Study for the review of Commission Regulation EU 2019/1783 Ecodesign of small, medium and large power transformers

1st Stakeholder meeting

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26 September 2023

Housekeeping rules of the meeting

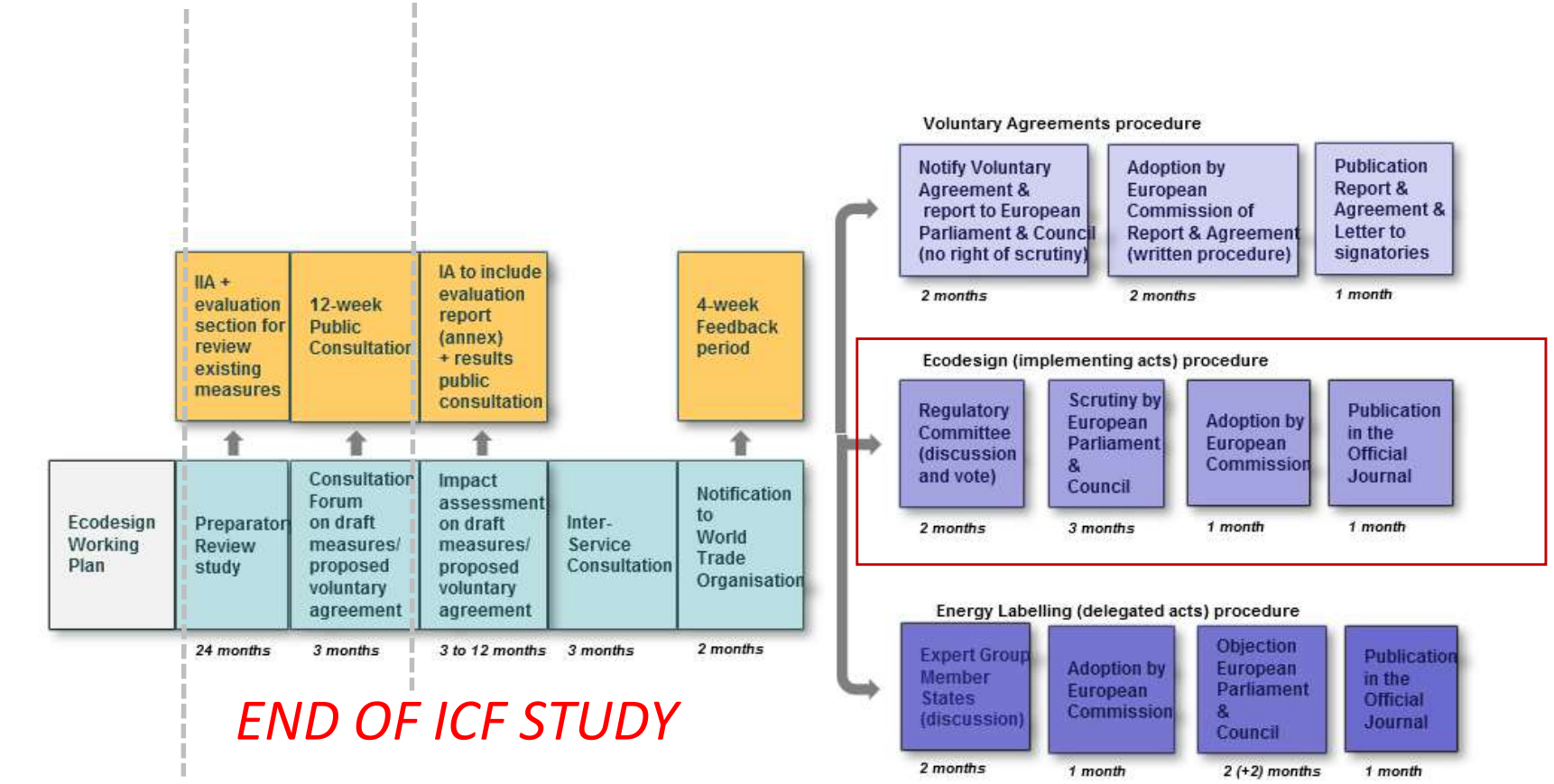
- During each sub-session of presentation, virtual participants will be able to pose written questions or to ask for the floor (type [name organization] + 'floor please' [+topic]). Please write them in the chat when invited to do so by the Chair, starting with the name of your organisation (questions without the organisation name will not be considered).
- The questions will be answered at the end of each sub-session. In case of time constraints, priority in replying to the questions will be given, based on the order in the chat. Everyone remains muted (unless speaking when invited by the Chair)
- **Concise** intervention or question

NB : The chats will not be kept/copied. Please do **not** make comments in the chat area unless invited by the Chair.

Agenda

- Introductions
- Setting the scene (DG GROW)
  - Q&A
- Delivery Plan
  - Scope
  - Study Objectives
  - Project Team
  - Project Website, Registration & Audiences
  - Milestones & Timeline
  - Deliverables
  - Starting Position
- Stakeholder Involvement
  - Qualitative questionnaire
  - Quantitative questionnaire
- Q&A
- Technical Analysis- Phase 1
  - Review items a-r (split into themes)
- AOB
- Closing statement (DG GROW)
  - Call for action (ICF)

Setting the scene



END OF ICF STUDY

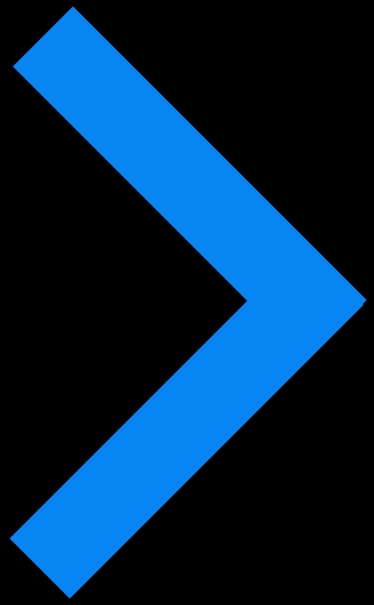
WE ARE HERE!

Main points (DG GROW)

- Introduction and overall process
- Scope of the review
- Interplay with ESPR
- Energy efficiency and material efficiency
- Product level / system level

Q&A

Delivery Plan



Scope
Study Objectives
Project Team
Project Website, Registration & Audiences
Milestones & Timeline
Deliverables
Starting Position

Scope

Phase 1 – Technical analysis
This involves a detailed assessment of all items raised in the review section of Commission Regulation (EU) 2019/1783 plus the other items raised by DG GROW, as well as an update to the Ecodesign frequently asked questions (FAQ).

Phase 2- Update of the preparatory study for the transformers Regulation
This phase will update the existing preparatory study of Commission Regulation (EU) 2019/1783, informed by Phase 1, and further by additional market research, consultation and experience in the EU.

Phase 3 Ad-hoc technical assistance
The study team will deliver continuous technical support to DG GROW on a stand-by basis to address questions raised by the Commission (e.g., by DG GROW, other DGs) and the Consultation Forum.

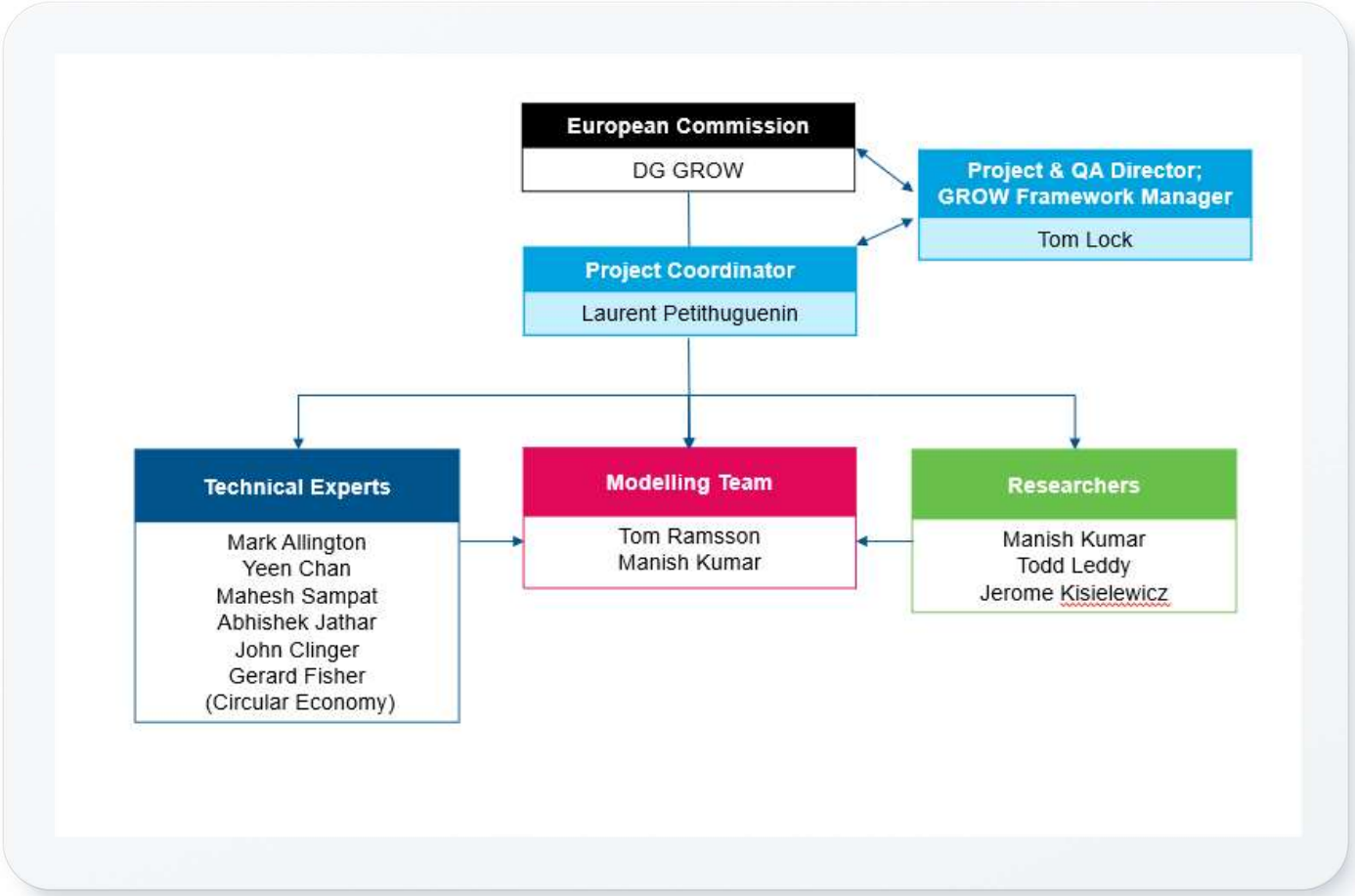
Presentation of the Delivery Plan – Study Objectives

Supporting the Commission with technical expertise for the assessment of the items listed in Article 7 of Regulation 2019/1783, and of further items listed in Phase 1

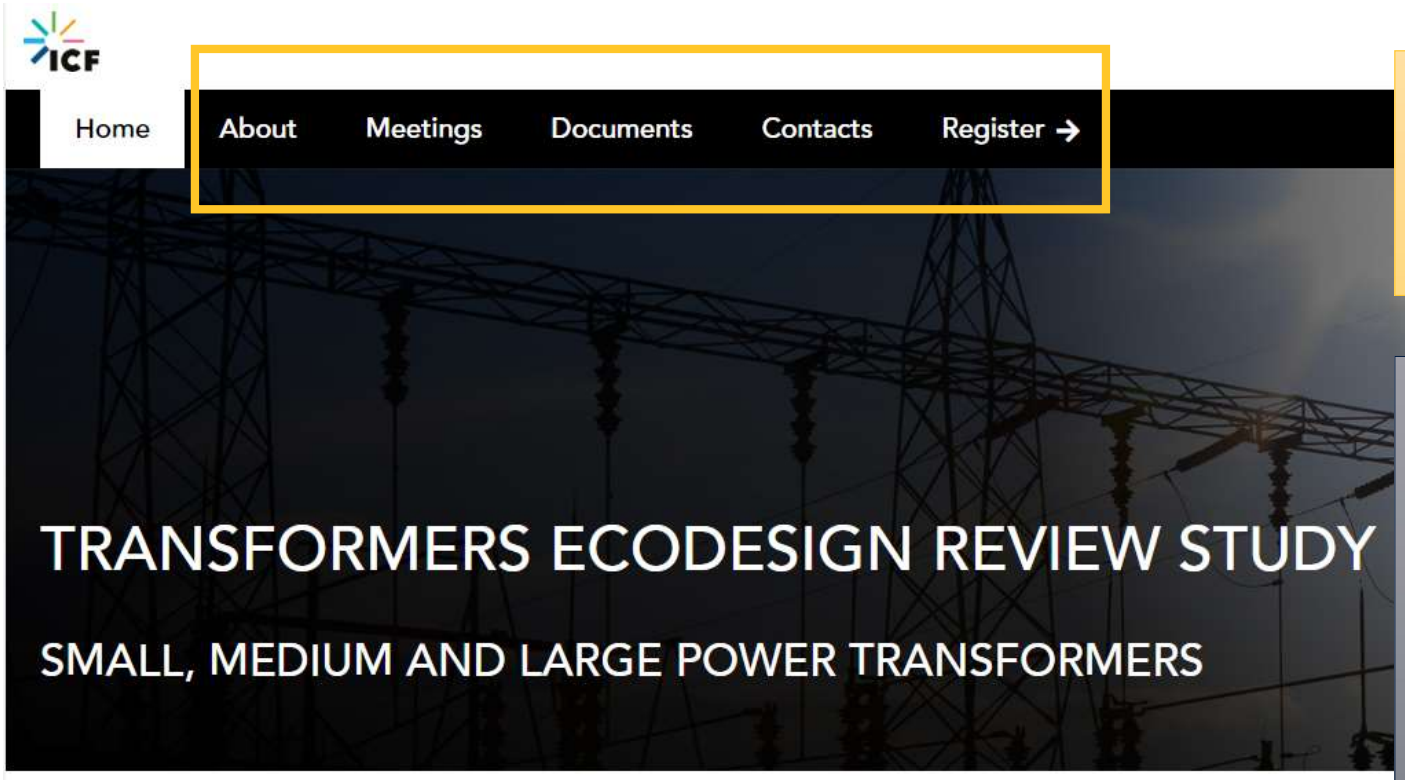
Development of the proposal for a potential update of existing Ecodesign legislation for power transformers

Provide ad-hoc technical expertise.

Presentation of the Delivery Plan – Study team



Project Website, Registration & Audiences



Study website:

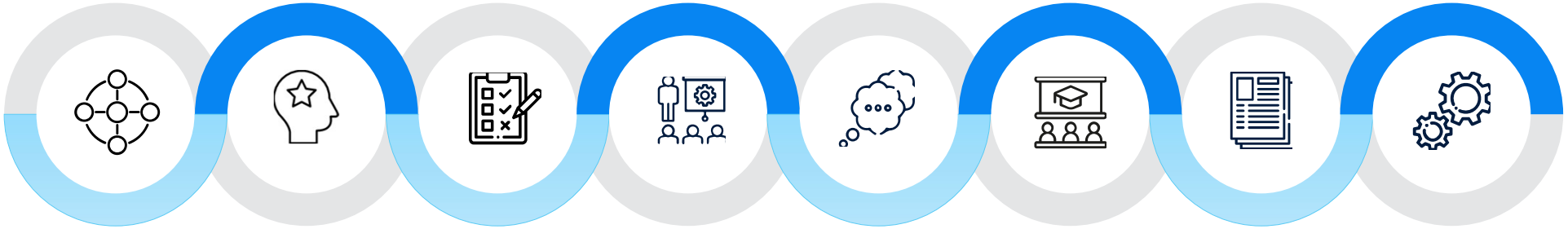
eco-transformers-review.eu

Encouraging registration for all types of stakeholders:

Manufacturers,
Utilities,
Market Surveillance Authorities,
Recyclers

This will allow you to be automatically notified of any document uploads, meetings, etc.

Presentation of the Delivery Plan – Deliverables



Kick off meeting minutes
End of June 2023

Study webpage
Early July

1st Stakeholder meeting (online) & minutes
End of September

Interim report (phase 1 and draft phase 2)
End of October

2nd Stakeholder meeting & minutes
Early December

Second interim report (Phase 1 and 2) + Working documents for the Consultation Forum
February 2024

Consultation Forum & minutes
Early Spring

Final Study report
Mid-May

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Starting position

Data

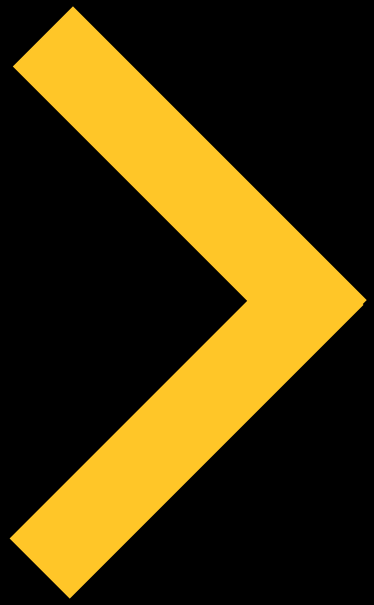
- Generic data can be sourced from Prodcom for production and trade, and Eurostat for waste streams.
- ICF can engage with ENERGY STAR data for transformers technical potential in the US.
- Data from the past preparatory study - 2017

- Stakeholder engagement is key to project delivery, to ensure that information not available in the public domain can be used in the study.

Methodology

- Use of the updated EcoReport tool and Methodology for the Ecodesign of Energy-related Products (MEErP)

Stakeholder Involvement



Qualitative questionnaire

Quantitative questionnaire

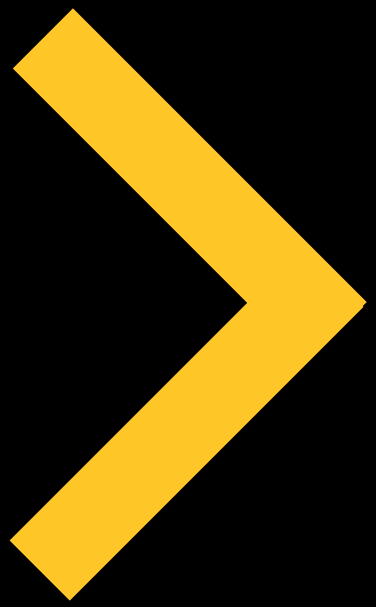
Qualitative Questionnaire

- General questions which have been organised under themes for:
  - Regulation definitions and scope
  - Ecodesign energy efficiency requirements
  - Existing standards and regulations
  - Implementation of Ecodesign requirements and methodologies
  - Material efficiency
  - Environmental considerations
  - Other topics
- Signposts have been set to orient stakeholders towards questions of most interest for them.

- Word document, sent out to registered stakeholders. Found here: https://eco-transformers-review.eu/documents/
- Please send completed responses to transformersreview@icf.com
- Completion deadline is 30th of September.

Quantitative Questionnaire

- After the qualitative questionnaire review, the project team will create a quantitative questionnaire to gather the necessary data to complete the research.
- Any data shared will be confidential. The research team can sign NDAs to reassure stakeholders.
- Estimated for release in November 2023.



Any questions?

Technical Analysis – Article 7 of Regulation 2019/1783

Overview of review items

Items listed in Article 7 of Regulation 2019/1783:

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

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;

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

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;

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

Further items to be analysed:

i) material efficiency aspects;

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

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

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.

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

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

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 2019/17834.

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

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).

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

Transformer sizes and scope

The Commission Regulation 2019/1783 sets out Ecodesign requirements for placing on the market or putting into service power transformers with a ***minimum power rating of 1 kVA*** used in 50 Hz electricity transmission and distribution networks or for industrial applications.

"**Small power transformer**' means a power transformer with a highest voltage for equipment ***not exceeding 1,1 kV***.

"**Medium power transformer**" means 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 than or equal to 36 kV***;

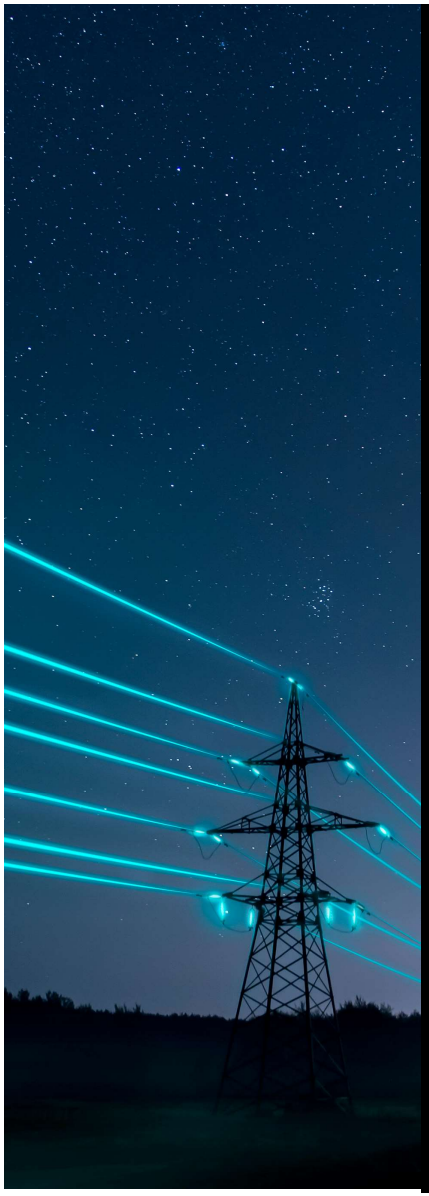
"**Large power transformer**" means a power transformer with at least one winding having either ***rated power greater than 3 150 kVA*** or highest voltage for equipment ***greater than 36 kV***;';

Regulation definitions and scope (1/2)

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 categorization of power transformers (including conventional transformers, overload transformers and fire performant transformers)



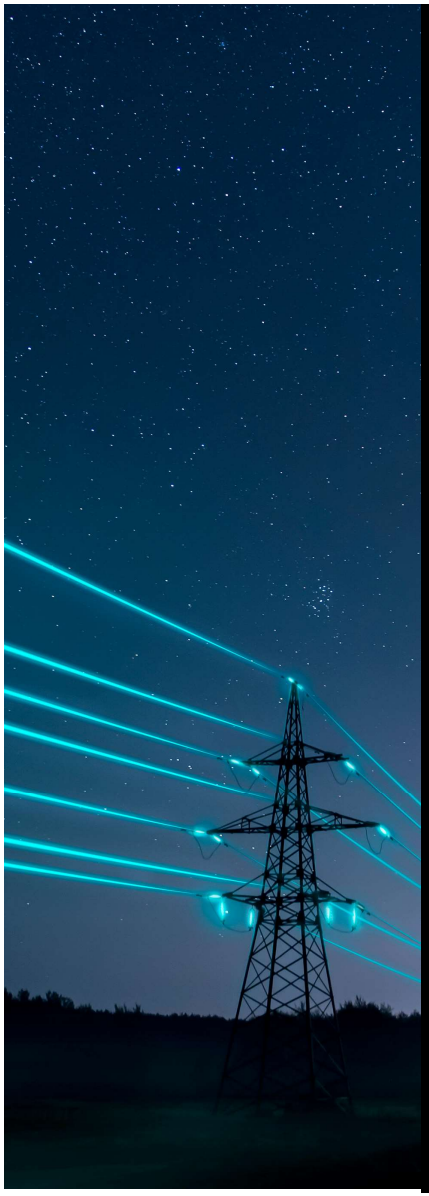
- For offshore applications, the concern is increased efficiency would increase the transformer weight, driving installer and platform costs disproportionately. The market share is estimated under 5%. Feedback suggests these may already meet Tier 2.
- Pole mounted transformers have a concession in line with the costs to install two poles in H formation setups. The concession seems appropriate, but the window should be reduced from the 400kVA maximum as not in line with rural needs.
- The concession for the combination of winding voltages seems to be in place to keep transformers within the size/weight limitations of existing substations. However, feedback suggests that this exemption may not be required for new sites.

Regulation definitions and scope (2/2)

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 categorization of power transformers (including conventional transformers, overload transformers and fire performant transformers)



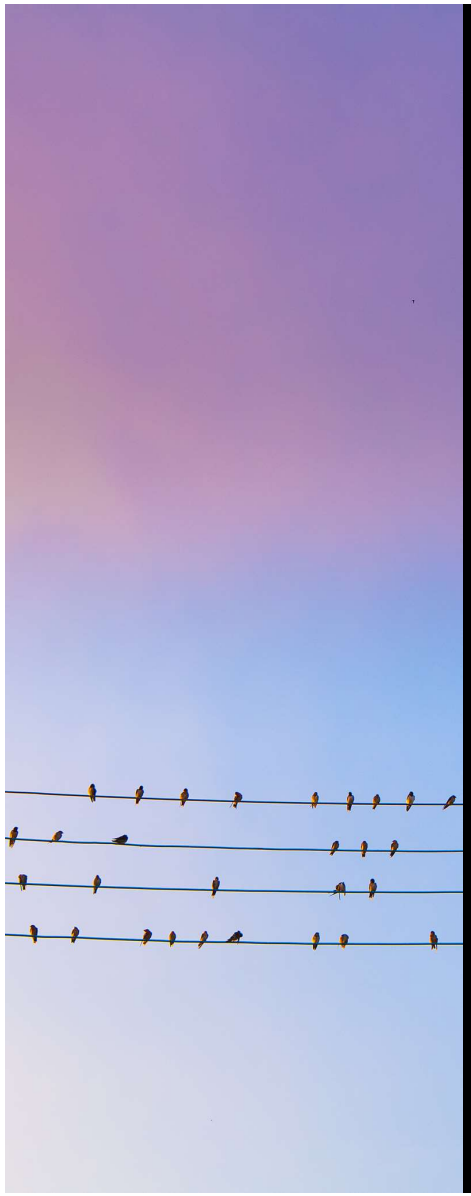
- Functional categorisation of power transformers does not seem to be required to provide specific exemptions for transformers. However, this categorisation could be useful to ensure that transformers created for specific applications, such as furnaces or railway, would have an efficiency requirement curve to match ideal load levels.

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.

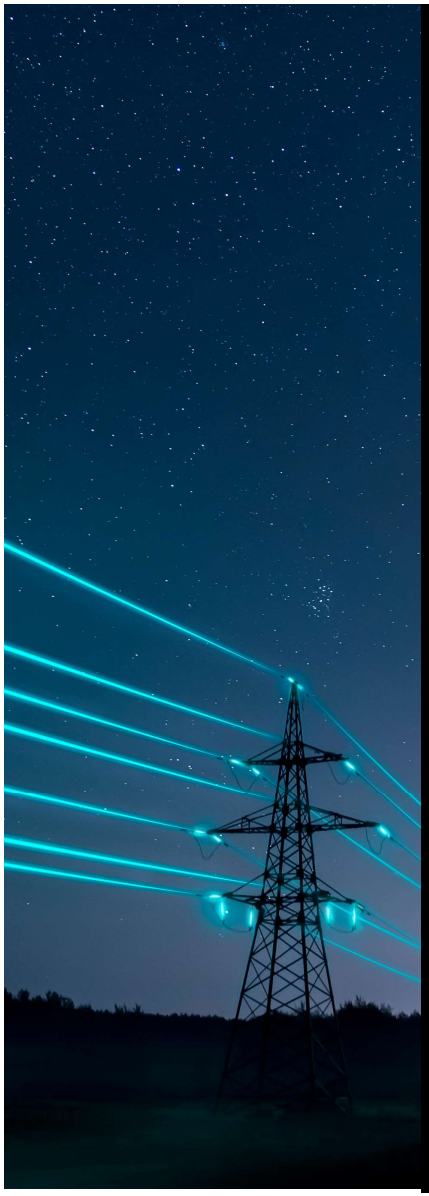


- Initial findings show that as the amorphous core transformer technology has rapidly developed and become cost competitive, it would allow a shift to a Tier 3 efficiency. The increased upfront cost would be compensated by reduction in energy loses.
- Small power transformers are defined as having a highest voltage not exceeding 1,1 kV. Current feedback shows these would not meet Tier 2 performance levels. These may increase due to new applications from green transition such as EV charging and PV inverters.
- Due to the life expectancy of transformers over decades, the increased electricity prices are not deemed to be critical over the Total Ownership Cost, as material costs have also increased.

Existing standards and regulations

j) An analysis of the standards, and 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 Tier 2.



- Standards considered are IEC 60076, EN 50588-1, EN 50629, IEEE C57.12 .
  - IEC standards are used in Europe and Asia. They require testing at 100% load.
  - IEEE is used in North America, requiring testing at 50% load.

- Review to include US regulation, Japan Top Runner and China.

Implementation of Ecodesign requirements and methodologies (1/4)

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;

- Disproportionate costs have been defined as the need for the installation to replace the complete substation housing, or require additional floor space, which would be above the net present value of avoided electricity loses. This definition is not exhaustive and fixed.
- There is an overlap of responsibilities:
  - Utilities to define site constraints
  - Manufacturer to prove constraints cannot allow for more efficient transformer
  - Utilities to make the decision to replace with Tier 1
  - Manufacturer to document transformer destination.
- The team has not yet been provided of the evidence submitted for concession.

Implementation of Ecodesign requirements and methodologies (2/4)

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;

- The Peak Energy Index (PEI) was included in 2014 for medium transformers above 3150kVA. The 2019 regulation now defines "medium power transformers" as having a power rating under 3150kVA. Therefore, Medium power transformers are currently regulated with absolute values of maximum load and no-load losses, without the use of PEI.
- Keeping medium transformers regulated under an absolute values table allows for mass production of transformers and their performance to be standardized.
- Ecodesign regulation splits requirements for liquid-immersed and dry-type transformers. The main concern for the technology split is with regards to fire-safe and leak-proof behavior. New technologies such as electronic transformers and ester-insulating liquids may allow for a technology-neutral approach.

Implementation of Ecodesign requirements and methodologies (3/4)

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;

- For this item, considerations are to be made for the transformers Total Cost of Ownership, CO2 footprinting and material passport.

Implementation of Ecodesign requirements and methodologies (4/4)

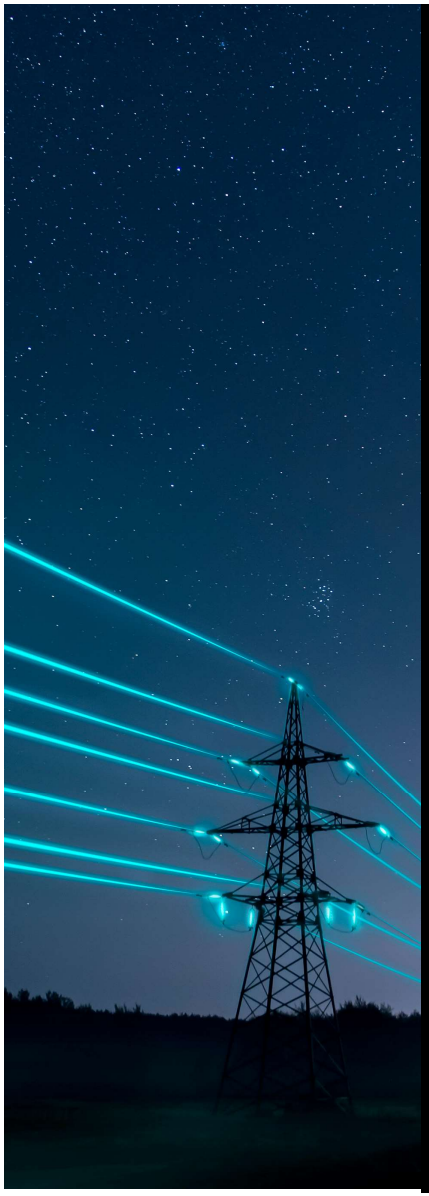
q) a techno-economic analysis on the relevance and feasibility of requirements (in particular for low-to-medium and medium-to-high voltage transformers) related to design features aimed to increase the efficiency and lifetime of transformers when working with reversed power flows (due, for instance,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

- The increase in embedded generation is leading to an increase of reverse power flow scenarios across electrical networks.
- Reverse power flows may cause result in increased core losses and a reduced the life expectancy of transformers. This is critical for older transformers.
- New transformers (notably smart ones capable of adjusting automatically to reverse flows) should be capable of matching system requirements with on-load tap changers, and hence avoid these losses.

Material efficiency

i) Material efficiency aspects;

m) Strengthening potential of the existing MEPS and the potential of introducing material efficiency requirements (MMPS)

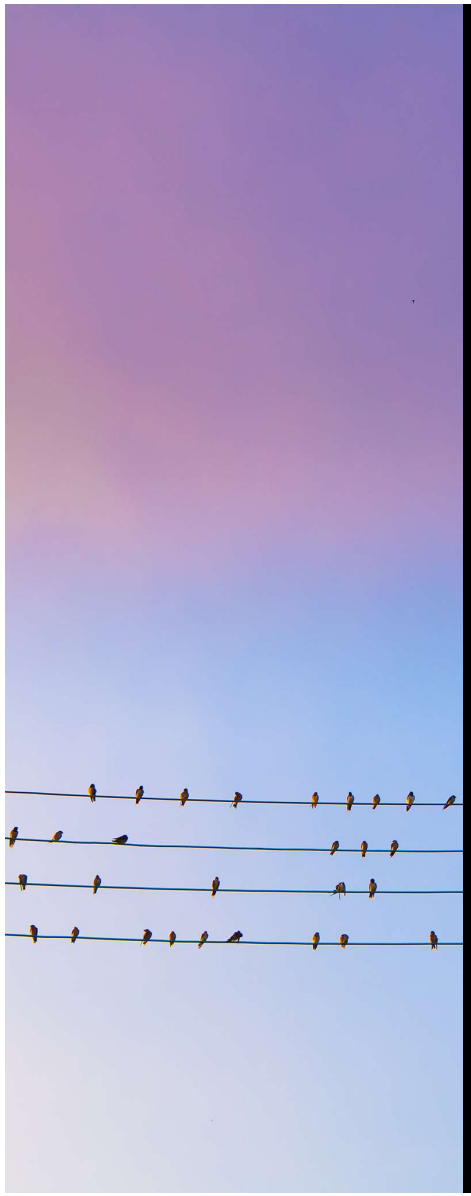


- The average life expectancy of transformers is of 50 years.
- Product failure is likely to be caused by the windings. However, rewinding may result in efficiency losses due to improper matching.
- Transformers are mostly recovered and recycled due to highly recyclable metallic components.
- The oil from liquid-insulated transformers can be recovered, and reused. There could be opportunities to strengthen this practice.

Environmental considerations

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

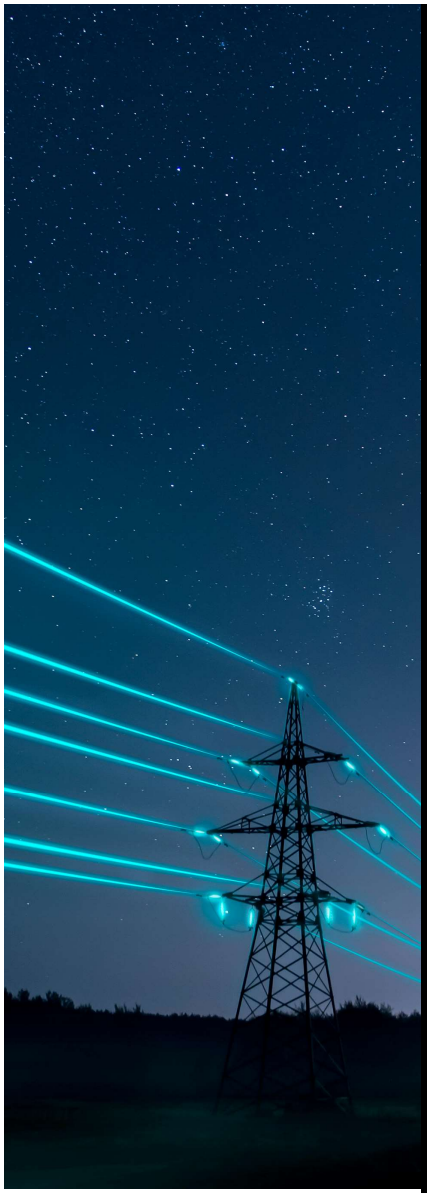
k) technological, market and regulatory evolutions affecting environmental performance;



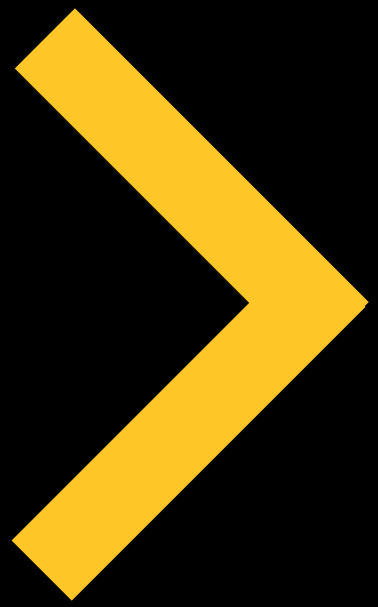
- Power transformers are currently outside of the scope of Directive 2000/14/EC on 'noise emission in the environment by equipment for use outdoors'. There could be scope for their inclusion under Ecodesign.
- Biodegradable oil may be a solution to avoid environmental concerns from leaks.
- The regulation proposal for F-Gas 517/2014 in April 2022 doesn't appear to explicitly prohibit the use of SF6 or HFCs in transformers. However, it does for electrical switchgear, and also decreases the levels of HFC production.

Other Topics

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

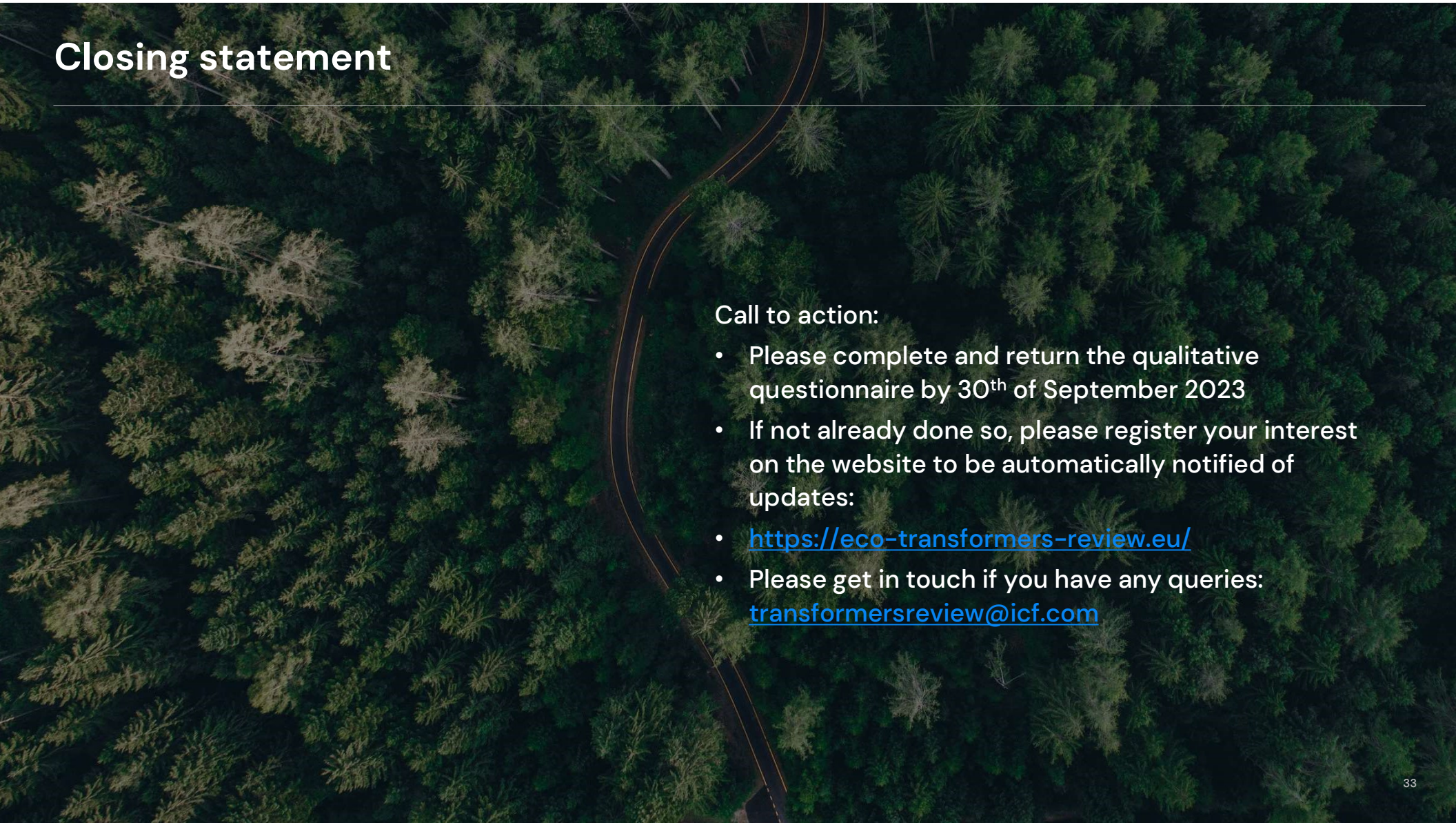


Please let us know if there are other topics which should be researched during this process.



AOB

Closing statement



Call to action:

- Please complete and return the qualitative questionnaire by 30th of September 2023
- If not already done so, please register your interest on the website to be automatically notified of updates:
- https://eco-transformers-review.eu/
- Please get in touch if you have any queries: transformersreview@icf.com

Thank you

for your participation

Get in touch with us:

Transformers Study Review
transformersreview@icf.com

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