEC will use only asset-based outputs instead of utilization-based outputs to compare like with like.

However, to provide information on, and incentives for, the correct asset intensity facing fuel substitutions, AEC will also incorporate a dynamic efficiency model, covering several years of operations. In this case, to monitor the volume transported and peak load development in the natural gas sector and the adaptation of assets to outputs, usage-based outputs will also be used. The inclusion of usage-based outputs in the dynamic model will capture how TSO can adapt to changing circumstances.

For this calculation, the Agency proposes to use SFA as a primary method and DEA as a secondary method for confirmation.

The use of dynamic modelling considering network utilisation is discussed in sections 3.3 and 4.7 of document D02 and in section 2.5 of document D03.

SFA is not only the academically most used dynamic method, but also and foremost the relevant tool to explore and address random variables or data errors in the AEC, thereby providing a valuable validation of the correctness of the static model results.

13. Do you consider appropriate to provide additional efficiency scores taking into account network utilisation? Why? Please elaborate.

Yes, we consider it appropriate to provide additional efficiency scores that take into account network utilization.
Reasons why it is appropriate:

- Decarbonization Impact: The energy transition will lead to significant changes in natural gas demand and flow patterns, including likely decreases in overall volumes. An efficiency assessment that only considers asset-based outputs would fail to capture how effectively TSOs are adapting their networks to these new realities. A TSO that intelligently manages declining demand by optimizing existing capacity or strategically decommissioning assets, even if it has older infrastructure, should be recognized for its efficiency in adapting to changing circumstances.

- Incentivizing Adaptation and Optimization: Including utilization metrics in a dynamic model incentivizes TSOs to adjust their network size and operations in line with actual and forecasted demand. This encourages efficient use of existing infrastructure, strategic decommissioning, or repurposing, rather than simply maintaining or expanding assets regardless of actual need. This aligns with the broader goal of reducing investment needs through better coordination.

- Long-term System Costs and Affordability: Ultimately, efficient adaptation to decreasing demand can lead to lower overall system costs for consumers. If TSOs are rewarded for aligning network capacity with demand, it contributes positively to affordability, especially in a context where fewer users might be bearing the costs of the system.

- Reflection of Real-World Challenges: TSOs are actively dealing with managing overcapacity and changing flows. An efficiency comparison that ignores these real-world challenges would be less relevant and less useful for informing regulatory decisions.

Therefore, the proposed dynamic analysis with usage-based outputs is a crucial complement to the static, asset-based model, offering a more complete picture of TSO efficiency in a decarbonizing context.

14. Do you consider the proposed method design appropriate (SFA as primary method and DEA and secondary method)? Why? Please elaborate.

Yes, we consider the proposed method design, utilizing SFA as the primary method and DEA as a secondary method for dynamic efficiency analysis, to be appropriate. We do note that data limitations can pose challenges; therefore, it’s important to build up a consistent database over time in order to be able to perform dynamic analyses.

15. Is the use of two methods a strength for the analysis or a source of ambiguity in the interpretations? Why? Please elaborate.

The use of two complementary methods (SFA as primary for dynamic analysis and DEA as secondary/cross-validation, and vice-versa for static analysis) is a strength for the analysis, rather than a source of ambiguity. Employing multiple robust methodologies for the same analytical problem significantly enhances the credibility and robustness of the results. If both methods yield consistent findings, it provides stronger evidence for the conclusions drawn, minimizing the risk that results are an artifact of a single model's assumptions or limitations. The secondary method acts as a critical cross-validation tool60. Any significant discrepancies between the results of the two methods would signal a need for further investigation into data quality, model specification, or underlying assumptions. This iterative process improves the overall quality and reliability of the efficiency scores. Finally, different methods provide complementary insights, not gained when focusing on one methodology alone.

Topic 7: Data quality

For the purpose of ensuring data quality, the Agency proposes several layers of validation, including:

- Asset system and audited financial statements.
- Clear guidelines and templates.
- NRA check of the data submitted by TSOs Cross-validation of all TSO datasets, including technical engineering validation.
- Data analysis by the consultant.

The processes for the validation of the data to ensure the quality of the dataset are described in chapter 4 of document D03.

The AEC proposes an integrated data validation strategy in six steps involving TSOs, NRAs, ACER, consultants and auditors to ensure maximum data quality.

16. Do you agree with the data validation approach outlined? What other alternative measures should ACER consider ensuring the quality of the data? Please elaborate.

We largely agree with the outlined data validation approach, which incorporates multiple layers of checks involving TSOs, NRAs, ACER, consultants, and auditors. This multi-step process, from asset system and audited financial statements to cross-validation and technical engineering validation, is comprehensive and crucial for ensuring high-quality data, which is foundational for any credible benchmarking exercise.

To further strengthen data quality, ACER could consider the following additional measures:

- Standardized Data Collection Software/Platforms: Implementing a common, user-friendly data collection platform or software with built-in validation rules and checks at the point of data entry by TSOs. This could proactively reduce errors and inconsistencies before submission.
- Training and Guidance for TSOs and NRAs: Providing targeted training sessions and detailed guidance documents for TSO personnel responsible for data submission and NRA staff involved in data validation. This would ensure a shared understanding of data definitions, reporting requirements, and validation procedures.
- Pilot Data Collection/Trial Runs: Conducting a pilot data collection exercise with a subset of TSOs before the full-scale data request. This would allow for identification and resolution of common data interpretation issues, technical problems, and ambiguities in definitions, refining the process before the official submission.
- "Explain or Justify" Mechanism for Outliers: For data points identified as outliers during validation or modelling, requiring TSOs to provide detailed explanations and justifications for why their data deviates significantly from peers or historical trends. This would aid in understanding unique circumstances versus potential data errors.
- Anonymous Peer Review of Data (Optional): After initial validation, allowing TSOs (or even NRAs) to anonymously review aggregated, anonymized data from a selected peer group to identify potential inconsistencies or anomalies they might observe from their operational perspective. This could leverage collective expertise while respecting confidentiality.
- Regular Methodology Review for Data Impact: Continuously reviewing how changes in the methodology (e.g., new outputs or inputs, environmental factors) impact data requirements and potential data availability issues. This ensures that the methodology remains pragmatic and data-supported.

Reinforcing these aspects, contributing to the reliability and comparability of the TSO data, would strengthen the credibility and acceptance of the benchmarking results.

Topic 8: Technical input on benchmarking

The AEC is an empirical assessment of total cost, actual and efficient levels, related to services performed by structurally comparable operators. Intrinsically, the mission is a methodological challenge requiring the mobilization of the best possible statistical, operations research and econometric methods that are relevant to the problem at hand.

In in chapter 7 of document D02 and chapters 2 and 3 of document D03 with references, some of the methods and techniques used are described and discussed. However, the documents do not purport to provide a full technical description, for this the underlying documents and the references to this note could be consulted.

Some of the techniques have been discussed in past projects, we list some of the relevant aspects as consultation questions, without claim of exhaustiveness.

17. The criteria in section 7.7 of document D02 list 'relevance' as a criterion for the model specification. However, data mining techniques such as principal component analysis or machine learning may derive good predictions of total cost without an explicit cost function. Do you agree that this criterion is sound and necessary for the AEC purposes? What measures can be taken to assure relevance of the results? Please elaborate.

Yes, we strongly agree that 'relevance' is a sound and necessary criterion for the AEC purposes. While data mining and machine learning techniques can indeed provide good predictions of total cost, relying solely on them without considering the underlying economic or engineering relevance of the input and output variables could lead to "black box" models. Such models, even if statistically accurate, may lack interpretability and policy relevance for NRAs and stakeholders. For the AEC results to be widely accepted by TSOs, consumers, and other stakeholders, the methodology must be transparent and comprehensible. A model built on economically and technically relevant criteria fosters trust, whereas complex, opaque models, even if statistically sound, can be met with scepticism.

18. The comparison of assets with different dimensions and material is partially based on a normalized grid metric (NormGrid). Is the use of such normalization acceptable and robust for the AEC? Please elaborate.

The use of a normalized grid metric (NormGrid) to compare assets with different dimensions and materials is acceptable and likely necessary for the AEC. However, its robustness depends entirely on the transparency, expert validation, and continuous refinement of its underlying methodology and weighting factors.
Reasons for acceptability and robustness (assuming proper design):

- Addressing Heterogeneity: TSOs operate networks with a wide variety of assets, differing in age, material, diameter, pressure levels, and operational conditions. A raw comparison of physical units (e.g., km of pipeline) would be highly misleading due to these inherent differences. Normalization attempts to create a "common denominator" by weighting assets based on their functional equivalence or service delivery capacity, which is essential for "comparing like with like".
- Focus on Service Provision: The NormGrid aims to reflect the service capacity provided by different assets, rather than just their physical characteristics. For instance, a larger diameter, high-pressure pipeline might deliver a significantly higher transport service than a smaller, lower-pressure one, even if their length is the same. Normalization attempts to capture this functional difference.
- Common Practice in Benchmarking: Similar normalization techniques are common in utility benchmarking (including electricity TSOs and DSOs) where network assets are diverse. The fact that the CEER TCB benchmarks have used similar approaches suggests a degree of established practice.

While necessary, normalization should not over-simplify the complexities of TSO assets to the point where it loses its explanatory power. The balance between comparability and capturing essential asset characteristics is key.

19. Service quality is not explicitly modelled among the parameters in chapter 3 of document D03. Should service *quality* be part of the benchmarked outputs? If so, how can it be measured?

Yes, service quality absolutely should be part of the benchmarked outputs, or at least explicitly considered as a crucial contextual factor in the efficiency assessment.
Reasons for inclusion:

- Avoiding Perverse Incentives: If efficiency is measured solely on cost minimization relative to asset base or volume, TSOs might be incentivized to cut costs in ways that degrade service quality (e.g., deferred maintenance, slower response times to issues). This is a well-known risk in incentive regulation, as highlighted by Spence (1975) concerning price-cap regulation and its impact on quality of supply.

• Holistic View of Performance: True "efficiency" for a monopoly network operator is not just about cost minimization but also about delivering a high-quality service. Customers (including large industrial users like IFIEC members) value reliable and secure gas supply. An efficiency comparison that ignores service quality provides an incomplete and potentially misleading picture of TSO performance.
• Balancing Regulatory Goals: Service quality directly relates to "security of supply" and indirectly to "affordability" (through avoided opportunity costs of interruptions), which are key goals of energy policy, as outlined in the "energy policy triangle".
• Lessons from Electricity Regulation: As noted in the provided documents, electricity DSOs in the Netherlands include a "Q-component" for quality regulation using indicators like SAIFI and CAIDI. This demonstrates a practical precedent for incorporating quality metrics into network regulation.

How can service quality be measured?
Measuring service quality for gas TSOs can be challenging but is feasible using a combination of direct and indirect indicators:
Direct/Quantitative Indicators:
• System Reliability/Availability:
o Number/Frequency of Interruptions: Total number of unplanned service interruptions.
o Duration of Interruptions: Total time of unplanned service interruptions (similar to CAIDI in electricity).
o Volume of Gas Unsupplied/Curtailment: Quantity of gas that could not be delivered due to network constraints or interruptions.
• Pressure and Flow Stability: Maintaining stable pressure and flow rates within specified tolerances.
• Connection Times: Average time taken to process and facilitate new connection requests or capacity upgrades. This is a crucial metric for electricity DSOs, as noted in the Brunekreeft report.

• Congestion Management Performance: Metrics related to the frequency, duration, and cost of congestion management actions.
Indirect/Qualitative/Perceptual Indicators:
• Customer Satisfaction Surveys: Surveys of large industrial users, smaller distributors, and other direct network users regarding satisfaction with supply reliability, responsiveness, and communication.
• Stakeholder Engagement Quality: Evaluation of TSO engagement with stakeholders (e.g., in network development planning processes).
• Safety Performance: Number of incidents, leaks, or safety breaches.
Implementation Considerations:
• Controllability: Ensure that the chosen quality metrics reflect aspects of service that are genuinely controllable by the TSO.
• Data Availability and Comparability: Assess the availability of consistent data across TSOs for the selected indicators. Harmonizing data collection would be crucial.
• Weighting: If integrated into a composite efficiency score, appropriate weighting of quality metrics relative to cost metrics would be needed. Alternatively, quality could be a separate "performance score" or a "collar" mechanism where poor quality negates some efficiency gains.

Given the importance of security of supply and the evolving role of gas networks, incorporating service quality is vital for a comprehensive and fair assessment of TSO efficiency.

20. Do you agree with the output variable selection methods in section 3.2 of document D03? What improvements can be made? Please elaborate.

Section 3.2 of document D03 classifies possible output variables based on the three basic supply tasks of TSOs: Transport, Capacity Provision, and Service Provision. It further categorizes them by controllability,

ranging from output-oriented (less controllable) to input-oriented (more controllable) variables. This classification, exemplified by the EFG4 German benchmarking of gas TSOs, is a sound and comprehensive approach for selecting output variables. The inclusion of GIS-based variables like "Transport moment" and "Transport capacity," which show high correlation with Total Expenditure (Totex), is particularly valuable for their explanatory power.
Improvements that can be made:
• GIS Data Requirement: The document notes that in past CEER benchmarks, some TSOs were unwilling to provide exact asset locations due to security concerns. For AEC, it is crucial to require TSOs to share this information. While the document suggests defining how data could be processed to fulfil stricter security requirements, the ability to build powerful output variables and increase the precision of environmental factors heavily relies on this data. ACER should consider strong data protection measures (e. g., decentralized processing by NRAs as mentioned) to overcome TSO reluctance, as the benefits of precise GIS-based variables (e.g., Totex-Correlations of 95-98% for "Area" and "Transport Capacity" in EFG4) are substantial.
• H2-Readiness Integration: The document recommends expanding data collection to include H2-readiness of pipelines and planned repurposing years. This is a vital improvement, as the energy transition progresses, it will be critical to understand how TSOs are adapting their infrastructure for hydrogen. This information should be systematically integrated into output variables or specific performance indicators to reflect forward-looking efficiency in grid adaptation.

21. Do you agree that the environmental correction factors listed in section 3.3 of document D03 are relevant and important for the AEC? What improvements can be made? Please elaborate.

Yes. These factors significantly impact the cost of providing services (both CAPEX and OPEX) and are exogenous to TSO management, meaning they are beyond the TSO's control. Correcting for these environmental conditions is essential for maintaining comparability between TSOs operating in different environments. By continuously enhancing the precision and scope of environmental corrections, the AEC can produce fairer and more accurate efficiency comparisons, which is vital for regulatory decision-making.

22. Do you consider it useful, in the analysis of the dynamic efficiency of TOTEX, to take national capital cost differences—particularly the WACC—into account when assessing the evolution of the optimal cost structure, especially the balance between OPEX and CAPEX? Please elaborate.

Yes. Ignoring national WACC differences would lead to an unrealistic assessment of what constitutes an "optimal" or efficient CAPEX/OPEX balance for a TSO in its specific national context.

23. Are there missing structural or environmental factors that should be included in the analysis? Please elaborate.

The document already lists a comprehensive set of environmental/structural factors and highlights the importance of leveraging GIS data for higher precision. These are critical for ensuring fair comparability.

24. Please provide any other view relevant to the topic of the consultation.

1800 character(s) maximum

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25. Please upload your file(s) in case you would find it necessary to provide any additional information from your side.

Maximum file size is 1 MB. If your file is bigger, please use the functional mailbox: AEC@acer.europa.eu.

Question on confidentiality

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- (●) Yes, ACER may publish the submitted replies.
- ( ) Yes, ACER may publish the submitted replies **anonymously**.
- ( ) No, ACER may not publish the submitted replies.

* **Does your submission contain confidential information?**

- ( ) Yes
- (●) No

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