ErP Study: Lot 2 Distribution and Power Transformers chapter 7

ID	Stakeholder	Section	Page	Comment	Vito and Biois reply
1	**T&D Europe**	**7**	**Title**	**The title do not include the small transformers that are not part of distribution and power transformers. A definition of small transformers is needed and this topic should have a special part in an other document.**	The term "power transformers" covers the small transformers in question according to IEC standards. Normally the titles are not changed.
2	**T&D Europe**	**7.1.1.1**	**7**	**The minimum of rated is not acceptable. The minimum must be 50KVA because most of all pole mounted transformers and some cabin transformers are with this kind of rated power. Utilities in France, Portugal in Spain…… operate with these rated power.** **For Oil distribution transformers (ODT) the maximum rated power should be 3,15MVA to be in compliance with dry type transformers.**	According to our interpretation 100 kVA is the maximum for the compact or pole mount category, please explain? To be discussed in the stakeholder meeting. Will be extended to 3.15 MVA (note EN 50464-1 should be extended as well including inter- and extrapolation)
3	**T&D Europe**	**7.1.1.1**	**7**	In yellow in document. Very compact three phase oil distribution transformer is not understood by manufacturers. In any case transformers between 50KVA and 630KVA must be in the same categories. These transformers should have some restrictions in terms of dimensions and size. Dimensions are for compact substation and weight are for pole mounted transformers at least between 50KVA and 160KVA; Stakeholders' suggestions are welcome to define the maximum size and weight related to transformer rating: For pole mounted transformers the maximum weight is 550KG in France for cranes reasons. WAITING FOR DATA FROM SPAIN AND PORTUGAL Limits of dimensions are according to the utilities requirements.	The weight limitation of 550kg in France appears to be for crane capacity reasons which doesn't seem valid for the functioning of the transformer itself. To be explained and discussed in the stakeholder meeting.

4	**T&D Europe**	**7.1.1.3**	**8**	**Definition for large power transformers is not correct. We propose two new categories: MPT(Medium power transformers) transformers which are between 3,15MVA up to 30MVA and an other large power transformers which is above 30MVA. Large and Medium power transformers are used not only for transmission purpose but for other application like primary distribution, generation… title has to be taking into account these applications.**	We suggest to use 'Medium and Large power transformers'. The borderline between medium- and large is unclear, e.g. comment 18 suggests 100 MVA. In principle it should not matter.
5	**T&D Europe**	**7.1.1.4**	**8**	**Title :Limits must be changed 100KVA must be replaced by 50KVA**	Not agreed: this is not for so-called distribution transformers and they exist in 63 kVA. To clarify text was modified to: '..with highest- voltage winding (HV) for equipment not exceeding 1 kV
6	**T&D Europe**	**7.1.2.1**	**10**	**This paragraph has to be review for a better understanding. Minimum rated power must be better identified by positive ways. The minimum rated power must be 50KVA.**	Definition and necessity to be discussed in the stakeholder meeting.
7	**T&D Europe**	**7.1.2.1**	**10**	**Each time series of transformers changes that represent an amount of expenses for manufacturers for prototypes and agreement. Therefore manufacturers don't want to change each 3years the level of losses of the transformers. Therefore manufacturers request to have directly the final level of losses.** **That means 2013 50KVA <=rated power <=630KVA 2013 A0Ck** **That means 2013 >630KVA 2013 A0Ak**	**Agreed**

8	**T&D Europe**	**7.1.2.1**	**10**	**The second part of this paragraph "The proposed loss limiting requirement…… to dry type transformers" is not applicable to distribution transformers and must be deleted**	**OK**
9	**T&D Europe**	**7.1.2.3**	**10**	**Large power 110KV and 100MVA are not enough representative for European market and that leads to mistake in the conclusion. European manufacturers have decided to transmit to VITO a form to launch a new enquiry regarding rules (losses, cost and rated voltage).**	**Enquiry was launched and will be discussed in the stakeholder meeting**
10	**T&D Europe**	***7.1.13.2***	**24**	**Manufacturers prefers to change in one time to the final level of losses to avoid useless expenses**	**See also remark 7.**
11	**T&D Europe**	***7.1.13.4***	**38**	**Precision has to be given to indicate if LLCC is present time core technology (stack core)**	**The data used in the improvement options does not dictate a specific design (please read version V26), but rather an average that can be reached with various manufacturers using different design options.**
12	**T&D Europe**	***7.2.3***	**46**	**To move to amorphous transformers manufacturers have the needs of several years because all machines for core must be changed and winding machines should be modified. Invest to achieve such modification are important and difficult for smaller manufacturers.** **Supplier of amorphous have needs of time to increase quantities manufactured.**	**Text added**
13					
14	**ENA consulting**	***7***	**All**	**OBSERVATIONS ON APPROACH**	The focus is indeed on transformers, nevertheless a

				It would appear that the whole approach is based solely on the reduction of losses in the transformer. It seems strange therefore that in previous comments referring to cables that nothing is being proposed for cable or line losses which are much more dominant that transformer losses in terms of overall loss in the system. Recent experience has shown that asset replacement with new units having losses at the high end of current technology will still result in a reduction in losses overall. However, as markets can be set up such that the asset owner does not really pay for the losses, there needs to be more coordinated thinking in how this will impact in Member States. Regulatory price controls will need to reflect the European wide situation if utilities are forced to procure higher cost assets for little or no return. No-load loss reduction can be achieved by improving the core steel quality or the introduction of amorphous cores (lower end distribution only). Load losses can be reduced by using larger conductors. None of this is new! It has all been done before. What is being proposed is to introduce maximum loss figures into the standards which will force the utilities to procure more efficient transformers. However, utilities that apply TCO or LLCC to their procurement are often likely to be procuring at these lower proposed losses already. If the losses are enshrined in the standard this will also remove any incentive for manufacturers to move forward with even more efficient designs in the future. Fixed losses can also remove the ability of a utility to negotiate a lower cost solution as the manufacturer can insist on supplying what the standard permits. This solution is really only applicable for the industrial market. We are concerned that forced standardisation in this area may actually hinder the ability of utilities to reduce their cost of ownership, and may indeed cause increases in costs. We do not disagree with the objectives to reduce energy consumption	cable related issue was taken into account. On impact a new section (7.2.4) will be added that procurer higher cost transformers might reduce capital available for other investments (cables, ..). This item will be explained. It is indeed important, especially for TSOs, that seeking more efficient transformers by applying TCO or LLCC is not abandoned. Therefore a dedicated section 7.2.5 will be added as well. There should be no conflict, see also comments 50 and 51.

				overall, but this is better done by introducing incentives for better R&D and design changes via commercial and specified requirements rather than standardisation. Recent UK experience demonstrates that the required levels of losses can be obtained by means other than through standardisation.	
15	**ENA consulting**	***7.1.1***	**All**	• UK Utilities apply LLCC and or TCO to all distribution and power transformer procurement as a matter of good business practice. • Concept of BAT or BNAT should be considered to be a matter for the manufacturer to offer as the lowest lifetime cost. • Modifying a standard to include loss figures is a retrograde step as this stops utilities driving losses lower to achieve even lower LLCC's as the manufacturers would always claim/decide to work to the standard. We do not disagree with the concept, but the LLCC's for different utilities will be different depending on their business situation, e.g. required Rate of Return on Investment, cost of capital, design of system etc. • Standardisation of losses has been attempted before in the UK and it did not work because different partners in the procurement consortium had different key requirements and this ended up being counter-productive. It can also fall foul of national competition legislation as it requires competitors to "collude" with the design (and therefore the price) of major assets.	• See previous remark. A section will be added and the issue will be discussed at the stakeholder meeting • Table 7-1 will be discussed at the meeting as well. It needs to be replaced by a European more ambitious table. (see also other stakeholder comments).

				• Transformer no load losses as obtainable in standard UK practice has been consistently at the lower end of all the figures quoted in table 7-1 for many years. This has been achieved by active capitalisation of losses policy driven by the utility	
16	**ENA consulting**	***7.1.1***		**For a 90 MVA transformer load loss figures in Table 7 are very close and will make little difference across the grades. E.g. grade 2 is 322.3kW and grade 1 is only 319.2 kW. Where the load factor is 0.2, this means the reduction to grade 1 saves only 3.1 x 0.2 kW or 0.6 kW. This is less than the variations in capitalisation formula and much less than the loss tolerance in IEC 60076-1 and therefore not worth considering. It is much more important to consider load losses in conjunction with the intended applications which only the purchaser can know fully about.** **The no load losses in table 7-1 in grade 1+ are consistent with what has been achieved regularly by one UK DSO/TSO over the last decade. If this is then intended to save energy, then the grade 1 + is not low enough.** **The approach should not be to detail maximum losses. It should be to specify target losses and introduce some other control mechanism for excessive losses. Otherwise the manufacturer would simply supply the maximum losses permitted, thereby simplifying his own processes and giving him more profit. (This has been done in the UK with noise levels). It should be a case of specifying what is needed and not what the manufacturer can do at the moment, otherwise there is no incentive for the manufacturer to invest in further R&D.**	Table 7-1 will be discussed at the meeting as well. It needs to be replaced by a European more ambitious table. (see also other stakeholder comments).
17	**ENA consulting**	***7.1.1.1***		**DER transformers have been lumped together with distribution transformers, but this is not the case in the standards – IEC 60076-16 is about to be issued specifically to deal with the special nature of DER transformers. The load cycle on these**	The study discrimated DER transformers (BC 5 and 6). The need for discrimination DER

				devices is also significantly different from distribution transformers.	transformers will be discussed in the meeting and IEC 60076-16 will be added and investigated if this include loss limits.
18	**ENA consulting**	***7.1.1.3***		**Definition of large power transformer – this is incorrect as the definition of a large power transformer is above 100 MVA as per IEC 60076-7. Above 5 MVA and less than 100 MVA is defined in the same standard as a medium power transformer**	**See comment 4, text modified to 'Medium and Large power transformers..**
19	**ENA consulting**	***7.1.1.4***		**This size of transformer is defined as a distribution transformer in IEC 60076-1.**	To clarify text was modified to: '..with highest- voltage winding (HV) for equipment not exceeding 1 kV to discriminate from so-called distribution transformers.
20	**ENA consulting**	***7.1.3.1***		**We disagree with the conclusion that low efficiency transformers have been procured by TSO's. Typical loss figures for a 90 MVA 132/33 kV standard transformer purchased by one Utility in the UK in the last few years are no load loss 29.5 kW, load loss 315 kW (i.e. as proposed for 2015 even including a 5% tolerance on load loss!). Without any tolerances, these figures are both well below the best values quoted in table 7-1 and are the values obtained by good application of capitalisation formulae**	Text will be updated. It differs from DSO and indeed several have procured for more efficient transformers compared to grade 1 in the Chinese standards for decades.
21	**ENA consulting**	***7.1.3.1***		**TSO's and DSO's have monopolies and can pass on all investment costs to the end user. From the UK perspective this statement is not true. Costs passed on to the end user are based on regulatory price controls and are based on "use of system" charging. This can mean rising costs but income from the use of system being reduced!**	**Text will be modified to: ..could .. which might not offer the proper incentive, however there exist regulatory price control mechanisms that might reduce profit when grid losses increase.** **This is not EU27 wide policy,**

					please look at comment 60. **Please refer to TSOs that made financial losses due to this?**
22	**ENA consulting**	***7.1.3.1***		**- total cost of ownership may well be increased in the longer term by adopting the most efficient loss categories. This is wholly dependent on load profiles, utilisation and seasonal demand fluctuations etc; only the sourcing utility can really determine the optimum mix and therefore the true cost of ownership**	**Text need to be modified. Indeed the load profile must be neutralized when comparing A and B. In the study $B = Ax(\alpha xKf)^2/PF^2$.** **Would result in $B \geq 0.8Ax(\alpha xKf)^2/PF^2$ and making available the load profile parameters assumptions (α,Kf,PF)?** **To be discussed.**
23	**ENA consulting**	***7.1.6***		**need for a new standard for industrial transformers – this is not required as these transformers are covered by the IEC 60076 series at the moment. What is needed is a change to the capitalisation approach for this type of transformer where the first cost is always the dominant factor due to the way these units are procured and installed.**	**Not agreed by the manufacturers, should not be mixed with so called distribution transformers? .. industrial transformers with high voltage winding below 1 kV.**
24	**ENA consulting**	***7.1.6***		**Therefore, un update of the IEC 60076-11 standard for oil filled transformers is needed taking new developments and test results into account - IEC 60076-11 is the standard for dry type transformers and not for oil filled**	**Text will be updated and provide more clarification** Therefore, an update of the IEC 60076-11 standard to include oil filled transformers is needed or a new one dedicated to dry type transformers can be developed.

25	**ENA consulting**	***7.1.7***		**need to reduce tolerance on loss measurement in IEC 60076-1. This has been called for by a number of European experts during the recent revision of IEC 60076-1 and has been rejected for a number of reasons, mainly linked to the use of this standard for all transformers up to the largest voltages of 1200 kV and 2000 MVA and higher where manufacturing tolerances cannot be so closely controlled. The new version of IEC 60076-1 is scheduled for publication towards the end of 2010 and will not be due for revision until around 2015. What is needed is a separate document for distribution transformers which can then be used to separate the requirements of the standard for the different types of product. This has been recognised in the IEC community but as yet there has been no volunteer to lead such a modification. This is also recognised by many utilities by the application of a "no positive tolerance" clause in their specifications which effectively resets this tolerance to +0%!**	**Noted and to be discussed in the stakeholder meeting** **Good suggestion for 'no positive tolerance' or +0%**
26	**ENA consulting**	***7.1.7***		**addition of efficiency class to transformer rating plate in IEC 60076-1. This document is about to be re-issued with a new version. Future changers would need to be incorporated in the next review scheduled most likely for 2015 or 2016**	**Noted and text added**
27	**ENA consulting**	***7.1.9***		**If the transformer is at end of life, it is reasonable to assume that all the ancillary components will also be at end of life and therefore re-use is not really an option.**	**Yes.**
28	**ENA consulting**	***7.1.10***		**The addition of a third winding to increase voltage and reduce loss. This is not really practical in general terms as the investment to increase voltages would be determined by the need to re-lay a huge amount of cable. Where cables are capable of being uprated to a higher operating voltage, most utilities have schemes in place to adopt "dual ratio" transformers**	**In this configuration there are no double windings, it is only a matter of reconfigurating windings from parallel to series. Hence there are no extra losses, cost increase is due to some extra terminals and wiring.**
29	**ENA consulting**	***7.1.13.1***		**BAU in the UK utility sector would most likely comply with the**	**The data available to the project**

				proposed lowest losses. Does this imply that the rest of Europe has been less attentive to the capitalisation process?	**team is for the EU-27. There will obviously be some variations between countries.**
30	**ENA consulting**	***7.1.13.4***		**Figure 7-6 BC4 graph – This does not reflect the UK utility situation where the BAU case is lower than the LLCC (see earlier examples) and the BAT cases for three phase distribution and transmission class transformers.**	**The data available to the project team is for the EU-27. There will obviously be some variations between countries.**
31	**ENA consulting**	***7.2.3***		**A strategy of encouraging amorphous core development will almost certainly mean European manufacturers will lose out to the existing manufacturers of this technology from the USA, Japan and Asia. This will mean further dependence on overseas suppliers and a reduction (potentially significant) in the European manufacturing base. This is not the right strategy for an integrated approach from the EC.**	**Noted. Text will be updated. This might be for steel manufacturers but isn't de facto the case for transformer manufacturing.**
32	**Hitachi Metals / Metglas**	**Chapter 7 Summary** For several standards, updates are recommended, especially to add two extra no load losses categories (0.75A0, 0.5A0) in standard EN50464-1 to cover BAT developments of amorphous transformers	**6**	The categories proposed to handle amorphous are not appropriate for amorphous. Ao is based on a silicon steel standard and using a fraction of Ao for amorphous will not result in values appropriate for amorphous. Hitachi Metals/Metglas recommends that one new category is added (perhaps called AAo or Ao+). It is hereby proposed that this standard would have the following NLL values: Table 1 – proposed AAo NLL	The is a close fit between this proposal for AA0 or A0+ with 0.5A0, e.g.: 90/2, 145/2, 210/2 matches closely 40, 69, 92,.. The proposal with 0.5A0 would round off values in line with the existing standards and current measurement tolerances. Therefore at least 0.5A0 should be added. The 0.75A0 could serve other developments with silicon steel.

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<tr><td></td><td colspan="2">Recommendation</td></tr>
<tr><td></td><td>4%</td><td>6%</td></tr>
<tr><td>Power</td><td>S15 - 8%</td><td>S15 - 15%</td></tr>
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<tr><td>Power</td><td>SH15-8%</td><td>SH15-15%</td></tr>
<tr><td>50</td><td>40</td><td></td></tr>
<tr><td>100</td><td>69</td><td></td></tr>
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<tr><td>2000</td><td></td><td>638</td></tr>
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These values are based on the current Chinese standard S15 which is only applicable to amorphous. In China, amorphous transformer makers routinely exceed the S15 standard and it is common for Chinese power supply bureaus to ask for some % below S15 in their tenders. Metglas analysis shows that the values in Table 1 would be achievable by European transformer makers. The reason that the proposed values go from S15-8% for 4% short circuit impedance to S15-15% for 6% is that the Chinese standard is entirely based on 4%.
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<td>33</td>
<td>Hitachi Metals / Metglas</td>
<td>7.1.2.1 Proposed maximum load and no-load losses requirements for Oil-immersed distribution transformers
The proposed maximum load and</td>
<td>10</td>
<td>This Tier 1 requirement seems very low. In an international comparison Europe would rank well below the US, Japan, China and India.</td>
<td>Noted.
There is another proposal to directly implement Tier 2 (comment 7).</td>
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		no-load losses requirements for Oil-immersed distribution transformers not being so-called 'very compact Three-phase oil-immersed distribution transformers (≤100 kVA)' is: - ≤630 kVA C0Ck in Tier 1 (2013) and A0Ck in Tier 2 (2015) - >630 kVA B0Bk in Tier 1 (2013) and A0Ak in Tier 2 (2015)			
34	**Hitachi Metals / Metglas**	*7.1.3.2 Policy recommendations towards distribution transformers operated by Transmission System operators (TSO)* The identified BAT	**13**	Where does this result come from? A and B factors: what do these assumptions mean exactly? If the difference between A and B factor is limited to 15%, this would mean a load factor of 90%. Hitachi Metals/Metglas is requesting more explanations.	Indeed this should be corrected (see comment 22).

		(A0Ak) should serve as a reference and at least the LLCC should be implemented.			
35	**Hitachi Metals / Metglas**	7.1.7 Needs for standards to be updated It is therefore recommended to extend the classes up to 0.5xA0 and also include an intermediate class 0.75xA0, e.g. called AA0 and AAA0.	**16**	Please see earlier comments	Noted
36	**Hitachi Metals / Metglas**	**7.1.13.1/2/3**	**19/31**	7.1.13.1/2/3 All scenarios have a very inefficient entry point. Hitachi Metals/Metglas believes that, if the correct (market) prices are used for AMDT's, AMDT's will easily become the lowest LLCC. BAT conclusions may also be altered by using correct AMDT prices.	**The scenarios were conducted using the market data available to the project team. Updates to this data will be discussed in the stakeholder meeting.**
37	**CLASP**	**7 All**		**Thank you for the opportunity to review draft Chapters 6 and 7 of the EuP Study: Lot 2 Distribution and Power Transformers. Overall, we are impressed with the quality of the work prepared, its readability and presentation. We do however have a range of comments on both chapters which we prepared for your consideration. In the pages that follow, we provide detailed comments on these chapters using the template provided on**	**Noted these priorities**

				your website. I summarise our main issues below: **• The text would benefit from further clarity on scope of coverage / regulatory applicability, particularly for "very compact" subcategory exemptions and kVA ratings not included in the scope of covered products (e.g., between 2500 and 5000 kVA for oil-immersed and between 3150 and 5000 kVA for dry-type).** **• The schedule phasing in regulations and the regulations themselves are not ambitious, with certain levels cost-justified in 2010 only being adopted in 2015.** **• Large power transformers appear to have very weak standard levels under consideration, far higher than "typical utility" losses for the 100 MVA rating according to SGB Starkstrom. CLASP proposes an alternative table of efficiency values, based on this industry data.** **• The chapter would benefit from clarification of how to treat non-standard kVA ratings (i.e., kVA ratings that fall between two standard numbers in a table).** **• We continue to believe a lower tolerance on manufacturing losses is possible, given advances in the last two decades in steel, core-cutting equipment, annealing furnaces and other production engineering. We suggest 5% instead of the IEC 60076's 10% from 1993 (or earlier).**	
38					
39	**CLASP-Europe**	**7.1.1.1**	**7**	**We support the use of EN 50464-1 to define covered products, as it becomes immediately clear to manufacturers whether a transformer would be covered or not. We note that in this instance, three-phase oil-immersed distribution transformers would be covered, spanning from 50 kVA to 2500 kVA with the highest voltage not exceeding 36 kV. This encompasses**	**This point will be discussed in the stakeholder meeting.**

				transformers represented by BC1, BC2 and BC5. **We are concerned that in the second paragraph of this section, the contractors introduce discussion of "very compact" three-phase oil-immersed distribution transformers and state that this group might need different and less stringent losses. This issue has not been previously discussed in Chapters 1 through 6, nor have the Commission's contractors investigated how upgrading materials and changing core constructions can reduce volume while also improving efficiency. CLASP is concerned about the last minute introduction of this issue because of the lack of analysis and the uncertainty behind:** **a) how would "very compact" be defined from an application perspective? This is important to prevent this class from being exploited as a loop-hole, undermining the energy savings potential.** **b) how much would the Commission relax the stringency on losses?** **These are critical questions which have not been explored or discussed in any previous chapter, but are simply stated as fact in the policy and impact analysis chapter. In order to better understand regulatory levels and impacts on size, we suggest that this subject be investigated and presented in one of the chapters of the Preparatory Study. In addition, we are aware that by upgrading materials and changing core shapes, it is possible (to a point) to reduce size while increasing efficiency, and thus we would suggest some analysis around this issue before simply stating that all space-constrained transformers should have a lower level. This may not be justified, as more compact alternatives may exist.**	
40	**CLASP-Europe**	**7.1.1.2**	**7-8**	**We support the use of EN 50541-1 to define covered products as covered product is very clear. We note that this group encompasses "Three-phase dry-type distribution transformers 50 Hz, from 100 to 3150 kVA, with the highest voltage for**	**Noted**

				equipment not exceeding 36 kV." We note (and agree) that no subcategories are required for dry-type transformers, and that all would be subject to the same regulatory level.	
41	**CLASP-Europe**	**7.1.1.3**	**8**	**This section discusses 'large power transformers (>5 MVA) used in 50 Hz electricity transmission.' The definition provided (i.e., "a static piece of apparatus with two or more windings which, by electromagnetic induction, transforms a system of alternating voltage and current into another system of voltage and current usually of different values and at the same frequency for the purpose of transmitting electrical power") is based on the International Electrotechnical Vocabulary (IEV) and does not define any kVA ratings.** **We are concerned by the use of the MVA rating in brackets: "(>5 MVA)" as this is a constraint which appears to leave certain ratings, such as between 2500 and 5000 kVA for oil-immersed and between 3150 and 5000 kVA for dry-type transformers without coverage under EcoDesign. CLASP wishes to ensure maximum possible coverage of large kVA oil-immersed and dry-type transformers, and we are concerned that the scope of coverage identified in 7.1.1.3 is unclear and may be incomplete.** **We suggest that in establishing the definitions addressing scope of coverage in sections 7.1.1.1, 7.1.1.2, 7.1.1.3 and 7.1.1.4 that VITO work to establish clear definitions that encompass the complete set of transformers originally envisioned in Chapter 1 of the preparatory study. We are concerned that through the use of specific industry standards, the identification of explicit kVA ratings and voltage ranges, there will be products that are inadvertently excluded from any future regulation which will distort the market, undermine the Ecodesign Directive objectives and forego the opportunity for energy savings. We therefore suggest that VITO add a table to summarise the coverage of this table, much like was done in Table 1-3 of Chapter 1, to establish the roadmap between the broad scope discussed in Chapter 1 and the explicit definitions**	**Will be discussed in the stakeholder meeting. Medium and large power transformers are not such a big market (few 1000) and an extra enquiry was launched to seek more information and extend and optimize requirements.**

				being proposed in Chapter 7.	
42	**CLASP-Europe**	**7.1.1.4**	**9**	**We support the focus on efforts to define special purpose transformers with well defined target applications in order to avoid loopholes, however we are unclear on what VITO considers to be 'special purpose' beyond the explicit mention of welding transformers and guitar amplifier transformers. We suggest that more development of this section be applied in order to clarify the transformers that would be subject to any exclusion from the regulation. We would then suggest an opportunity to review those special applications, the definitions for them, the rationale behind granting them the exclusion and the approach the Commission will follow to ensure that these exclusions don't develop into loop holes.**	**Scope discussed in the stakeholder meeting, any suggestion are welcome.** **It remains a niche market which is hard to map. Figuring out the last potential loophole in this area might unduly delay other regulation. The product group of smaller industrial transformers had a low estimated impact on energy consumption.**
43	**CLASP-Europe**	**7.1.2.1**	**10**	**This section addresses maximum losses for oil-immersed distribution transformers, which represent a very large share of the European transformer market. The draft document proposes the following schedule for transformers that are not subject to space constraints:** **≤630 kVA C0Ck in Tier 1 (2013) and A0Ck in Tier 2 (2015)** **>630 kVA B0Bk in Tier 1 (2013) and A0Ak in Tier 2 (2015)** **CLASP is very disappointed that levels which are economically justified in 2010 must wait for five years to be introduced to the market. There is no discussion or explanation in this section as to why these levels are selected, or why they are being proposed on this schedule. Furthermore, as discussed in our comments on Chapter 6, we believe the 400 kVA oil-immersed unit at A0Ak is overpriced, which causes the minimum life-cycle cost to fall at the level proposed here of A0Ck in Tier 2. And, for the 1000 kVA oil-immersed transformer, we expressed concern that A0Ak was not ambitious enough in terms of**	**Agreed to review Tier 1 with Tier 2 targets. See also other stakeholder comments.** **The main reason for not going beyond classes A0Ak was that neither in manufacturers catalogues neither in DSO literature evidence could be found that such transformers are sold or installed, hence it is not 'BAT'.** **Noted:** **- a proposal for a softer A0+ close to 0.9A0.** **- For larger transformer >630**

losses, stating A0+ and Ak+ levels should be developed and analysed to see if they are more cost-effective than A0Ak.

CLASP suggests that the Tier 1 (2013) level be A0Ak for all oil-immersed transformers (≤630 kVA and >630 kVA) under EN50464-1 and that the Tier 2 (2015) level be defined at a level more ambitious than A0Ak. For example, A0+Ak+ levels could be developed by deducting 50% of the difference in losses A0 and B0 from A0 to create A0+ and deducting 50% of the difference in losses between Ak and Bk from Ak to create Ak+. The table of efficiency values would look as follows:

No Load Losses P0 Rated Power	Tier 1 (2013) A0 (watts)	Tier 2 (2015) A0+ (watts)	Impedance (%)
50	90	80	4%
100	145	128	
160	210	185	
250	300	270	
315	360	320	
400	430	385	
500	510	460	
630	600	535	
630	560	500	6%
800	650	575	
1000	770	685	
1250	950	850	
1600	1,200	1,075	
2000	1,450	1,275	
2500	1,750	1,550	

kVA a second Tier 0.9Ak could be an option. Taking into account that it is technical feasible but not a current product on the market yet.

<table>
<tr>
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<tr><th>Load Losses Pk(W)
Rated Power</th><th>Tier 1 (2013)
Ak
(watts)</th><th>Tier 2 (2015)
Ak+
(watts)</th><th>Impedance
(%)</th></tr>
<tr><td>50</td><td>750</td><td>688</td><td rowspan="8">4%</td></tr>
<tr><td>100</td><td>1,250</td><td>1,138</td></tr>
<tr><td>160</td><td>1,700</td><td>1,550</td></tr>
<tr><td>250</td><td>2,350</td><td>2,150</td></tr>
<tr><td>315</td><td>2,800</td><td>2,575</td></tr>
<tr><td>400</td><td>3,250</td><td>2,950</td></tr>
<tr><td>500</td><td>3,900</td><td>3,550</td></tr>
<tr><td>630</td><td>4,600</td><td>4,200</td></tr>
<tr><td>630</td><td>4,800</td><td>4,400</td><td rowspan="8">6%</td></tr>
<tr><td>800</td><td>6,000</td><td>5,500</td></tr>
<tr><td>1000</td><td>7,600</td><td>6,900</td></tr>
<tr><td>1250</td><td>9,500</td><td>8,750</td></tr>
<tr><td>1600</td><td>12,000</td><td>11,000</td></tr>
<tr><td>2000</td><td>15,000</td><td>13,500</td></tr>
<tr><td>2500</td><td>18,500</td><td>16,750</td></tr>
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<tr>
<td>44</td>
<td>CLASP-Europe</td>
<td>7.1.2.1</td>
<td>10</td>
<td>This section proposes to constrain ‘very compact’ (i.e., space-constrained) three-phase oil-immersed distribution transformers to be less than or equal to 100 kVA.

While we welcome the restriction of this sub-category to a partial range of rated power (kVA) levels, we remain concerned about how this subcategory will be defined. For example, would it apply to every oil-immersed transformer of 100 kVA or less? We remain very concerned about the lack of clarity around defining ‘very compact’ transformers.

We note that the loss-limiting requirement presented for ‘very compact’ transformers would be the use of copper conductor (instead of aluminium) and the use of domain-refined grain-oriented electrical steel with a performance of 0.96 Watt per kg at 1.7 Tesla at 50 Hz. We support the concept of a materials design standard alternative, as it should result in very compact designs – however, we have the following comments:

1) The domain refined material you have selected at 0.96 Watt is not the best performing domain-refined</td>
<td>Noted

Scope and range will be discussed in the meeting.

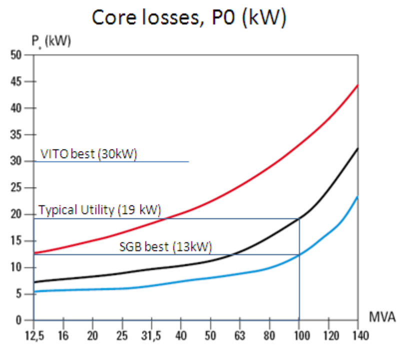
About the material loss 0.96W/kg: this allows some competition and mechanical scribed material that might be needed for some particular core forms that annealing.</td>
</tr>
</table>

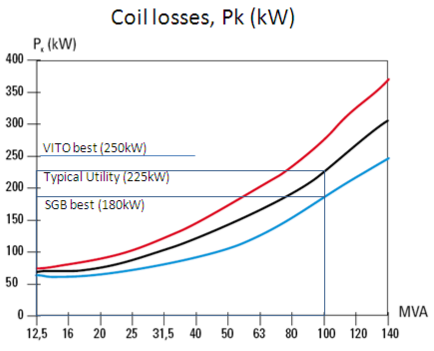
				electrical steel, and there are better materials that can achieve 0.85W/kg (from Thyssen-Krupp) and 0.90W/kg from AK Steel. We suggest this better domain-refined steel because it will not only save more energy, but it will enable construction of more compact designs. In addition, the higher cost of the material would deter manufacturers from using this subcategory as a loop-hole. **2) In addition to requiring copper and domain-refined core steel, for clarity of design we would also suggest requiring seven-step mitred construction, as this will ensure the core design benefits from use of the high-quality core material in an optimal way.** **3) We are concerned about how the Commission would enforce this regulation in practice. We would welcome further clarification on how this requirement would be enforced, given that this subcategory of transformer may be commonly applied in some member states, depending on their particular distribution network. It would be very unfortunate to later learn that companies that comply with the regulation have lost business to less scrupulous companies who supplied transformers that failed to meet these requirements, gambling on the fact that there is little probability of being discovered to be non-compliant.**	
45	**CLASP-Europe**	**7.1.2.2**	**10**	**The opening sentence is unclear: "When drafting those requirements the risk for mitigation from oil-immersed to dry type transformers needs to be considered." We are unsure what is being stated here, we thought you might mean the following: "When drafting the dry-type distribution transformer requirements, the risk of dry-type transformers being substituted for oil-immersed transformers needs to be considered."** **If this is indeed the intended statement, then we share your**	**Agreed text was incomplete.** **Will be reformulated as suggested.** **Suggestion for additional levels noted but the draft standard is currently for voting and a short term revision might be unlikely.**

				concern on this point, as you rightly point out in this section, the losses of an A0Ak oil-immersed are much smaller (430W core, 2800W coil) than an A0Ak dry-type (700W core, 4500W coil), and if the standard on dry-type is weak, it could trigger a migration to dry-type – with near doubling of transformer losses, completely undermining the objectives of the Ecodesign Directive. **CLASP therefore supports the adoption of the A0Ak regulation for dry-type transformers from Tier 1 (2013) to avoid loopholes. Furthermore, we refer back to our comments on Chapter 6 for the 1.25MVA dry-type transformer (BC3) where we suggested that additional designs be prepared for this analysis, developing A0+ and Ak+ levels which will explore further the relationship between maximum efficiency and minimum life-cycle cost. For the 1.25MVA unit, we suggested a design at A0+ of 1600W and an Ak+ of 9500W. We would suggest that A0+Ak+ levels be adopted for Tier 2 (2015) which are calculated by deducting 50% of the difference in losses A0 and B0 from A0 to create A0+ and deducting 50% of the difference in losses between Ak and Bk from Ak to create Ak+. Then, Tier 2 (2015) can adopt A0+Ak+.** **As an example of how this would work, the following table presents our suggestion for 12kV dry-type transformers with 6% impedance voltage:**	

kV	kVA	Tier 1 (2013) Ak (watts)	Tier 2 (2015) Ak+ (watts)	Tier 1 (2013) A0 (watts)	Tier 2 (2015 A0+ (watts)
12	100	1,800	1,700	260	22
	160	2,600	2,550	350	30
	250	3,400	3,350	500	44
	400	4,500	4,300	700	61
	630	7,100	7,000	1,000	92
	800	8,000	7,500	1,100	1,00
	1000	9,000	8,500	1,300	1,20
	1250	11,000	10,500	1,500	1,35
	1600	13,000	12,250	1,800	1,60
	2000	15,500	14,250	2,200	2,00
	2500	18,500	17,250	2,600	2,30
	3150	22,000	20,000	3,150	2,82

46	**CLASP-Europe**	**7.1.2.3**	**11**	**As discussed in Chapter 6, we are concerned that the proposed levels for Large Power Transformers are not ambitious enough, and simply scaling the Chinese table core losses without further adjustment is problematic.** **Consider the following graphs from SGB Starkstrom and SMIT Transformers that provide losses in accordance with standards (red line), typical electric utility specification (black line) and values achievable by SGB (blue line).**	**Agreed. Also T&D insisted to review this and an enquiry is ongoing to fill this gap.**





We have super-imposed boxes and labels on these SGB graphs to facilitate interpretation of the core and coil losses for a 100 MVA transformer. In Chapter 6, the designs considered for the 100 MVA were 60kW-300kW, 40kW-275kW, 30kW-300kW and 30kW-250kW. From this graph, it is evident that the most ambitious combination of core and coil losses considered in Chapter 6 has higher core and coil losses than the "typical" electric utility specification on the SGB graph. Rather than 30kW of core losses, SGB estimates that utilities typically specify 19kW and they are capable of manufacturing around 13kW. Rather than 250kW, SGB estimates that utilities typically specify around 225kW, and they're capable of manufacturing around 180kW.

CLASP suggests that the levels for the Large Power Transformers be set at the midpoint between the Typical Utility and SGB Best lines in the graphs above for Tier 1 (2013). Then, Tier 2 (2015) could be the SGB Best line. To cover the kVA ratings that are not included in the SGB plot, CLASP proposes adopting the VITO recommendation or uses the 0.75 scaling rule to determine maximum losses from the SGB curves. The following table presents CLASP's suggestion for Tier 1 and Tier 2 maximum losses for this Large Power Transformers.

kVA	P0 (Core Losses) VITO (kW)	P0 (Core Losses) Utility (kW)	P0 (Core Losses) SGB Best (kW)	CLASP Tier 1 (kW)	CLASP Tier 2 (kW)
6,300	4.44			4.44	3.17
8,000	5.34			5.34	3.79
10,000	6.24			5.70	4.48
12,500	7.38	7.00	5.30	6.15	5.30
16,000	8.88	7.50	5.50	6.50	5.50
20,000	10.44	8.00	6.00	7.00	6.00
25,000	12.30	9.00	6.50	7.75	6.50
31,500	14.58	10.00	7.00	8.50	7.00
40,000	17.40	11.00	7.50	9.25	7.50
50,000	20.82	12.00	8.00	10.00	8.00
63,000	24.60	13.00	9.00	11.00	9.00
75,000	27.90	16.00	10.00	13.00	10.00
90,000	32.16			14.80	11.80
100,000		19.00	13.00	16.00	13.00
120,000	40.08	24.00	17.00	20.50	17.00
140,000		32.00	23.00	27.50	23.00
150,000	47.34			28.96	24.22
180,000	53.16			33.20	27.77

kVA	Pk (Coil Losses) VITO (kW)	Pk (Coil Losses) Utility (kW)	Pk (Coil Losses) SGB Best (kW)	CLASP Tier 1 (kW)	CLASP Tier 2 (kW)
6,300	35.9			35.9	34.2
8,000	44.9			44.9	42.7
10,000	52.9			52.9	50.1
12,500	62.9	72.0	70.0	62.9	59.5
16,000	76.8	75.0	71.0	73.0	68.6
20,000	92.8	76.0	72.0	74.0	68.5
25,000	109.8	90.0	75.0	82.5	75.0
31,500	132.7	105.0	80.0	92.5	80.0
40,000	155.6	125.0	90.0	107.5	90.0
50,000	193.6	145.0	105.0	125.0	105.0
63,000	233.5	165.0	130.0	147.5	130.0
75,000	277.3	190.0	155.0	172.5	155.0
90,000	319.2			190.5	170.0
100,000		225.0	180.0	202.5	180.0
120,000	396.0	270.0	225.0	247.5	225.0
140,000		305.0	245.0	275.0	245.0
150,000	470.9			289.6	258.0
180,000	530.7			332.0	295.8

47	**CLASP-Europe**	**7.1.2.4**	**12**	**Table 7-2 presents maximum losses for a limited number of kVA ratings for smaller LV/LV 50 Hz transformers. The section then states that certain 'special purpose' (not defined) smaller LV/LV transformers that are unable to satisfy the maximum loss requirements in Table 7-2 should meet the following design requirements – use rectangular copper wire and core steel with maximum losses of 0.80 W/kg at 1.5 Tesla at 50 Hz.** **CLASP supports this approach, except the core steel should have maximum losses of 0.73 W/kg at 1.5 Tesla at 50 Hz (1.10 W/kg at 1.7T at 50Hz).**	**Noted**
48	**CLASP-Europe**	**7.1.2.1 - .4**	**7-12**	**Throughout this section, it would be helpful if VITO included discussion around how the Commission intends to handle non-typical kVA ratings, such as those not appearing in the tables. This is a minor point, but it should be agreed whether transformers between two ratings would be held to the maximum losses of the rating above or below the non-typical kVA rating, or have their maximum losses of the non-typical kVA based on linear interpolation between the kVA ratings immediately above and below it. CLASP would support this latter option – linear interpolation for non-typical kVA ratings.**	**Noted.** **Linear inter- and extrapolation should indeed be added to avoid loopholes.**
49	**CLASP-Europe**	**7.1.3.1**	**12**	**The discussion on policy measures for TSOs is helpful, and responsible TSOs should continue to use total cost of ownership based on high valuation of losses. CLASP strongly feels that this should not be seen as an alternative to a regulation on maximum losses for power transformers. As discussed in our comments on section 7.1.2.3 above, there exists potential to improve efficiency and achieve the objectives of the EcoDesign Directive through the adoption of these regulations. Progressive TSOs will continue to purchase at or below these levels of losses, and the regulation will ensure that a minimum performance level is achieved.**	**Agreed it there should be no conflict with TCO and MEPS (topic of stakeholder meeting as there might be disagreement amongst stakeholders see comment 15)**

50	**CLASP-Europe**	**7.1.3.2**	**13**	**This section contains three suggestions for incentivising DSOs to adopt more energy-efficient practices. CLASP supports the measures presented, but again strongly feels that this should not be seen as an alternative to a regulation on maximum losses for power transformers. Progressive DSOs will continue to purchase at or below these levels of losses, and the regulation will ensure that a minimum performance level is achieved.** **The second paragraph of this section discusses other legislation that "TSOs" are subject to. Should this say "DSOs" or was this paragraph intended to be inserted into section 7.1.3.1?**	**Agreed it there should be no conflict with TCO and MEPS (topic of stakeholder meeting as there might be disagreement amongst stakeholders see comment 15)**
51	**CLASP-Europe**	**7.1.3.3**	**14**	**CLASP shares the concern expressed in this section that some DER investors may be looking for short payback periods that are not in alignment with the life-cycle (+20 years) of a transformer. In these instances, inefficient transformers will be installed and operated over their full life-time with negative environmental consequences.** **CLASP fully supports the recommendation to have the meter installed such that it incorporates losses from the transformer, as the transformer is a critical component of the DER system. Furthermore, transformers remain energised even when the wind is not blowing or the sun is not shining, thus the transformers will run the meters backwards, consuming power from the grid. CLASP agrees that Renewable Energy Certificate Systems should only be given for electricity generated by the renewable energy resource, and is concerned with inaccuracies that may be introduced through having the meter installed on the wrong side and a correction calculation applied for losses above the BAT level (A0Ak). By installing the meter on the correct side of the transformer and accounting for those losses, the DER system will benefit from accurately tracking energy generation and all losses will be relevant.**	**Noted**

52	**CLASP-Europe**	**7.1.3.4**	**14**	**In this section, the BAT levels (A0Ak) are identified as easily being drafted into procurement specifications, however CLASP has two concerns:** **1) CLASP strongly feels that this should not be seen as an alternative to a regulation on maximum losses for these transformers. An EU-27 regulation will ensure that all equipment purchases, not only those for large public buildings and certain industrial sectors, will achieve a certain minimum performance level. More progressive consumers can always purchase higher, but the Ecodesign Directive would ensure a maximum level on losses that no one would exceed.** **2) For several of the Basecase transformers analysed, the A0Ak level was found not to be ambitious, and that other more efficient levels exist in the market. There may be more efficient, cost-optimised levels for certain Basecase transformers (e.g., A0+ and Ak+).** **CLASP supports the concept of accelerated depreciation of energy-efficient capital assets as a method for promoting efficiency. This is a win-win for society and business.**	**Agreed and we add a statement to support this concern.**
53	**CLASP-Europe**	**7.1.5**	**15**	**Other options that may be included in this section include:** **1. Higher-flux amorphous material, to enable a reduction in the size of amorphous cores and thus a reduction in associated winding losses.** **2. Thinner steel laminations in Georg and other transformer core steel processing machines. Presently, 0.23mm (0.009 inches) is the thinnest lamination used, but thinner steels – such as 0.18mm (0.007 inches) are manufactured and could further reduce core losses.** **3. Improved coatings between steel laminations that will**	**Thanks for reminding, will be added.**

				reduce sound while enhancing electrical performance (i.e., reducing losses).	
54	**CLASP-Europe**	**7.1.7**	**16**	**CLASP welcomes and fully supports the recommendations in this section to develop extra no-load and load loss classes that exceed the A0 and Ak levels already published in EN 50464-1 and EN50541-1.** **CLASP appreciates the acknowledgement of its comment from the second stakeholder meeting relating to the fact that the loss tolerance specified in IEC 60076-1 may be excessive. IEC 60076-1 states that the maximum allowable tolerance on the total losses (sum of the load and no-load losses) is +10% of the total losses. CLASP believes the level could be less than +7.5%, given the improvements in core steel processing, core handling equipment, annealing furnaces, winding equipment, insulation and other variables that had previously necessitated the +10% tolerance. CLASP believes that 5% should be the maximum allowable tolerance level, based on data supplied to the US Department of Commerce's National Institute of Standards and Testing, who supported the development of the US DOE's test method, compliance certification and enforcement procedures. See the NIST Technical Note 1456:** http://www1.eere.energy.gov/buildings/appliance_standards/commercial/pdfs/technical_note_1456.pdf	**Tolerance issue will be discussed in the stakeholder meeting. See comment 25 and suggestion for no positive tolerance (or +0%) that is often used.**
55	**CLASP-Europe**	**7.1.8**	**16**	**CLASP strongly supports the recommendation to report the load and no-load losses on products that are included in the regulation. This label should be mandatory as it will be the first means of an enforcement officer to ensure compliance, and will also enable customers to verify they have received equipment of the quality and calliper they expect. It is more important to have the actual wattages included, as the particular efficiency classes are subject to change year-on-year, and having wattages leaves the option for customers to purchase above**	**noted**

				the minimum efficiency class levels.	
56	**CLASP-Europe**	**7.1.13**	**17-19**	**Table 7-4 presents sales, replaced and stock for the seven basecase units, however as discussed in our comments on Chapter 6, we believe the starting stock is too low for several of these units. This projection from 2005 to 2025 is helpful, but if it is starting with a installed stock that is off by a factor of two or more, the error will only be compounded in this forecast, and the energy savings estimate from the regulation will be more severely underreported. We look forward to the review and revision to the stock calculations in Chapter 6 and the updating of this and other tables in Chapter 7.**	**The market data is taken from section 4.5.1. The project team will discuss internally to determine where an improved explanation of methodology should be placed.**
57	**CLASP-Europe**	**7.1.13.4**	**38**	**CLASP notes that Table 7-12 presents the energy savings estimate from the previously discussed lowest life-cycle cost and the best available technology scenarios. Considering the time period of 2011 to 2025, the table reports a reduction of between 9.6% and 12% for the LCC and BAT scenarios. This represents 165.5 to 206.2 TWh of savings over this time period, or 75.8 to 94.5 $MtCO_2$ equivalent savings. CLASP agrees that this does represent a significant savings potential, and through the incorporation of our comments on Chapters 6 and 7, we hope to see that increase slightly to reflect the increased ambition on some critical units, such as the oil-immersed large power transformers.**	**Noted.**
58	**CLASP-Europe**	**7.2.1**	**46**	**In the context of the discussion on potential negative impacts of larger and heavier energy-efficient transformers, it deserves mention that adding more core steel and lowering the flux density is not the only way to make a more energy-efficient transformer. It should be noted that through the use of premium conventional core steels, including domain-refined and mechanically scribed grain-oriented electrical steels with very thin laminations and improved coatings between the laminations, lower losses can be achieved in a smaller volume.**	**Will be added and part of the stakeholder meeting discussion**

59	**CLASP-Europe**	**7.2.3**	**46-47**	**CLASP strongly objects to the statement contained in this section which reads:** **“Therefore, the following elements could be taken into account when deciding on maximum transformer losses:** **- Raising the no-load requirements above class A0 (EN 50464-1) would phase out Domain Refined High-permeability steel production and associated production of steel and transformers.** **- A fast raise to class A0 (EN 50464-1) would require high amounts of Domain Refined High-permeability steel production and could disturb the market as well.”** **We believe that both of these statements are invalid, as we have demonstrated in our comparison with US data in Chapter 6. Indeed, in the US, transformers operate at 60Hz, so achieving higher efficiency is more difficult because the frequency is higher - however using conventional steels and conventional construction methods and windings, the US was able to develop optimised designs that exceeded the efficiency levels presented in Chapter 6. Thus, raising no-load requirements above class A0 will not phase out grain-oriented electrical steels. Furthermore, VITO should conduct a global study of core steel requirements, production volumes and availability before concluding that a fast rise would “disturb” the market. The US market and its suppliers were able to achieve a similar shift in just over two years, going from no regulation to efficiency levels that exceed the equivalent of A0.**	**See also T&D comment 24.** **Text will be modified to ‘far’ above class A0, as indeed a small step 0.9A0 might also be possible.**
60	UBA	7.1		In general, the policy analysis should differentiate between the following relevant market actors: - Electricity transmission companies, transmission system operators - Larger electricity distribution companies, distribution system operators	The modelling and analysis is already sophisticated and based on the MEEuP methodology to achieve fast and significant results. In order to perform more fine grained analysis by policy makers a tool will be made available.

				- Smaller electricity distribution companies, distribution system operators - Owners of large industrial plants - Owners of small industrial plants or sites in the tertiary sector - Owners of small industrial transformers - Engineering firms, ESCOs, energy consultants and planners, who often have a large influence on decisions, particularly in small industrial plants and the tertiary sector - Users that are not owners, e.g., shops or offices renting space in tertiary sector sites - Large transformer manufacturers - Small transformer manufacturers - Steel, copper and aluminium manufacturers. Policy options to be developed in Task 7 will have to take into account the differences in market position, incentives and disincentives, barriers and obstacles, capabilities and capacities, knowledge and decision processes of these different actor types in the transformer market chain. Therefore, this should be analysed in more detail and in sufficient differentiation. For example, ➢ With regard to electricity distribution and transmission companies, removing disincentives and including incentives in regulatory schemes should be the main activity to be combined with the loss requirements proposed here. ➢ In addition to the loss requirements proposed here, clearly visible information required on the nameplate of a transformer, a labelling scheme like one of the three options proposed by the EU SEEDT project, information, motivation and qualification, the	

				inclusion of transformer issues into energy advice and audit programmes as well as the provision of a toolkit for buyers (including the calculation tool provided by the SEEDT project) particularly address those market actors who lack of information and knowledge or who tend to follow traditional purchasing routines which do not lead to least-cost solutions. These are particularly small and medium industry and commerce, but also some smaller electricity distribution companies, engineering firms, ESCOs, energy consultants and planners. Only few larger companies in industry and in the electricity sector will need such information and qualification. ➢ It should be analysed, if market surveillance in the case of transformers or certain transformer types could be more difficult than for other energy-related products and which provisions could overcome possible obstacles (e.g. possibilities for the respective public authorities to join tests run by buyers). ➢ Manufacturers and their suppliers will have to comply with loss requirements and the labelling scheme required, and might make use of available information and toolkits in their marketing activities. These market actors are directly addressed by R&D funding. ➢ All market actors can implement demonstration or pilot projects together with manufacturers (and their suppliers), but probably larger companies will particularly be prepared to make use of respective R&D support provided.	
61	UBA	7.1.1.1		Exemptions with less stringent loss requirements for “very compact three-phase oil-immersed distribution transformers” or any limitation of kVA within this category does not seem to be justified.	Will be discussed in the stakeholder meeting
62	UBA	7.1.2		It is appreciated that ambitious transformer load and no-load losses requirements have been proposed which go partly even a little bit beyond what had been proposed within the EU SEEDT project, and which will therefore lead to larger electricity savings and CO_2	Noted

				emissions reductions than calculated in the EU SEEDT project.	
63	UBA	7.1.3		A detailed analysis of the incentives and barriers for electricity distribution and transmission companies to invest into LLCC transformer technology, to follow LCC saving approaches, to improve location of transformers and to reduce redundancies in the electricity system is missing here (and in Chapter 3; in their response to stakeholder comments, the preparatory study contractors have suggested to make at least a reference to this topic in Chapter 3, but this should be extended to better understand the problem of the relation between setting loss requirements and regulation of grid companies). Why is this important for the policies and measures proposed in Chapter 7? In some countries within the EU-27, the situation currently is as follows: While there is a bidding for the electricity price for grid losses, there is no incentive for distribution and transmission companies to reduce the quantity of grid losses. Costs of grid losses are always fully paid by the electricity end-users in these countries. If now an implementing measure requires lower losses, the end-user will have to pay less. But lower losses can only be achieved by higher investment costs, which need to be accepted by the regulator as eligible costs. Therefore, it should be analysed, if changes in the internal market directive for the electricity market, or at least changes in the national laws and ordinances on the regulation of electricity distribution and transmission companies are necessary, in order to safeguard, that there are no barriers to invest into the more efficient transformer technology.	Will be added as a suggestion but it is heavily related to assessing cost for rewiring the grid and beyond the scope of transformers. Cost figures for rewiring are very local and would form a hard basis to formulate a EU wide policy. Following text 'In some countries within the EU-27 ..' will be added as it nuances comment 21 related to the UK .
	UBA	7.1.7		There is clearly the need to update existing standards, particularly EN 50464-1, in order to take BAT and BNAT options sufficiently into account (cf., e.g., the additional categories proposed for the labelling scheme proposed by the EU SEEDT project).	Noted

1	UBA	7.1.8		Cf. also the information, motivation and qualification activities proposed by the EU SEEDT project, particularly activities to be carried out on Member State level.	A reference to information actions will be made in section 7.1.3
2	UBA	7.1.13		Growth of sales assumed is questionable, particularly for BC 2 and 3, but also for the other base cases. What are the assumptions behind, and why have these figures been finally selected for the impact analysis?	**The market data is taken from section 4.5.1. The project team will discuss internally to determine where an improved explanation of methodology should be placed.**
3	UBA	7.1.13 and 7.2		In contrast to the opinion of the preparatory study contractors in their response to stakeholder comments, we think that relevant interactions between transformer scenarios and scenarios of the general development of the electricity system should be explicitly modelled within Task 7 and would not be beyond the scope of discussions. While the preparatory study contains data and information on the general development of the European electricity system (development of consumption, which in turn is partly dependent on the demographic and infrastructural development; development of electricity savings, which is partly dependent on the policies and measures in place; development of distributed generation) as well as on the expected development of sales of transformers until 2020, it neglects the interaction between both. This interaction should be explicitly modelled (cf., e.g., the transformer scenarios differentiated by two scenarios of the development of the electricity system, PRIMES TRENDS and PRIMES EE/RES, as in Irrek et al. 2008 within the context of the EU SEEDT study).	The extent of modelling that is suggested is out of the scope of this study.
4	UBA	7.2.1		Any larger negative impact of the loss requirements proposed here on transformers mounted on exiting poles or installed within existing buildings with limited space cannot be expected. Possible negative impacts and constraints regarding the investment into amorphous transformers have already been sufficiently	Will be discussed. All evidence is welcome.

				discussed in Chapters 5.1.2.4 and 5.1.2.6 of the draft preparatory study report of April/May 2010.	
5	UBA	7.2.3		Regarding the impact on the manufacturers and competitive situation in the market, it has to be noted that there is a typical the chicken or the egg causality dilemma in the transformer market: On the one hand, without any visible increase in demand for energy-efficient transformers, European manufacturers will not invest into HGO or amorphous transformer production plants. On the other hand, if an implementing measure creates this demand, the existing production capacity will not be sufficient to satisfy demand. Therefore, what is recommended is a clear strategic plan for an implementing measure and further policies and measures in this context, with visible tiers for the European manufacturers clearly showing what will happen, so that investment into production facilities can be better planned and an increase into energy efficiency can be achieved.	Dilemma will be added.
				Received after the deadline the day before the meeting 23/8/2010 (Answered after the meeting in the extend possible	
	Eurelectric	7.1.2.1		The proposal to set particular levels of losses for transformers is economically incorrect, but to go further and state and prescribe the resistivity of the material and the level of core losses is completely unwarranted. There are two reasons why it is unwarranted: (a) the transformer designer may be able use other materials in a more clever manner to achieve the target required e.g. Hexaform design (b) Competition is restricted when the materials from which the transformer can be made are set by fiat. This issue is potentially very serious. The description of the losses required in transformers up to 100kVA is very unclear – if <=100kVA is in question why is the restriction	Section is reviewed completely

				described as *"-<= 630kVA C0Ck in Tier 1 (2013) and A0Ck in Tier 2 (20145). "* This section needs to be clarified.	
		Section 7.1.2.3		Setting levels of Load and No Load loss for 110kV transformers requires rather more justification than is provided here. The costs of HV transformers is very high and extra costs – which may be extremely high, particularly in cases where the electrical design dictates the shape of the transformer and this conflicts with the losses requirements so that the design is expensive to produce. It is worrying that such a proposal is made – apparently based on copying a proposed Draft Chinese standard and then simply multiplying Grade 1 by an arbitrary correction factor of 0.6 simply because Grade 1 wasn't ambitious enough. **It isn't a question of ambition or reaching a very high target – it's providing society with the best balance of cost and benefits.**	This was discussed in the meeting and will be reviewed. (New enquiry was launched and will be included in the latest update)-
		Section 7.1.3.1		This section contains many sweeping statements whose justification would require quite detailed analysis by energy market economists. It is stated that 'electricity prices in the past could have been too low and they could now be different' – this is correct the price of electricity could indeed be either higher or lower than it was in the past. 'Therefore it can be recommended that authorities put forward European long term electricity indexed prices (e.g. 0.08 €/kWh) and interest rates to be used ' – how will the authorities know the future price of electricity which is dependent on the price of oil, or the interest rate to be used ? The answer is that they can't – even the markets will only price commodities for a very limited period ahead.	Indeed there was an error related to TCO recommendations (see other stakeholders comments). Based on those and other related comments the TCO recommendation has completely be reviewed. BTW: Apart from the used electricity price used, that was agreed in the beginning of the project. The rationale will be repeated on the update.

				Trying to use an artificially high rate for electricity to justify low loss transformers is bad economics and would only rive dysfunctional investments. Instead of getting the wrong answered some of the time the wrong answer would be obtained all of the time. From an economist point of view this would not seem to be a strong proposal. Next it is proposed to limit the differentiation between the cost of no load losses (A) and load losses (B) to *‘e.g. <=20% ‘on* the basis that ‘*Significantly lower no load prices fit in an electricity park with a high share of nuclear energy for the base load and fossil fuels for peak loads might have been used in the past, however this is outdated with a higher share of renewable energy currently’.* The reason for the difference in the capitalisation rates of the A and B factors is that the kWh used by Iron losses are 24/7 whereas most of the Copper losses occur for a short time at peak. So Iron losses account for a every large number of kWh and Copper losses for a much smaller number. Secondly the copper losses tend to be larger at peak time when they occur so they have more of an effect on peak demand requirements and could be associated with a demand charge (- although to date this has not appeared in this project). Taking both of these impacts into account the capitalisation rates for Copper losses are €670/kW and for Iron losses are €6,700 per kW for a typical 15-50kVA transformer. So the price of electricity has nothing to do with the relative capitalisation rates for iron and copper losses, and the suggestion that capitalisation rates which differ by a factor of 10 would be set to within 20% of each other is somewhat unusual. It s then suggested that because TSO’s ‘*use a much lower electricity price compared to DSO’s because of the top down large scale electricity production and distribution. This might be debatable in the future as well when a high share of DER is integrated in the*	

				electrical grid. Thus it is recommended to limit this differentiation in-between electricity prices used in large power transformers compared to Distribution transformers (e.g. <15%)' Aging there is a lack of understanding as to how the price of electricity is derived and what it means. The price of electricity is set by a market and is intended to signal the value of the product in such a way that decisions taken are related to the societal value of the product, as signalled by the information in the price. So electricity at the Distribution level is more expensive than at the Transmission level because there is greater investment in network infrastructure on the Distribution system than on the Transmission system, and because the losses in transporting a unit down to the Transmission system are greater – say 2% losses on Transmission and a further 6% in the Distribution system. So if there was sufficient DER perhaps you could end up with a situation where there was a much generation at Distribution as at Transmission and loads were served at LV from local generation. However in such a case the transformers would be carrying little load and there would be no justification in having low loss transformers as there were no losses to save! Also, it would-be at least 20 – 40 years before this situation was achieved (if it was) so that in the meantime transformers would still have to be bought on the basis of existing electricity prices at the Transmission and Distribution levels. Finally there is the statement that as TSOs and DSO's are monopolies they can pass the cost son to customers so that no financial incentives are needed. Furthermore they can issue bonds to raise funds for the extra costs with Govt backing for the bonds. The bottom line here is that society is paying directly for these extra costs and these cost should only be inflicted on society if the benefit they confer is greater than what society could otherwise achieve with these funds.	

				Reality is that TSO and DSO's are regulated monopolise and any cost increases have to be agreed by the regulator. The Regulator is precluded from agreeing extra costs that are not justified in a Regulatory Impact assessment which is subject to public scrutiny. The public include large energy users as well as economists who publicity challenge increases and required a detailed economic justification for same.	
		Section 7.1.3.2		As above but now suggesting that the DSO could get Tax benefits for using efficient transformers. As the DSO is a regulated monopoly this is just another way of taking the money from the customer directly, but less transparently, as at least in the monopoly such transfers would have to be justified	See above reply
		Section 7.1.3.3		Meter on HV customers are always installed on the LV side – not practical to install metering at say 110kV or 220kV when al that is required is to install it at the lower voltage side and calculate loss. The losses incurred are charged to the DER. The short time frames are due to the higher discount rate used by DER's who are generators. Generator BNE WACC is about 15% so 7 year payback – this is economically rational. In theory the DER could auction the savings in losses produced by installing a more efficient trafo and then transfer the extra units saved to the purchaser	Thanks for informing. Text added 'In this case, it is recommended to include the calculated losses and charge them to the DER owner.'
		Section 7.1.3.4		Replacing high loss transformers with low loss transformers before the end of their economic life is not justified on economic grounds.	Is a case by case decision, should be compared with other means of EU to reach 20/20/20 targets.
		Section 7.1.10		Use of Dual Ratio trafos depends on having a clear policy on Voltage updating – otherwise you end up with a Dual Ratio trafo which is in situ for 25 years before uprating takes place	Indeed Text added, note the copper is used anyhow its only a matter of

					reconfiguring the windings.
		Section 7.2 Impact Analysis		**'….ecodesign requirements should not entail excessive costs nor undermine the competitiveness of European enterprises…** **This is clearly not the case with the proposal as outlined. They are not economically justified and increase costs for no clear benefit, in ways which are clearly non-optimal.** **It can be expected that the costs of these measures will cause significant complaints by business to Regulators and Governments, and that the argues in favour of the proposals are weak.** **The only argument for low loss equipment is that where all items of plant and all investments are made on the basis of Total Cost of ownership, including an assessment of the losses as part of the investment costs.**	A new related section has been added.
		Section 7.2.3		**The impact on manufacturers may be more significant than expected on low loss trafos , as the value of losses is high and so technologies such as the latest generation from Hitachi could knock out all other forms.** **Also, if the justification for using low loss transformers is losses saving and the environment then the manufactures should be expected to meet this requirement, whether the manufacturers are in Europe or elsewhere.**	Related comments were also received from T&D Europe and section has been updated.