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| Date : | 9/03/2016 | Ref. | VITO/1610352/PVT |
| From : | Paul Van Tichelen | Annex(es): | Powerpoint presentations of the meeting (see project website) |
| To : | Cesar Santos; Stakeholders | | |
| Copy : | Paul Van Tichelen, Paul Waide, Berend Evenblij, Peter Heskes | | |
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# Minutes of informative stakeholder kick-off meeting for Preparatory study for the review of Commission Regulation 548/2014 on transformers

EC Breydel building (Ayral room), avenue d'Auderghem 45, Brussels, 16th September 2016

## Participants

### European Commission

DG GROWTH Cesar Santos (CS)

**Project Team**

VITO Paul Van Tichelen (PVT)

Paul Waide Consulting Paul Waide (PW)

TNO Berend Evenblij (BE)

TNO Peter Heskes (PH)

**Stakeholders**

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| **First name** | **Surname** | **Company/organisation** | **acronym** |
| **Sacotte** | **Michel** | **T&D EUROPE** | **SM** |
| **Sigrid** | **Jacobs** | **ArcelorMittal** | **SJ** |
| **Pierre** | **Lucas** | **T&D Europe** | **PLU** |
| **Reiner** | **Korthauer** | **ZVEI** | **RK** |
| **Ray** | **Thomson** | **Noratel AS** | **RTO** |
| **Roman** | **Targosz** | **ECI** | **RTA** |
| **Hans-Paul** | **Siderius** | **Netherlands Enterprise Agency** | **HPS** |
| **Christophe** | **ELLEAU** | **EDF / Electricite de France** | **CE** |
| **Nico** | **Wurzel** | **SBA-Trafobau Jena GmbH** | **NW** |
| **KONSTANTINOS** | **PSOMOPOULOS** | **PIRAEUS UNIVERSITY OF APPLIED SCIENCE** | **KP** |
| **Jesper** | **Holmberg** | **Brussels Direct** | **JH** |
| **Peter** | **Schafeld** | **thyssenkrupp Electrical Steel GmbH** | **PS** |
| **Régis** | **Lemaître** | **thyssenkrupp Electrical Steel GmbH** | **RL** |
| **Bram** | **Cloet** | **CG Power Systems Belgium NV** | **BC** |
| **Patrick** | **LAUZEVIS** | **ENEDIS** | **PLA** |
| **Anthony** | **Walsh** | **Esb** | **AW** |
| **David** | **Crawley** | **Energy Networks Association** | **DC** |
| **Thomas** | **Hammermüller** | **trafomodern Transformatoren Ges.m.b.H.** | **TH** |
| **Angelo** | **Baggini** | **CENELC - University of Bergamo** | **AB** |
| **Manuel** | **Sojer** | **Maschinenfabrik Reinhausen, Germany** | **MS** |
| **Wim** | **De Maesschalck** | **Eandis** | **WDM** |
| **Robby** | **De Smedt** | **Laborelec** | **RDS** |
| **Carsten** | **Tonn-Petersen** | **Viegand Maagøe A/S** | **CT** |
| **John Bjarne** | **Sund** | **ABB/Norsk Elektroteknisk Komite** | **JS** |
| **Herman** | **NOLLET** | **EREA Energy Engineering** | **HN** |
| **Thong** | **Vu Van** | **ENTSO-E** | **TV** |

## Objective of the meeting

The intention of the meeting was to serve as a first stakeholder kick-off meeting `for the preparatory study for the review of Commission Regulation 548/2014 on Ecodesign requirements for small, medium and large power transformers'. The study commenced in September 2016 and is expected to conclude in May 2017 (9 months). Due to the short time available to organise this meeting direct invitations were sent to the previous Lot 2 (2011) registered stakeholders who had agreed that their names could be disclosed and after direct e-mails to the stakeholder organisations (T&D Europe, Orgalime, Eurelectric, ENTSOE). This invitation was distributed to these parties directly and anyone who registered was welcome to attend.

The purpose of the meeting was to enable the stakeholders to meet the team, discuss how they can provide input and to report their experience thus far with the current Regulation.

## Note: complementary to this minutes of the meeting the meeting powerpoint presentation can be consulted

Prior to the meeting a Memo was sent by Norwegian Water Resources and Energy Directorate (NVE) (see Annex) and also JS sent in an extensive analysis evaluating the PEI index (see Annex).

## Agenda

* 10h00-10h20 Coffee in meeting room Ayral
* 10h20-10h30: Presentation of the study team and tour de table
* 10h30-11h40: Scope of the assignment (Paul Van Tichelen, VITO)
* 11h40-11h50: Regulation 548/2014 (Paul Waide, Waide Strategic)
* 11h50-12h: Discussion on data sourcing
* 12h-12h20State of art in CENELEC TC 14 standardization (Angelo Baggini, CENELEC TC14, University Bergamo)
* 12h20-13h20: lunch
* 13h20-14h40 Stakeholders view in the review of Commission Regulation 548/2014.
* 13h20-13h40 The present time situation viewed by the manufacturers (Michel Sacotte, Orgalime, Schneider-Electric)
* 13h40-14h10 The view of a DSO: Anthony Walsh (ESB Networks) & Wim De Maesschalck (Synergrid)
* 14h40-15h: Closing, participants expectations and priorities with respect to the review of Regulation

## Minutes

**Short presentation of participants (all)**

After all participants presented themselves, Cesar Santos welcomed the participants and gave a short overview of what the study is aiming to do.

CS mentioned that there has not been enough time since the regulation measures were adopted to really know what impact it has had. The purpose of the meeting is to: ask questions, understand how the market has changed, consider which assumptions can be improved and what is being overlooked. Within this study there is a need to define priorities because the study has a modest budget and short frame. We will touch upon standardisation but discussions on this really belong in other fora.

**PVT introduced the assignment (see powerpoint in annex)**

**See stakeholder meeting presentation slides 5 till 9**

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| abbr. | Comment/answer |
| CS | asked if there were any comments on the review issues mentioned in Art 7? |
| MS and AB | Said that they have in in there slides that will be presented later today. |
| AW | said that 95% of losses from main designs and 5% from those exempted ones thus we need to focus on the main product groups |
| RTa | Mentioned that the study need to ensure that the end of life value of materials is considered |
| CS | No one mentioned the changing landscape in generation – does anyone have any concerns re the impact of the introduction of Renewable Energy (RE)? |
| KP | said they are doing work in this area and have experienced high harmonic distortion caused by power electronic converters, under a process of studying this within the context of distributed generation and smart grids. The first measurements show that a lot of losses are due to this and they are not included in the regulations. |
| AW | mentioned that future price of electricity is often driven by the capital costs of RE and this needs to be taken into account in the review of Tier 2 |
| HPS | said the new landscape of electricity generation/consumption – distributed generation – needs to be taken into account in the regulation. However he’s not happy if this is an exercise about reopening the discussion on Tier 2 because this will create uncertainty for manufacturers. NL not very happy to go in that direction. |
| CS | in absence of Commission making a counter proposal, Tier 2 will still apply; however, we should ask ourselves whether the assumptions behind the Tier 2 levels are still valid? It should be assessed without preconceptions. |
| RL | GOES producers have fulfilled the aim of Tier1 and that we have to discuss about the impact of Tier 2 |
| SJ | said that with technical solutions that might satisfy higher EE level it might have impacts on noise (due to steel type choices and the flux density)  Asked if noise information should be added to the regulation? |
| CS | said we could consider product information requirements – minimum requirements for noise might be far-fetched at this point. |
| MS | said he can’t see why noise should be part of Ecodesign regulations. Have to review basis for noise regarding the manufacturer of magnetic steel – to his knowledge there is no recognized standard on noise measurement for raw material (magnetos striction) because and therefore we cannot specify the component – CENELEC has undertaken some work to try and specify the component  (note: noise on the transformers is specified in IEC60076-10)) |
| SJ | in working group IEC TC 68 there is a technical document that specifies how to measure noise but this is not yet a standard |
| PLA | said we need a global approach of what we want for Tier 2 |
| CS | the question was whether Ecodesign could treat noise, to which the answer is yes, but that it is not the main priority of the transformer |
| AW and RL | said it was best not to focus on this – it was a side topic |
| AB | said all of us are thinking about transformers as they are now (electromagnetic transformers), but in the future we will have the same function with electronic transformers; however, we need to take these into account as otherwise we will have lower efficiency transformers outside of the regulations |
| PK | silicon carbide technologies will come and replace the typical electro-magnetic transformers as we have them now (they can deal with failures very quickly and easily compared to electromagnetic transformers - these will be installed in Italian transmission network (5MW system – via ENEL) from 2018. ENEL. Mentioned risk of large power outages are reason why these are being introduced |
| CS | asked consultants to liaise with the stakeholders on this. |
| AW | said that this was covered very well in original VITO report. Discussed solutions ESB is applying (tap transformers) to address the issues PK mentioned |

**See stakeholder meeting presentation slides 9-14 on Task 2-6.**

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| abbr. | Comment/answer |
| AW | It was confirmed that single—phase transformers were overhead and are used in the UK. Converting would require building a new line. Used since 1930s. Used to have 5 kVA and xKVA transformers but now use 15kVA. Used in rural lines to small loads. |
| MS | raised the case in the US that had similar cases in terms of population density etc. as found in Ireland. |
| AW | said that the analysis applied to Ireland based on the US case significantly overestimated the load factor for small single phase transformers. |
| MS | said T&D Europe would like to consider the findings from the US case for Ireland |
| AW | said he had gone through the US analysis and he could share the results. AW said CENELEC TC 41 said the details were sent to the Commission on this. Said in the Irish case the impedance dictated the capital costs due to the long lines (achieving sufficient short circuit power is the reason, therefore Kp is no issue because we mostly need to dimension on short circuit power, leading to a lower Kp then demanded for high eff). |
| PVT | requested that he share his information with the study team. |
| AW | said that the total MVA used in these transformers in IE and UK was insignificant (75+120MVA of transformer capacity replaced/added per annum) and hence was not a priority |
| PLA | mentioned there was no goal about market surveillance. Very surprised as non EU competitors can price based on performance and gain competitive advantage if there is inadequate market surveillance. There is a problem in the tolerance and incertitude |
| HPS | mentioned it would be good to remind MS of their Market Surveillance obligations. He also mentioned the INTAS H2020 project that is examining market surveillance for large products (transformers and large industrial fans |
| PLA | asked if it was possible to create an EU level team that could address this issue – he has seen there is a problem in competition on this |
| JH | A cooperative market surveillance project has been recently launched by Nordsyn (http://www.norden.org) to collaborate on market surveillance in the Nordic countries |
| WdM | mentioned the need to ensure different MS market surveillance authorities should measure PEI in the same way |
| PW | extended an invitation to participants to reach out (via him) to the INTAS H2020 project if they wish to raise issues about market surveillance for transformers that can be looked at by this project (www.intas-testing.eu) |

**See stakeholder meeting presentation slides 15-16 with project plan.**

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| abbr. | Comment/answer |
| CE | was glad to hear about the focus on costs assessment in Tier 2 assessment but said that capitalization cost should be given more emphasis. Mentioned cost of electricity is currently low and although it is expected to rise market actors adjust their behavior when that happens. Pertinent when considering relative importance of load and no load losses. |
| PVT | mentioned how in BE the situation changed rapidly in response to changes in the relative penetration of central versus distributed generation. Complementary to the introduction of renewables there will be a new need and cost for storage or flexibility. For example, the production of renewables do not necessarily fit with the no load losses of transformers |
| BE | Asked, for example, what should also be the requirement for a transformer connected to a wind farm? |
| WdM | mentioned there were many questions about how DSO treat upgrades for RE and electric vehicles etc. and that it’s very important that we consider where the EE of the transformer fits within this investment framework. |

**Regulation 548/2014  (Paul Waide, Waide Strategic)**

Skipped to save time in the meeting: - PW invited participants to read the PPT giving an overview of the regulation.

**Data needs and data sourcing (Berend Evenblij, TNO)**

BE discussed the data needs for the study and it is proposed to discuss it after the stakeholder presentations because they already contain a lot of information sources as could be concluded from the input received just before the meeting.

**12h00-12h20: State of art in CENELEC TC 14 standardization (Angelo Baginni, CENELEC TC14,  University Bergamo) see powerpoint presentation in annex.**

Note: VRDT = Voltage Regulation Distribution Transformers from WG30 has now been moved into an IEC process.

Followed by a short discussion about how utilities take into account the regulatory requirements in their procurement process.

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| PL | mentioned if there is a subsequent change it is a problem for utilities as it takes about 4 years to develop prototypes, test, test in situ and install. |
| PLA | The benefit of the regulation is that the clear timeline simplifies negotiations with the supply chain |
| PVT | asked if front runner utilities have already procured Tier2 transformers? |
| PLA | answered that in the case of ENEDIS they still procure Tier 1. |
| PLU | pointed out that the Ecodesign Directive is based on not increasing the amount of money customers should pay without pushing European industries to extinction |

**12h20-13h20: lunch provided by the EC in the building**

**13h20-14h40 Stakeholders view in the review of Commission Regulation 548/2014**

Stakeholders could present their views and feedback.

**13h20-13h40 The present time situation viewed by the manufacturers (Michel Sacotte, Orgalime, Schneider-Electric)**

See powerpoint presentation in annex, some notes:

* The global view of manufacturers is that they don’t want to have the PEI at thresholds below 3150kVA because they want to retain a standardised production platform.
* 75% of the products are already capable to meet Tier 2 (some issues for 1000Kva, pole mounted and 36kv dry type wind turbine), but it is not an issues for large power transformers.
* AMT are still a small fraction of products supplied and magnetic steel has improved since the previous regulation so Tier 3 could be studied.
* T&D Europe is ready to launch a study to support this study to see what is possible in future magnetic steel performance.

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| PL, AB | query about what the impact of attaining Tier 2 is on the weight of transformers and the implications this has for DSOs to replace existing Tier 1 products (impact on increasing T&D costs on substation floor).. |
| RL | said the magnetic steel product will be better tomorrow than today |

MS continued, see powerpoint, some notes:

* It is important that the efficiency of the transformer has to be measured at the terminals (otherwise opens opportunity to claim high performance associated with dropping functions that will have to be added afterwards).
* In case of repairs most manufacturers are preparing blue guides. Clarification is needed to avoid legal issues. It is more complex for large transformers (blue guide or white).

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| AB | this is a simple economic issue on the marginal costs of repairing an existing transformer versus installing a new one |
| MS | said T&D E don’t know well the survival rate curve of transformers – utilities may know this better. |

MS presented list of T&D E wishes (last slides), some notes:

* Uniform market surveillance is highest priority.
* Need to clarify what is meant by an emergency transformer. Clarify rectifier application. Need to clarify the documentation – nobody is following this on web sales currently for B2B sales. Clarify the concession case for large power transformers.

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| abbr. | Comment/answer |
| CS | asked the stakeholders if the future limits of transformer EE are related to weight and retrofitting rather than other issues – is this true? i.e. could we end up with transformers that are so efficient that they can’t be installed in substations? |
| PLA | raised the issue that if we want to make progress we need to consider the issue dependent on the type of final application because the retrofitting constraints are very different between DSO/TSO substations and other applications. Could take 100 years to replace all existing substations. |
| WdM | agreed that~60% of transformers they install are retrofits in existing buildings. Space and not touching the substation is much more important than the cost of the transformer – if the former have to be changed as a result of the transformer change the cost is 5-10 times higher |
| HPS | said the substation issue isn’t new so the challenge is to make the Tier 2 transformers that meet the same form factor |
| MS | first they have to check if it is possible (in some cases it is and in some it isn’t). Also, if we move form Al to CU in most cases we can meet the Tier 2 but the cost difference for conductor is a factor of 3. |
| PLA | raised issue of extra weight when using CU that lead to an accident with an operator |

**13h40-14h40 The view of a DSO: Wim De Maesschalck (Synergrid) & Anthony Walsh (ESB Networks)**

See powerpoint presentations in annex.

AW (or WdM) made the following remarks during his presentation:

* Proposes to use the long run marginal cost (LRMC) and appropriate discount rate.
* For a large transformer 50% of the costs could be for transportation. Other costs are associated with site costs.
* Asked whether for Tier 1 the impact of in line with our expectations? (Reported anecdotally a 20% increase in weight and price for a range of Tier 1 transformers
* WdM mentioned utilities are limited by budget and have large asset bases – need to make assessment of what yields best result (upgrade many transformers with marginal EE gain but low incremental cost or a lower number of optimal transformers).
* AW also mentioned investment trade off choice between reducing losses by upgrading line capacity or putting in higher EE transformer.
* ESB capitalise the losses with LRMC and assess them over the life time of the transformer.
* AW said there was only 1 single phase DT manufacturer in EU

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| abbr. | Comment/answer |
| TV | said if view total losses from generation system operator range is 2-2.5% (TSO) and for distribution is round 4% - transformers can save maximum of 0.5%. |
| RTA | clarified typical T&D and transformer losses in the EU. |
| PVT | asked if we could have the price of the transformers assumed in the presentation– AB said no but can generally assume the price is proportional to the weight |
| AW | said no but can generally assume the price is proportional to the weight |
| PK | said we need to consider Ecodesign of transformers and not just the EE. Need to consider total cost on whole life time of transformer including end of life and not just operational life (which is what utilities focus on). |

WdM continued part of the DSO presentation, some notes:

* Eandis (DSO) use TCO procurement in accordance with CENELEC guide and follows the Regulation in that way that tenderers can offer Tier 1 but can get a bonus for Tier 2.
* They are looking for asset performance including network reliability, customer connectivity, open market therefore open technologies, national policies/regulations on safety, RE etc. Interchangeability of transformers is critical (typically 2-3% asset stock replacement figures).
* They have focused on TCO for many years and have lower losses as a result.
* They discussed in detail problems with weight and dimensions.
* Reaching Tier 1 had been ok for size impacts but Tier 2 may be problematic.
* See conclusion slide ad general message of beware unintended consequences – i.e. shift to dry type to keep within space constraints.

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| abbr. | Comment/answer |
| PL | said for ERDF just reaching Tier 1 resulted in 20% increase in size |
| TV | Confirms this and recommended to put more efforts on consideration of exemptions |
| CE | said on behalf of the EDF Nuclear Generation: they also have these limits on weight, dimensions and clearances regards the HV parts for the transformers on site and in buildings |

**14h40-15h30: Closing discussion on participants expectations and priorities with respect to the review of Regulation 548/2014, AOB**

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| abbr. | Comment/answer |
| CS | asked MS of T&D E if there were ingenious technical options to keep within weight and size? |
| MS | said that there were some options to keep within weight size but required best materials, increase cost and impact on noise. Manufacturers have to solve the three issues of weight, size and noise |
| RL | queried how it was possible that the size of the core had increased by 20% given that steel producers had shipped a lot more high quality magnetic steel. |
| MS | said that the improvement in magnetic steel had not been enough to reach the requirements and therefore size increases had also been needed |
| HN | mentioned the case of the Low Voltage transformers his company EREA produces. Installed base of 50 MVA per year for EREA’s products |
| CS | said that a significant rationale would need to be elucidated for why there should be any exceptions for these products |

PVT said the next step will be to send out a request for data. He will contact stakeholders and especially to request that those who have indicated in this meeting that they have conducted similar data acquisition exercises (T&D E and CENELEC (MS), Eandis (WDM), Norway,(ESB single phase(AW)) that they should share their data. Suppliers of data can indicate whether their data (in whole or in part) is confidential and the study team will discuss with them how they can manage/use confidential data. After this extra enquiries can be launched to fill the gaps identified.

**15:50 meeting closed**