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From	:	Paul Van Tichelen	Annex(es):	**Powerpoint presentations of the meeting + stakeholder comments (see project website)**
To	:	Cesar Santos; Stakeholders		
Copy	:	Paul Van Tichelen, Paul Waide		

Minutes of informative stakeholder Workshop for Preparatory study for the review of Commission Regulation 548/2014 on transformers

EC Breydel building (Ayral room), avenue d'Auderghem 45, Brussels, 29th March 2017

Participants

European Commission

DG GROWTH	Cesar Santos (CS)

Project Team

VITO	Paul Van Tichelen (PVT)
Paul Waide Consulting	Paul Waide (PW)

Registered stakeholders for the meeting

First Name	Surname	Company / organisation name	acronym
Wim	De Maesschalck	Eandis / Synergrid	WDS
De Smedt	Robby	Laborelec	RDS
Angelo	Baggini	Cenelec	CENE
Michel	SACOTTE	T&D Europe	T&D
Pierre	Lucas	T&D Europe	T&D
Anthony	Walsh	Eurelectric	EUREL
Roman	Targosz	ECI	ECI
Kai	Pollari	ABB	ABB
Jean-Christophe	RIBOUD	RTE/ ENTSO-E	ENTSO
Patrick	Lauzevis	ENEDIS	ENE
Christophe	ELLEAU	EDF Production DIPNN	EDF
FREDERIC	WALTER	Cahors-Transfix / AFNOR UF14	CAHOR
John Bjarne	Sund	ABB/Norsk Elektroteknisk Komite	JBS
Armin	Vielhauer	E.ON SE	EON

Bram	Soenen	BE Ministry of Environment - Product policy	BS
Sigrid	Jacobs	ArcelorMittal	SJ
Michael	Scholand	CLASP	CLASP
Bram	Cloet	CG Power Systems Belgium NV	CG
KONSTANTINOS	PSOMOPOULOS	PIRAEUS UNIVERSITY OF APPLIED SCIENCE	PIR
Ray	Thomson	Noratel AS	NORA
Radoslaw	Szewczyk	DuPont + Polish National Committee	POL
Mark	Allington	ICF	ICF
Jonathan	Hayward	BEIS	BEIS
Régis	Lemaitre	thyssenkrupp Electrical Steel	TK
Guillermo	AMANN	ORMAZABAL	ORMA
Theo	Meeks	Stedin B.V.	STED
Fernando	Ramalheira	EDP Distribuição	EDP
Flavio Mario	Mauri	e-distribuzione	FLAV
Carsten	Tonn-Petersen	Viegand Maagoe A/S for NVE	VIEG
Christer	Skotland	NVE	NVE
Paul	Jarman	National Grid UK / IEC TC14 chairman	UKGRI
Vincent	Hay	Energy Networks Association	ENA
Andreas	Halatsch	environment agency germany	AH
Gert	Rietveld	VSL	VSL
Hans-Paul	Siderius	Netherlands Enterprise Agency	NL
Mike	Rimmer	Dept for Business, Energy and Industrial Strategy	RIM
MAR	OLMEDO	GEDELSA	GED
Anders	Hallberg	Swedish Energy Agency	SEA
ilaria	sticchi	ANIE Federazione	ANIE
Jesper	Holmberg	Brussels Direct/Hitachi Metals	JH
Jeremy	Tait	Tait Consulting Limited (for ECOS)	ECOS
Moritz	Schlegel	BAM Federal Institute	BAM
Franziska	Schwerdtle	ZVEI	ZVEI
Herman	Nollet	EREA Energy Engineering BVBA	EREA
Senta	Marenz	CEER (Council of European Energy Regulators)	CEER

Objective of the meeting

The intention of the meeting was to serve as a stakeholder workshop 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). The purpose of this meeting is discuss the draft report that was published on the project website (https://transformers.vito.be/) and to the hear the views of the stakeholders on the related tasks. Before the draft report was compiled two stakeholder enquiries were launched from which results are in the report and/or presented in the meeting.

Note: complementary to this minutes of the meeting the meeting powerpoint presentation can be consulted together with the input comments received from stakeholders on the project website

Agenda

9h00: Registration desk opened
9h00-9h30 Coffee in meeting room Ayral
9h30-9h40: Presentation of the study team and tour de table

TASK 1
9h40-10h20: Task 1 report on minimum requirements for Tier 2 (Paul Van Tichelen, VITO) (incl. remarks on discount rate (Eurelectric) and Tier 2 CAPEX (Hitachi Metals))
10h20-10h25: CAPEX for EE compared to CAPEX for RES(Paul Waide)
10h25-10h30: GOES development for Tier 2 (Regis Lemaitre, Thyssens Krupp)
10h30-10h50: T&D Europe on Task 1 (Michel Sacotte, T&D Europe)
10h50-11h00: Impact of using Copper for Tier 2 GOES transformers (Roman Targosz, ECI)
11h00-11h15: Eurelectric on Tier 2 Economic feasibility in green field and brown field (Antony Walsh, Eurelectric)
11h15-11h30: coffee
11h30-11h40: The view of TSOs (Jean-Christophe RIBOUD, ENTSO-E)
11h40-11h55: Discussion on the Economic feasibility of Tier 2
11h55-12h15: Discussion on how to set Tier 2 requirements for medium power transformer
12h15-12h30: AOB related to Task 1?

12h30-13h30: lunch

TASK 3
13h30-13h50: Task 3 VERIFICATION OF EXISTING EXEMPTIONS AND REGULATORY CONCESSIONS
13h50- 14h10: Summary of contributions by CENELEC TC 14 pre-standardization activity (Angelo Baginni, CENELEC TC14, University Bergamo)
14h10-14h20: T&D Europe point of view on Task 3 (Michel Sacotte, T&D Europe)
14h20-14h30: Example - existing limits in the EDF Nuclear installations (Christophe ELLEAU, EDF)
14h30-14h40: Discussion on concessions for green field large power transformers
14h40-14h50: How to deal with pole mounted transformers?
14h50-15h00: Dual voltage: is it a loophole? Review the requirements and how?
15h00-15h15: other Q&A Task 3 + How to proceed with input in Task 1&3
15h15-15h30: coffee break

TASK 4/2
15h30-15h40: Task 4 ON ANALYSIS OF OTHER ENVIRONMENTAL IMPACTS(Paul van Tichelen, VITO)
15h40-16h00: Task 2 CONSIDERATION OF MINIMUM REQUIREMENTS FOR SINGLE-PHASE TRANSFORMERS(Paul Waide)

16h00-16h10: If and how to deal with small power transformers (Paul Waide)
16h10-16h30: Closing + AOB

Minutes

Short presentation of participants (all)
After all participants presented themselves, Cesar Santos welcomed the participants.
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9h40-10h20: Task 1 report on minimum requirements for Tier 2 (Paul Van Tichelen, VITO)
(see Powerpoint presentation available on the website)
Amongst others PvT said that Hitachi has told him Trafo costs are lower than what is assumed in the study and that the margins on sold products are low. Prices are in the reference – PVT asked for stakeholders to review this data. PvT said Eurelectric had said that the discount rate should be 4% in line with the better regulation tool #54. Seems unrealistic but even with this rdr the sensitivity analysis seems to show that Tier 2 is still more economic than Tier 1. MEErP uses a 4% escalation rate electricity prices for household products.

abbr.	Comment/answer
PVT	PVT said Eurelectric had said that the discount rate should be 4% in line with the better regulation tool #54. Seems unrealistic but even with this the sensitivity analysis seems to show that Tier 2 is still more economic than Tier 1. MEErP uses a 4% escalation rate electricity prices for household products that compensates in calculations the 4% discount rate.
EUREL	Anthony Walsh said (a) 4% is the real discount rate after inflation – inflation of 2% is NOT subtracted from the real discount Rate of 4% (b) MEErP 4% Escalation rate refers to Household electricity including taxes and fixed costs but is not appropriate to apply over full transformer lifetime (c) Rate of €0.08/kWh refers to Domestic after DUOS deducted, rate of €0.12/kWh is rate without deduction of DUOS.
PVT	said he will add a calculation with 4% rdr to the next version of the study in a kind of sensitivity analysis
CS	confirmed that a 4 % discount rate combined with 4 % escalation rate is currently used for household products
EUREL	Stressed that for households there are taxes and other factors that influences electricity prices. According to him we can't have a situation where energy prices are going up with 4 % per year. EUREL said also that long term financing costs needed to be added in.
CEER	Supported the Euroelectric view on fixed costs of electricity not being reduced i.e. that impact on energy costs should be the comparison basis.
PVT	Says that we are aware that due to the long life time of transformers these aspects have a strong impact. The study team has not a crystal ball on future development of interest rates and electricity prices but will seek advice within the EC and add various scenarios in a sensitivity analysis in an update of the report.
PVT	explored what the impact would be if the total CAPEX costs were lower & BAT (AMT), therefore reference was made to new transformer price input received from Hitachi
T&D	said that there is new data that AMT costs are now much lower for Tier 2 but it is a new data that has to be analysed
JH	Jesper from Hitachi Metals said there is a link in their comments to the price of the products
FLAV	said do not forget installation costs

PVT	said he looked at this and found very different substation installation costs in BE and DE
ENE	Patrick Lauzevis said that there were many factors that affect these costs and there are many steps to install a substation; installation can take up to six months. You have a product price but after that you have transportation etc.. Hence he said be careful with considering the product price alone.
PVT	In summary PvT said Tier 2 is justified for green field sites but said that the main issue is for brown field sites
PVT	presented the PEI and kPEI findings
ECI	Roman Targoz said load losses should be an increasing priority. He said Eurelectric's model is not relevant to current situation – based on load data from 10 years ago and situation has changed as loads have risen.
PVT	said if the PEI approach were permitted for distribution transformers in Tier 2 we could have cases with a higher efficiency at lower load levels
T&D	For manufacturers PEI is impractical to manage for distribution transformers and will increase the price of transformers due to poorly adapted components supply and reduced concurrency, it will lead to increased CO2 production in the event that the load factor is not indicated (Often the case in diffuse market) and will also decrease the standardization of transformers in European Countries.
UKGRI	said trafo designs for high and low loads were fundamentally a choice – can't have both for a given price and therefore really critical that kPEI choice is open. Also takes issue on what is happening on the network said that for transmission networks distributed generation is increasing difference between minimum and maximum loads and that average loadings may be coming down on transmission networks. DSM could have the opposite effect on distribution networks
PVT	Said that manufacturers could check if it is technical possible to have designs optimized for either very high or very low loads
JH	Tier2 is justified for greenfield, one need to precisely define exceptions for brownfield- why not use the DoE procedure for this? Note that the DoE MEPS could also be used for tier3…
EUREL	Anthony Walsh said some utilities are in favour of Fixed Losses, but others prefer PEI because they want to be able to match the load factor of the trafo to the load they expect to get. In high loads want to minimise Cu losses in low load situations want to minimise Fe losses. So PEI should be available as an <u>additional</u> alternative to the values of Fixed Losses.
ENE	Patrick Lauzevis as opposed to AW said that for ENEDISF (DSO) fixed losses were very easy to manage. Having several PEI options is very complex and he is not in favour of that. If different PEI losses are allowed it's also difficult for the utility to manage the network losses. I confirm ENEDIS prefer 'fixed losses'. For information other DSO than prefer use fixed losses : EDF Nuclear plan, EON, RWE, ENBW , Laborelec, Eandis, SSE, Iberdrola and Latvia ...
ORMA	said need exception for trafos > 36kV but < 4MVa
ENTSO	said for nuclear stations safety aspects are of concern and therefore large transformers are used indoor. He is not in favour of a minimum kPEI due to physical constraints.
PVT	This will be discussed in Task 3 and is also in later presentations.
CS	Cesar Santos asked to clarify losses issue in response to JC Riboud and said that no load and losses will remain as information requirement in the regulation. Therefore he asked whether it makes sense to replace with minimum requirements with PEI and a formula versus compared to tables with no load and load losses? Please give me your views. Is there a downside for compliance?
FLAV	said he favoured PEI but other stakeholders said they were in favour of fixed losses. There is no agreement on this. A possible proper solution is to keep fixed losses as preferable and

	PEI as alternative.
EUREL	Anthony Walsh said the additional alternative of PEI still allows using fixed losses in the tendering procedure with exactly the same values. In principle it should not make any difference for those who want fixed losses they can do that it only opens the opportunity for those who want other values to do that.
CS	Is there any downside having this choice of both fixed losses and minimum PEI?
ENE	I am in favour of fixed losses. For larger transformer PEI is right.
EDP	If the Regulation has the PEI as alternative (calculated from the Regulation table losses) each DSO can build, from this PEI and its own network Kpei, a proper fixed losses table. So, at the end, no problems for the manufactures neither for any DSO network manage, because it will work with fixe losses again. In Europe is not possible to have completely standard transformers, since there are different network voltages. If a DSO wants to follow the Regulation fixed losses table, they can make it.
T&D	Said that each country will have different set of load and no load losses for example due to differences in cost of electricity prices. This is very difficult for the manufacturers because they cannot standardise products, they want the same transformer for all countries. When they have to design different transformers for each market they will be no economic optimal transformer either. We have to remember that CO2 saving should be our target. All manufacturers around the table share the same vision.
EUREL	He points out that transformers should be designed to match the load in order to operate efficient. Utilities do not pay for the electricity used the same as other costumers, therefore for calculating the benefit to the society price they only uses the energy component which was based on their analysis on international gas prices converted to electricity taking thermal plant efficiency into account. All Utilities can do this therefore with the same factors for calculating capitalisation factors.
PVT	We noted that there are different and opposite statements but the report will contain various scenarios. He noted also that renewables are not cheap compared to converted gas prices.

John Barjne Sund presentation (see Powerpoint presentation available on the website) –

WG29 collected data on transformers which were the basis behind their PEI analysis. These data can also be analysed with respect to total losses. This is done, and the results are shown in the enclosed table. These losses are in line with the transformers having the lowest losses in the collection, which contains several hundreds of transformers. They are grouped according to their rated power and the voltage level on the high voltage side. These transformers are installed in several EU countries and have been in service for some time. This indicates that transformers with such losses are fully possible to manufacture.

John Bjarne Sund showed also a graph of total losses vs Po/Pk. The loss curves get steep below 0.2 times Po/Pk. So the conclusion is that the ratio Po/Pk should not be below 0.2 if PEI still will be chosen as the acceptance criterion. In that case the PEI figures should in addition be increased in order to obtain reduced losses.

abbr.	Comment/answer
JBS	He said that the PEI approach without additional requirements has an inherent large loophole, which enables purchasers to buy transformers with low purchase price and very high load loss *which still fulfil the PEI requirements!*
UKGRI	Paul Jarman said that this consideration for total losses was irrelevant because optimisation

	would be for 100 % load. Network transformers should not be optimized for this load and adoption of a total losses approach would have substantial unintended consequences (in terms of a less efficient network).
JBS	John Bjarne Sund said that purchasers, who want the optimisation of a large power transformer done at a particular load current different from the rated current, can specify that in the enquiry. The manufacturers can easily meet this request. According to him, before Tier 1 came into force, the large majority of Norwegian distribution utilities simply bought distribution transformers with the lowest purchase price, disregarding the transformer losses.
CENE	We looked at this topic of total losses in CENELEC and voted negative. CENELEC believe it is better to stay on PEI.
JBS	If the purpose of the Regulation is to prevent transformers with high losses to enter the EU-market, the PEI will fail in doing so.

Roman Targoz ECI presentation – conclusion weight increase is very slight for high efficiency TIER 2 tranformers based on Copper. In many cases Cu designs shown to be lighter than Al. For 1600 kVA oil immersed weight difference is 2-3% moving to Tier 2.In all cases Cu is lighter than Al. Furthermore Cu helps to reduce oil volume.

abbr.	Comment/answer
FLAV	said that more than 90% of his existing substation sites are limited to around 2 tonnes.

Anthony Walsh Eurelectric Presentation:

Eurelectric is in favour of loss reductions, but such reductions must be in best interests of the Customer, who ultimately pays. So Savings from reduced losses must pay for any extra costs involved.
For Distribution Transformers there were large increases in the costs for the Transformers, as well as significant cost increases in accommodating new transformers of extra size and weight in existing substations. Having larger greenfield Sites would also cost extra money for both the utility and developer and was not a cost free way of accommodating more efficient transformers.
Eurelectric would like a choice of EITHER Fixed Loss or PEI for Distribution Transformers – many utilities like the simplicity of Fixed Losses but others would prefer PEI especially where their Load Factor was different.
Eurelectric illustrated that using typical capitalisation rates the savings in losses produced in moving from Tier 1 to Tier 2 were about 10% of the price of the Transformers, yet the expected price increases shown in the Laborelec report were much greater – typically 30 – 120%. This indicated that TIER 2 was excessively costly to the Customer.
Eurelectric suggested that the values propsed by CLASP for TIER 2 from a detailed engineering/financial analysis looked more economically feasible, and Eurelectric suggested that the range A0,Ak to A0 Ak+20% be considered instead for Tier 2.
In relation to exemptions for Tier 2 on the grounds of not technically possible/not reasonably practical/not economically feasible Eurelectric suggested using capitalised values as a benchmark alternative OR using a Transformer constructed to yield losses consistent with having been constructed with typical Tier 2 materials.

Regis Lemaitre presentation on GOES developments for Tier 2. There is a direct relation between performance of the material and of the transformer. GOES accounts 2.3 to 2.5 million tonnes worldwide (less than 0.2% of world steel production). 96% of trafos built with GOES – AMT ~4% (% is lower in EU). Would like EN10107:2014 and IEC60404-8-7 rel. 2017 standards terminology to be used in the final report to avoid confusion. Laser scribing technology allows performance to be even

higher. GOES losses improvement has continued over 60 years. Thickness has also been reduced – now going down to 0.20 and 0.18. Moving from CGO to HGO reduces losses 20% at same thickness and moving to laser scribed 0.23 mm best grade reduces losses by another 25% versus HGO 0.30. Tier 1 increased demand for best HGO grades. Steel mills ready to make Tier 2 material available. EU REACH will ban Chrome VI on 21.09.17 and such Cr VI substances are used in GOES coating process. Now a Cr VI free() coating has been produced. Because it is related to the manufacturing coating process this only applies to European manufacturers. Thanks to research expenses and capital investment in coating equipment they have developed a more costly chrome VI free coating process.

abbr.	Comment/answer
PVT	Taked note of Chrome VI free coating process and will add this to Task 4 of the report.

Michel Sacotte (T&D Europe) presentation. Study needs to consider high temperature insulation trafo designs. CAPEX differences for Tier 1 and Tier 2 are appropriate for green field. Generally they are also ok for brown field sites but in some very specific cases very high prices can occur. Tier 2 is always reachable. New technology could be used to reach it but this has not happened yet. Study was based on existing technology. Risk on only specifying PEI – manufacturers oppose using PEI for < 3.15MVa even with limits on the kPEI value. Belgium distribution transformers are a special case with double winding – so does not represent the EU case for brown field sites. For Tier 3 the statements should be more technologically neutral re dry vs oil types. For single phase manufacturers can produce models with lower losses.

abbr.	Comment/answer
T&D	Michel Sacotte from Schneider said that their single phase manufacturing produce less than 100 units in Greece per year and this is not for use in Greece, hence the information supplied by Greece (see comments) on single phase transformers cannot be correct and one should be careful with it.
FLAV and ENE	New technologies available, as use of special insulating solid material and high temperature insulating liquids, are very interesting from utilities and I want to keep all options for new technology open. The regulation should not limit new technology but rather do the opposite.
ENE	Also added that therefore we should set performance requirements by function but never describe technology (copper ....)
T&D	Indeed we should not forget that in 2011 everyone thought Tier 1 is impossible and now we are there without any problem. For the future also Tier 2 will be possible with existing production technology but in some cases with new technology. The future is with new technology and we will have smaller transformers.
EUREL	They support sustainability but Tier 2 levels but it must be cost neutral and affordable to customers. Tier 2 trafo costs 30-120% greater according to their estimates. Installation cost is several times higher compared to transformer costs and therefore exemptions are needed for brown field. For large power transformers the requirements are fine but they don't support minimum kPEI. Similar issues apply for pole-mounted. More thought needs to be given to brown field vs green field. Use of Cu should not be a requirement. Suggestion is to use PEI as an additional alternative for DTs as set out in the proposals they made.
ECI	Roman Targosz – said: • Cu will not dominate the winding material of Tier 2 trafos but copper winding can better address space weight constraints (see presentation) • ECI are assisting in Copper anti-theft approaches.

	• On interest rates ECI said that Eurelectric are using net present value calculations with very high discount rates which might potentially be explained by taking into account high risk factors, but according to the view of ECI this is not correct and discount rates should be risk free rates. There is no political risk.
EUREL	Confirmed that he used 4 % discount rates (= interest – inflation) and in his opinion this should be right.
PVT	PvT said we do not underestimate the costs and the discussion is between the future operational costs and the capital costs.

Lunch (12h30-13h30)

PvT Presentation on Task 3 on exemptions

abbr.	Comment/answer
EUREL	said the iron loss figure 0,7 W/kg proposed was very low
PVT	PVT said he agreed but this is just an indicative figure – here it was simply important to agree the principle. It should also be noted that the value is set at 1,5 Tesla while values in the standard for silicon steel are at 1,7 Tesla, the reason for proposing a value at 1,5 Tesla is to have also amorphous steel in the scope.
CS	Raised the issues again on the repair topic – a) one issue is if the current text is ok, b) if a repaired or second-hand product is imported into the EU from a third country, then it is placed on the market for the first time and it is subject to the requirements, that much we know.
EUREL and ENE	said for Euroelectric for transformers that fail they never get them repaired because the installation cost is so high that they don't take the risk and they don't see the issue, they only do it for large transformers or for small ones that were externally damaged
PVT	said its good news it's a non-issue from the utilities point of view, however we should not forget that it could be an issue for industrial clients.
PVT	said for pole-mounted trafos – concession should be limited to single pole
ENE	ENEDIS agree
T&D	said that for the time being it should be probably possible to find a solution for medium power transformer but not for large power transformers; For the time being we are applying the blue guide.
CENE	see also our analysis on the topic of repair in the next presentation

Presentation - summary of contributions by CENELEC TC 14 pre-standardization activity (Angelo Baginni, CENELEC TC14, University Bergamo). Discussed the document prTS50675 issued by CLC TC14. Conducted survey of impact on weight and dimensions. On exemptions proposal is to simplify and better qualify the exemptions – to link them practically to brownfield sites.
Requested Commission to define the economic criteria that would need to be demonstrated. Also produced a definition for single pole transformers with weight constraints. Also includes MEPS proposals in Part 2 and 3 – mostly Tier 2 with some exceptions/enhancements. Keep present definition for dual voltage transformers. For single phase transformers PEI values are listed. Designed to solve the Cz Rep issue.
Suggested to update the PEI curve to include the cooling consumption at KPEI. A new proposal on market surveillance uncertainty treatment was put forward.

abbr.	Comment/answer

	Some stakeholder asked if this document achieved by consensus?
CENE	We did fight a lot but this really something based on a consensus.
PVT	Thanks for the presentation and this is very useful data for the review study.

Presentation: The view of TSOs (Jean-Christophe RIBOUD & Paul Jarman, ENTSO-E). Stressed that he is talking for large units. He questioned the practical recycled Cu price in the study – not as high as indicated in report because it is wrapped in paper. He raised question of Cu cost variability. For large transformer defining a minimum kPEI is against EE. He also said that the PEI approach is working effectively for large transformers. For repair felt they were not allowed to sell a 2nd hand transformer that they placed on the market – however, it is a very niche market for large transformers. For Tier 3 – potential benefits are small compared to the effort.

abbr.	Comment/answer
JBS	John Bjarne Sund said that his employer many years ago requested the purchasers to specify the loading profile of the transformers in the enquiry. Then the manufacturer should suggest the rated power of the transformer. However, the purchaser did not respond to this approach, probably because the purchasers in many cases had difficulties in predicting the future loading profile. However, in cases when the purchasers have specified loss capitalisation values, the square root of B/A gives an indication of the average loading factor during the time the transformer is intended to be in operation.

Christophe Elleau (EDF Generation) presentation - spoke about space constraints in nuclear plants. The constraints are presented in pictures with several cases in existing installations. EDF insists to keep exemptions for existing installations for power transformers, and for transportation up to the final connection in the electric room. For greenfield sites is important as well.

Michel Sacotte presentation T&D Europe point of view on Task 3. Proposed need to fix limits for medium power transformers in terms of density and magnetic flux. On repair mentioned we should not forget new technology for transformer repair.

abbr.	Comment/answer
ORMA	said that he thought the definition was clear
CS	Asked when can we consider a repaired transformer as if it were a new one? If there's is consensus on the criteria to define when a repair transformer can be considered like new, then this could be reflected in the draft Regulation ?
T&D	Said for distribution transformer we are close to having a definition. For power transformers less so.
EUREL	Said that the answer is in his paper. He wants technology neutral requirements and steel should loss requirements for Tier 2 should not be more compared to Tier 1 otherwise it would be more expensive.
T&D	Did not confirm that and said that technical progress had a positive impact on price and performance, for example compares the current situation to 2008. Therefore the market situation today does not say anything for the situation tomorrow.
T&D	Says that repair of transformers approach from CENELEC has to be shared with T&D Europe. Life time can be considered, e.g. 30 years. In the end you also have new technologies for repair to be considered.
HPS	said the citation is from the blue guide but that the blue guide said if … then it "may" be considered a repair
ENE	said for distribution transformers that it was not worth repairing those that have failed because of the high installation cost – thus it's a non-issue

ORMA	Said the problem was not with utilities but other users where the transformers are sold one by one.
HPS	Suggested that the consultants should look at the CENELEC definitions and combine them with the text in the blue guide.

Paul Van Tichelen presented Task 4 on other environmental impact – he note that no proposals were received. Harmonics in the line voltage justify Tier 2.

After Task 4 he requested that stakeholders should say if they wish to update their comments as we will process the final comments?

After a short discussion the conclusion was that the deadline for comments and position papers to be included in the study is the 28th April.

AOB

abbr.	Comment/answer
ECOS	Said we didn't cover small transformers – rapid growth in electric vehicles and 30% growth in market size. Can look at correlation?
PVT	It are LV/LV transformers and in all this one should also look what are the drivers to use them, safety and isolation? Could it be transformerless such as in PV converters? We can only mention in the report due to limited resources. Note there is little time foreseen in the study and it could be connected to ingle phase which is the next presentation. Note also that LV/LV transformers are often inside machines and are therefore sometimes covered by the machine energy efficiency requirements. A discussion followed but nevertheless it was concluded that for small applications that have no specific requirements it can be a good solution to set ecodesign requirements.

15h40-16h coffee break

Paul Waide presented Task 2 on single phase transformers. These transformers are used in single phase MV networks which are present in Ireland and the UK only. It is therefore not considered as a loophole and it is also not relevant for most of the European countries.

abbr.	Comment/answer
EUREL	Note that the single phase transformers as referred by in the Greece comments are in his opinion not distribution transformers
AREA	Are we talking about medium voltage single phase transformers?
EUREL	Yes
EUREL	When comparing data for small single phase transformers it is important to look at transformer impedance because it is important to achieve network short circuit levels . In Ireland this is a particular issue because the lines are very long, therefore impedance requirements are set at 2.2% for 15kVA Transformer s and 4% for others. . The consequence of these very low impedance requirements is that they have a high kPEI but this does not mean they operate at a high load factor. So the copper losses on these transformers are much lower than would be economically justified by the copper losses saved – the reduced copper loss levels arise from the requirement to achieve a low impedance by decreasing resistivity, as reactance for the size and shape of the transformer has already been minimised. The UK in contrary has 4% impedance requirements and It's copper losses are set by

	economics, and hence higher than those in Ireland which are set by Short Circuit requirements. Reducing Iron Losses was considered and presented in papers to Vito, but as shown a decrease in Iron losses of 16W (using Amorphous, from 48W to 32W) resulted in a 75kg increase in weight. The capitalised value of this 16W saving was about €240, and it was felt that the cost of amorphous plus an extra 75kg of material would be greater than €240 and not produce any net savings.
EUREL	When looking at the price an issue is that UK transformers are split over different DSOs. Ireland has very competitive tender and includes capitalisation factors.
ENE	Was surprised with the very low PEI and said that it could be improved by amorphous and remarked that the US has also single pole. Do you use amorphous?
EUREL	No, not in Ireland. Noted that there is only one manufacturer ofSingle Phase PoLe Mounted transformers in Europe. The UK sometimes buys Amorphous Single Phase Pole Mounted Transformers in India.
PW	Raised the question if other load factors should be used for these transformers?
EUREL	Wants to use the PEI because they want the flexibility to prepare for changes in the load profile due to the use of electric vehicles and heat pumps, else it is locked into one load factor
PW	The question was discussed whether or not the IE and UK should be treated separate in the analysis according to MEErP in the study.
HPS	Warned to be careful in identify a market in a country because we do not do this in other products. He wants a technical distinction.
EUREL	Noted that this could be done because the UK has a different voltage, different transformer impedance, different tank design and has different load factor.
T&D	Also support to differentiate based on technical distinction

Paul Waide presented some slides to discuss small transformers.

abbr.	Comment/answer
PW	Paul Waide raised the question: are there loss measurement standards for small transformers? In the meeting this could not be confirmed but after the meeting we received information from Yves Boudou(IGNES) that the document prEN50645 "Ecodesign requirements for small power transformers" describing the “method of measurement for losses” is at “formal vote” step in Cenelec and this standard should be ratified within 3-4 months. It is also clearly mentioned in the prEN 50645 that according to Annex I of Regulation (UE) N°548/2014 (21 may 2014), that small transformers (above 1kVA) shall be marked with information given in clause 2 point a), c) and d). According to SR96, these requirements are sufficient to allow customers to compare easily “values and Ecodesign characteristics” of transformers from different manufacturers.
PW	Informed the stakeholders that this study does not cover small transformers, no time and budget is foreseen for this.
EREA	Noted: It is correct, “*Small power transformers*” are defined in Commission Regulation (EU) No 548/2014: Article 2 - Definitions: *(2) ‘Small power transformer’ means a power transformer with a highest voltage for equipment not exceeding 1,1 kV.* Also in Article 3 – Eco-design requirements it is repeated::

	Small power transformers, medium power transformers and large power transformer shall meet the eco-design requirements set out in Annex I. But in that same document No 548/2014 where in Annex 1 - Eco Design requirements are listed, *Small power transformers* are no longer 'listed'…. See table of content at the end of this letter. This means that no table with requirements (or even no guideline) for the "*Small power transformers"*
ECOS	Should we define a new product group with the arrival of electric vehicles?
EREA	Based on the evolution of electrical vehicles (electrical charging) also a growth in LV/LV transformers can be expected. Not only today these LV/LV transformers are needed (mostly in Belgium due to local particularities with the Grid – missing Neutral), but definitively in the near future when Mode-4 DC Charging will be in place (DC charging requires an IT Grid which will require a transformer).
	A discussion followed on the classification and it was noted that CENELEC TC 96 deals with these transformers and that there are some classifications
EREA	During the meeting also the terminology "*Low Voltage Transformer*" was used. It was also said that these transformers have to follow the Low Voltage Directive (LVD) 2014/35/EU. This is true. But, basically, The LVD covers all health and safety risks of electrical equipment operating with a voltage between 50 and 1000V for alternating current (AC) and between 75 and 1500V for direct current (DC). This LVD does not cover elements as stated in the Eco-design requirements**.**
UKGRI	Noted that the IEC standard organisation for small transformers TC96 is mainly looking at safety
EUREL	Noted that for smaller transformers the efficiency is heavily related to the product for which they are used, and should be related to the overall efficiency requirements from the product
UKGRI	I am afraid I have to disagree with that. The use of small transformers is so diverse and this makes it complex. This is why CENELEC is talking about transmission and distribution. In summary we can define it as anything with a highest voltage below 1,1 kV is a small transformer.
EREA	Commented: - This argument is valid if these are used in a "Machine" as a building block. - This argument is not valid in a lot of other situations where a LV/LV transformer is just used as a 'single element' to change (transform) the voltage or to change the Grid (IT/TN/TT). Here multiple examples can be given: elevators, industrial laundry machines, heat pumps etc… In these cases the transformer is kept out of the 'Eco-Label' of this application since it is not considered as an integrated part. And as such escaping from the Eco-design rules?
PIR	In the Ecodesign Regulation 200.000 pieces per year is a threshold. Having requirements for small transformers will help all products that include them and therefore this is an opportunity. They are often used in various small categories of products that not have yet ecodesign requirements. Such a study will help the EC to improve efficiency in these products. This is an opportunity to harmonize and the study could do the first step.
UKGRI	I am afraid I have to disagree with that. The use of small transformers is so diverse and this makes it complex. This is why CENELEC is talking about transmission and distribution. In summary we can define it as anything with voltage below 1,1 kV for small transformers.
PIR	We should not regulate any different application but the transformer efficiency. There are hundreds of thousands sold annually. There is demand for isolation, for protection; small transformers have 1000 of applications. There will be always a market for such

	applications and a need for regulation.
EREA	*not said in the meeting but received after the meeting ans just as an indication: we supply yearly about 50.000 pieces LV/LV transformer which do represent an installed power base of 50MVA in total.*
PW	This raises the question on how you define a function. The saving is per application and this is extremely complex, we can summarize this in the report. Is there market data?
ECOS	Note that small transformers are regulated outside Europe and take care that EU does not become dumping ground. The demand is ramping up but I note that there is no technical standard looking at efficiency of these transformers and the consultant could look at that.

16h40 AOB

It was repeated that comments and position papers for inclusion in the study can be sent until 28 April

The study will be finalized by June.

CS informed the participants that the Commission will present its ideas on the revision of the Regulation to the Consultation Forum organized by the EC that will likely happen in the 2nd half of October.

There are about 60 members of the Consultation Forum but maybe half of you around the table are not part of it, although the EC can invite you ad hoc. Therefore we need an expression of interest for those who would like to be invited in the Consultation Forum and therefore you should contact Cesar Santos (Cesar.SANTOS@ec.europa.eu).

Any input ahead of the consultation forum can also be sent directly to the EC.

16h50 the meeting was closed