**RE: Invitation to participate in a questionnaire on the review study of Commission Regulation 2019/1783 on the Ecodesign of small, medium and large power transformers**

As part of our ongoing efforts to improve energy and material efficiency, we are conducting a review study on behalf of DG GROW on Commission Regulation 2019/1783 on the Ecodesign of small, medium and large power transformers. The latest version of this regulation can be found here: [EUR-Lex - 32014R0548 - EN - EUR-Lex (europa.eu).](https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ%3AL%3A2019%3A272%3ATOC&uri=uriserv%3AOJ.L_.2019.272.01.0107.01.ENG)

The purpose of this study is to review the effectiveness of the regulation and identify areas for improvement for power transformers. The background and scope of the study is further developed on our platform: [Eco Transformers Review (eco-transformers-review.eu)](https://eco-transformers-review.eu/).

To achieve this, we are seeking your inputs as stakeholders. We would appreciate your inputs to the study, which you can provide by completing our questionnaire. Your responses will shape the direction of the study, to further understand the impact of the regulation.

The questionnaire covers topics such as regulation scope, energy efficiency, test methodologies, material efficiency and operating conditions of power transformers. It is designed to be quick and easy to complete, and we estimate that it will take approximately 60 minutes to finish. All responses will be treated confidentially and only used for the purpose of this study. The questionnaire closely aligns with the review scope, which covers a number of specific items, which are labelled ***a to r****.* These items (a-r) have been placed in the corresponding sections that they relate to. The items have been added as a sub-title under each title, in blue text and italic. We welcome stakeholder feedback in each of these sections, but appreciate that some sections may be more relevant to certain stakeholder groups, such as:

- Manufacturers and suppliers: Questions 1 - 28

- Transmission/distribution network operators and regulators: Questions 1 - 17; 23 - 28

- Standards testing, regulatory bodies and Market surveillance bodies: Questions 1 - 17; 23 - 28

- End-of-life handlers/Transformer recycling operators: Questions 18-22; 28

Please submit your completed questionnaires as an attachment and send to the transformer’s review email: [transformersreview@icf.com](mailto:transformersreview@icf.com).

The deadline for this questionnaire is the **30th of September 2023**. Please type your answers in the spaces provided beneath each question. If you have any questions, please contact us on the study email address: [transformersreview@icf.com](mailto:transformersreview@icf.com).

Questions

## Regulation definitions and scope

**f)** the appropriateness of the exemptions for transformers in offshore applications;

**g)** the appropriateness of the concessions for pole-mounted transformers and for special combinations of winding voltages for medium power transformers;

**p)** functional categorisation of power transformers (including conventional transformers, overload transformers and fire performant transformers and any others that the contractor may suggest).

1. Do you have any views or concerns with regards to the definitions and scope set out in the regulation?
   1. The regulation applies to power transformers with a minimum power rating of 1kVA used in 50Hz electricity transmission and distribution networks or for industrial applications. What are your views on this scope?
   2. The regulation defines "Small power transformers" as: *a power transformer with a highest voltage for equipment not exceeding 1,1kV.* What are your views on this scope?
   3. The regulation defines "medium power transformers" as: *a power transformer with all windings having rated power lower than or equal to 3 150 kVA, and highest voltage for equipment greater than 1,1 kV and lower or equal to 36kV.* What are your views on this scope?
   4. The regulation defines "large power transformers" as: *a power transformer with at least one winding having either rated power greater than 3150kVA or highest voltage for equipment greater than 36kV.* What are your views on this scope?
2. What are your views on the appropriateness of the exemptions for transformers in offshore applications? Can you provide an estimate of the market share these represent? What sort of rated power kVA values can we expect for these transformers? How are these transformers different from the mainstream?
3. The regulation defines "medium power, pole mounted transformers" as *a power transformer with a rated power of up to 400 kVA suitable for outdoor service and designed to be mounted on the support structures of overhead power lines.*  These devices are subject to a separate table of allowable maximum load and no-load losses. What are your views on the appropriateness of having a separate table for medium power pole-mounted transformers?
4. The regulation sets out correction factors for the applied regulatory maximum load and no-load losses to medium power transformers with special combinations of voltages in one or both windings. What are your views on the appropriateness of the correction factors for special combinations of winding voltages for medium transformers?
5. Transformers can be categorised in line with their functionality, such as for conventional transformers, overload transformers, for fire performant transformers, distribution transformers, safe extra low voltage transformers and Ultra High Voltage transformers.
   1. What are your thoughts on the categories mentioned here? Should specific definitions be clarified for them in the regulation?
   2. Are there other functional categories that you suggest for inclusion?

## Ecodesign energy efficiency requirements

**a)** the extent to which requirements set out for Tier 2 have been cost-effective and the appropriateness to introduce stricter Tier 3 requirements;

**e)** the appropriateness of setting minimum performance requirements for small power transformers.

**n)** impact of rising electricity prices on current and potentially stricter Ecodesign requirements.

1. Tier 2 energy efficiency requirements on transformers came into force in 2021.
   1. In your view, has Tier 2 been cost-effective?
   2. What are your views on the introduction of stricter Tier 3 requirements?
2. The Ecodesign regulation defines small power transformers as being transformers with a voltage for equipment under 1.1kV. These are currently excluded from energy efficiency requirements under Ecodesign.
3. What are the use cases for small power transformers? What would you estimate their market share to be? What quantities of small transformers are traded annually within the EU?
4. What value would you state as the current average efficiency for small transformers? Do you believe this average efficiency rate can be improved?
5. What are your views on setting minimum performance requirements for small power transformers? What performance level would you suggest is applied to small transformers?
6. Have the recent high electricity prices affected purchasing, operation and replacements of power transformers? If so, in what way?

## Existing Standards and Regulations

**j)** an analysis of the standards, and of their relevance for regulatory purposes;

**l)** Ecodesign (or similar) requirements for power transformers in other jurisdictions, in particular the US and Japan and in comparison to current Ecodesign requirements for Tier 2.

1. IEC 60076 is the main standard for single and three-phase power transformers. It is in 21 parts and covers many aspects of the product, including energy performance testing. The IEC 60076-20 specification proposes two methods of defining an energy efficiency index and three methods of evaluating the energy performance of a transformer:

* The Peak Efficiency Index (PEI) including a Total Cost of Ownership approach.
* The no-load and load losses at rated power for rationalisation of transformer cores
* The efficiency at a defined power factor and particular load factor (typically 50%)
  1. What are your views on this standard and the energy performance metrics presented above?
  2. Should other standards be considered when reviewing the transformers Ecodesign regulation?

1. What are your views on minimum performance requirements in other jurisdictions, in particular the US and Japan?
2. How do these requirements compare to the current Ecodesign requirements for Tier 2?
3. Are there any areas or considerations of these requirements which could be used to further improve the Ecodesign requirements?

## Implementation of Ecodesign Requirements and Methodologies

**b)** the appropriateness of the concessions introduced for medium and large power transformers in cases where installation costs would have been disproportionate. In particular, the analysis should investigate concessions in concrete cases (e.g. manufacturers, electricity companies, market surveillance authorities) and determine their

appropriateness;

**c)** the possibility of utilising the PEI calculation for losses alongside the losses in absolute values for medium power transformers;

**d)** the possibility to adopt a technology-neutral approach to the minimum requirements set out for liquid-immersed, dry-type and, possibly, electronic transformers;

**o)** existing methodologies for assessing technoeconomic aspects of Ecodesign for power transformers (especially in terms of technology neutrality, circularity, MEPS and MMPS), as well as for the assessment of the costs for replacement/installation of transformers, based on the principles laid down in Regulation 2019/1783;

**q)** a techno-economic analysis on the relevance and feasibility of requirements (in particular for low-to-medium and medium-to-high voltage transformers) related to design features aimed to increase the efficiency and lifetime of transformers when working with reversed power flows (due, for instance, to electricity from renewable energy sources injected in the grid at lower voltage levels).

1. The regulation 2019/1783 introduced concessions for the Tier 2 requirements such that: "*when the one-to-one replacement of an existing medium power transformer entails disproportionate costs associated with their installation, the replacement transformer is, exceptionally, only required to meet Tier 1 requirements for the given rated power."*
   1. Did you find these concessions useful for your operations? If so, what is the proportion of replacement cases where this concession was applied?
   2. What was the magnitude of the disproportionate costs quoted? How were these justified?
   3. What are your views on the technical and/or economic justifications quoted to justify the exemption?
   4. Do you consider this concession appropriate? what Improvements should be considered for inclusion?
2. For medium transformers, the regulation currently sets requirements for load and no-load losses separately, whereas these are brought together with the PEI calculation for large transformers. What are your views of utilising the PEI calculation for energy efficiency requirements on medium power transformers? The PEI would be used as a compliment to the absolute values requirements.
3. What are your views on the possibility of adopting a technology-neutral approach to the minimum requirements set out for liquid-immersed, dry-type and, possibly, electronic transformers?
4. Would a technology-neutral approach be an appropriate way to harmonise regulations and standards across transformer types?
5. What approach would you consider be most useful for a technology-neutral regulation? What are your thoughts on using a measurement of minimum efficiency at a specific load?
6. Are there any existing methodologies you would recommend for assessing technoeconomic aspects of Ecodesign for power transformers (especially in terms of technology neutrality, circularity, MEPS and MMPS)?
7. Alternatively, do you foresee the need to develop new methodologies for any particular technoeconomic aspects of Ecodesign?
8. What are the technical and economic costs to consider when setting requirements on transformers with a reversed power flow?
9. What requirements would you suggest including to increase the efficiency and lifetime of transformers when working with reversed power flows?

## Material Efficiency

**i)** material efficiency aspects;

**m)** strengthening potential of the existing MEPS and the potential of introducing material efficiency requirements (MMPS).

1. Are there specific measures to be considered to increase the commercial lifetime of transformers?
2. Are there specific materials that should be tracked for transformers due to their potential impact if released into the environment? If so, what measures would you recommend to limit these impacts?
3. What materials within transformers should be targeted for recycling operations? What sort of quantities can be expected in each transformer? Are there specific critical raw materials that should be tracked?
4. What is the rate of materials recovered and recycled from power transformers?
5. Material efficiency goals include improving product durability, reusability and recyclability, tracking substances of concern and increasing information requirements. Beyond what was detailed in the questions above, are there any other material efficiency considerations to be had for transformers?

## Environmental considerations

h) the possibility and appropriateness of covering environmental impacts other than energy in the use phase, such as noise and material efficiency.

k) technological, market and regulatory evolutions affecting environmental performance;

1. What are your views on the inclusion of an Ecodesign criteria with regards to noise emissions?
2. Are the temperature operation range considerations for transformers that should be considered as requirements under Ecodesign? Should the respective cooling systems be considered in this process, notably relating to the cooling mediums and mechanisms employed?
3. What are the climate adaptation considerations with regards to the design and installation of transformers?
4. What are the considerations for Ecodesign with regards to the use of SF6 in gas-insulated transformers?
5. Are there other environmental considerations to be had for transformers?

## Other topics

**r)** other topics, as emerged from consultations with stakeholders.

1. Are there any other topics not raised in this questionnaire that this regulation review should consider?