Ecodesign Preparatory Study ENTR Lot 2: Distribution and Power Transformers

Minutes of the Second Stakeholder Meeting

Place: European Commission
Centre Albert Borschette, Brussels

Date / Time: May 19, 2010
10h30 – 18h00

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Agenda:

10h15 – 10h45	Welcome and participants presentation (EC and Vito) Agenda Distribution of comments and proposed answers
10h45 – 11h00	Short presentation of MEEuP methodology and general scope of the study (BIO)
11h00 – 11h30	Chapters 1-3 in a nutshell with short discussion on approach for load profiles (Vito)
11h30 – 12h00	Gaps in standards and potential recommendations (Vito)
12h00 – 13h00	Presentation of Chapter 4 followed by a discussion on transformer price approach and selected comments and answers (BIO)
13h00 – 14h00	Lunch break

14h00 – 15h00	Presentation of Chapter 5 and selected comments and answers (Vito)
15h00 – 15h30	Needs for updated info related to Chapters 4 and 5
	Chapters 6 and 7 planning and approach
15h30 – 15h45	Coffee break
15h45 – 16h30	Other comments received and discussion (Vito)

The times of the agenda are the originally planned times, and do not reflect the reality of the events that occurred.

Annex: Stakeholders who read these minutes should also consult the powerpoint presentations of the meeting that are available on the project website.

Participants:

European Commission

ME	Martin Eifel	EC – DG ENTR

Lot 2 consortium

PVT	Paul Van Tichelen	VITO
MSt	Marcel Stevens	VITO
BT	Benoît Tinetti	BIO Intelligence Service
AT	Alexander Thornton	BIO Intelligence Service
TF	Thibault Faninger	BIO Intelligence Service

Stakeholders

MSa	Michel Sacotte	GIMELEC/T&D EUROPE/WG3
PL	Pierre Lucas	T&D Europe
CE	Christophe Elleau	EDF R&D
EC	Eric Coen	EREA nv
SJ	Sigrid Jacobs	ArcelorMittal
SF	Stefan Fassbinder	DKI
HDK	Hans De Keulenaer	European Copper Institute
CM	Chiara Margagliano	European Consulting Brussels
JG	Joachim Gerster	Vacuumschmelze

HL	Hans Lammert	ThyssenKrupp Electrical Steel GmbH
AS	Angélique Stopin	ThyssenKrupp Electrical Steel GmbH
AW	Anthony Walsh	ESB Networks/Eurelectric
HPS	Hans-Paul Siderius	NL Agency
MSc	Michael Scholand	CLASP/Navigant Consulting
RM	Richard McGeehan	Hitachi Ltd.
JH	Jesper Holmberg	Hitachi, Ltd.
VDF	Vance DeFelice	Hitachi Metals/Metglas
MDG	Maya DeGroot	federal public service health, food chain safety and environment

1. INTRODUCTION

Paul Van Tichelen (PVT) of VITO welcomed participants to the meeting and initiated introductions by all participants.

Martin Eiffel (ME) of the European Commission explains the meeting expectations:

- The study began 1.5 years ago. This is the second stakeholder meeting and there are two tasks remaining to be completed before the study ends in November. It is important to have comments from stakeholders.
- The EC wants a project report that answers all questions and addresses all concerns to have the necessary information for passage through the legislative process.
- There should be an emphasis on standardisation. We need to look for what exists and what might be needed related to test and measurement, as well as performance.
- There is a new ecodesign Directive (2009/125/EC) in which the product scope is extended to all energy-related products (ErP). For example, windows are an ErP. The update of the Directive has no impact on the current study and legislative process.
- The current working plan runs out in 2011 and a new one will take effect in 2012. A call for tender is currently out for the contract to create the new working plan.
- Article 21 of the new ecodesign Directive calls for an extensive review in 2012.

Anthony Walsh (AW) of ESB Networks/Eurelectric raises a question on the application of the Directive to ErP. Are cables and overhead lines included? Within a utility, an optimization is done to balance the losses in cables and transformers. Utilities look at capitalisation of energy efficiency over the entire system, rather than just one component. It is incorrect to minimise losses in transformers if greater gains can be made per capital in the system. He feels that the perspective of utilities is lacking within the present version of the study.

ME: All perspectives are welcome and will be taken into account. Cables as such are already covered under the original ecodesign Directive (2005). No one has yet come forward with a reason to focus on them.

Michel Sacotte (MSa) of GIMELEC/T&D EUROPE/WG3: The study of transformers is already very complicated; it should be remained focused on the transformer and not the system level aspect.

PVT: Agree. This is a horizontal discussion that is out of the scope of the study.

1. PRESENTATION ON MEEUP

Alexander Thornton (AT) of BIO Intelligence Service presents the methodology used in the study.

2. CHAPTERS 1-3

PVT makes a presentation on remaining issues within Chapters 1-3. It is essential particularly to receive information on the use phase.

AW: The load factor definition used in the study is not the one used by utilities. The difference comes from the load increasing over time.

PVT: Agreed. We will come back to this point.

Christophe Elleau (CE) of EDF: Dimensioning and weight are not included with performance parameters.

PVT: They are important but not related to the core functionality.

AW: Disagree. A transformer that is too big is unusable in certain contexts.

PVT: Information on amorphous transformer tests?

CE: When EDF tested Indian and Chinese products with the short-circuit test, they failed. However, the test specifications were satisfied by French products.

MSa: There is proof that at least one French and one German company have passed the short-circuit tests for amorphous transformers. It is technically possible to pass up to 1 MVA, and surely up to 400 kVA. There is a CIRED article for proof.

CE: Amorphous transformers are new for ERDF. Manufacturers in France were not informed, so the product was taken from the world market. There is a new field test program and manufacturers now know the needs of EDF.

AW: Why is there a problem with amorphous transformers and short circuit tests?

MSa: Short-circuit tests are one of the many requirements for reliability in Europe. The rectangular core of most amorphous transformer designs creates technical difficulties in this respect. As power increases, the difficulties increase.

AW: Is this a problem of manufacturing experience with amorphous material?

MSa: It is a question of design using amorphous material. The EU utilities are very serious about the short-circuit test and reproducible design is needed.

PVT: Can fuses or circuit breakers be used?

MSa: This is not possible as they are too slow. There are a few issues with amorphous transformers that need to be studied.

CE: Note that EDF shares the same specification with ENBW.

AW: There have been about 25 amorphous transformers in our system for the past 20 years in rural circuits that have lower short-circuit requirements without problem.

Vance DeFelice (VDF) of Hitachi Metals/Metglas: Amorphous transformers have no failures reported so far in Japan and the US and carry the same risk as any transformer.

MSa: The difference of standards from around the world needs to be studied.

Discussing raw material prices

Michael Scholand (MSc) of CLASP: Worked for seven years with the DOE transformer standards. The price table for that study was a five year material average price. There was a lot of fluctuation at the time. The marked up material price had to do with the manufacturers selling price of embedded material. Column two is not necessarily needed for the EU. The breakdown of markup is the following: 2.5% scrap and handling, 4% mitred scrap factor, 12.5% factory overhead, and 25% nonproduction markup.

AW: The numbers given for transformer stock are very confusing. It is better to increase the scope to 12 kVA which is utility size. Utilities should be asked for stock data.

PVT: It is hard to get good data. We would like the average rating and how many of them you have. (Note: Utilities are still invited to send data, which can be taken into account in chapters 6 and 7, as well as later impact assessments).

Discussing load factor

MSc: The DOE went through a long process to arrive at a 50% average load factor, used in association with specific load curves.

MSa: The price of transformers and load factor need to be accurately determined for this study to be finalised. Load factor data is needed for all countries. A new inquiry is encouraged as load factor is extremely important.

PVT: Agreed. We need stakeholders to provide data (Note: see also presentation, there might be confusion about the used definitions of load factors, as mentioned in the presentation this will be more documented in the updated chapters).

ME: On the basis of this report, the European Commission will take action. It is in the best interest of all stakeholders to provide data so a decision can be made on a solid basis.

AW: Eurelectric can be pushed to release data but one load factor is not sufficient. It is better to push for standardisation of capital losses across EU.

MSa: Yes but that is not the purpose of the study. Average load factor is needed for this study.

AW: Load factor is very unique in each location. Will ask EUrelectric for general factors.

CE: The problem with an average load factor is that when a utility constructs a grid, it considers not average but peak values (or worst case, see also powerpoint presentation on definitions). A better idea is to sum the total power installed, then obtain total no-load losses at the time. No-load losses are constant all year.

Discussing standards

MSa: Fire standards are generated by manufacturers. A technology dependent standard is set high and dry type was chosen to satisfy it. Liquid already has embedded energy and is inherently worse performing with respect to fire safety than dry types. No one tries to develop a liquid standard. An end user chooses a dry type transformer when considering safety and environment. However, liquid has lower level of losses. Vegetable oil is becoming more common, though fire performance remains the same.

Discussing energy labelling

PVT: Would it be a good idea to put the loss classes on the transformer nameplate?

AW: It would be better to indicate the losses values.

MSc: With efficiency you must always determine a loading point. No load and load loss info would be better.

MSa: Suggest a law to reduce losses rather than labelling. A working group to establish standards of energy efficiency was just launched. The first meeting will take place in autumn 2010. Goal is an energy efficiency standard in 2012.

Discussing performance tolerances

MSc: The DOE ended up creating standards for 5-6% tolerance which created higher quality products.

MSa: This is hard to achieve because of raw material standard deviation, testing tolerances, manufacturing process tolerances. 10% could be reduced to 7.5%, but not further.

AW: The utility expects a tolerance of less than 5%.

MSa: There is currently a 10% tolerance but penalties if the performance varies by more than 2%.

3. PRESENTATION ON TASK 4

Thibault Faninger (TF) of BIO Intelligence Service presents the results of Task 4.

Discussing EcoReport inputs

Sigrid Jacobs (SJ) of ArcelorMittal: Galvanized steel was used in the EcoReport for modelling core material but it is not precise enough.

MSc: same remark for the use of "cast iron" for the tank material.

TF: More appropriate materials were not available within the EcoReport. We are restricted to the use of the EcoReport.

SJ: Materials were added for the lot on motors, such as electrical steel. Will email with more information afterwards.

MSc: Support for expanded bill of materials.

AW: What country or continent is the steel being produced in? It is very geographic dependent.

TF: This is a general tool, and thus uses an EU average for inputs, including electricity generation.

ME: The EcoReport reflects an average. We cannot check where items are produced, but more focused on the design of products. It would not be possible to create regulations governing the supply chain.

Discussing transformer lifetime

AW: Product life of distribution transformers is more often 40-45 years because a transformer at partial load lasts longer.

Discussing 1 kVA transformers

AW: Where are the separation and isolation transformers used? Is this a unique situation?

Eric Coen (EC) of EREA nv: Separation and isolation transformers are commonly used outside of distribution in machinery.

PVT: There are many reasons for using them that are clearly explained in Chapter 1.

ME: The purpose of the study is to map all transformers, and thus they will remain within scope.

Discussing price of electricity

CE: The price of electricity should be 0.078 €/kWh.

AW: Is tax included in the price? The price varies depending upon which part of the transmission system it is in, as well as location.

PVT: A sensitivity analysis will be conducted to ensure robustness.

Discussing material cost of active part

MSa: 35% is very low but cannot give exact figures. Perhaps double that (look for utility revision formulas), definitely greater than 50%.

Discussing end of life

AW: Was cost of waste disposal taken into account?

TF: No true data was obtained so it was ignored. Data is welcome.

AW: For transformers constructed before 1990, it is a loss. For newer transformers, it is a gain.

4. PRESENTATION ON TASK 5

PVT presents the results of Task 5.

MSc: AK Steel makes carlite, an insulator that is better than glass and rivals amorphous transformer efficiency. Other steel coatings would be a useful improvement option.

Angélique Stopin (AS) of ThyssenKrupp Electrical Steel GmbH: ThyssenKrupp developed this and is also decreasing material thickness using new coatings. Will send info.

(info below provided 04/06/10 by AS)

The potentials for further loss improvements are related to the three loss components contributing to the total loss: hysteresis, eddy current and anomalous loss. Smoother surfaces (interface between insulation layer and steel matrix), new coatings with enhanced tension, sharper texture with improved grain structure (generating micrograins, controlling grain shape), optimized domain refining (decreasing of 90° closure domains), thinner gages (without destabilizing of secondary recrystallization) are the items on which each GOES producer works.

In the field of insulation coatings, most GO producers use the second generation coating "S2" (Carlite is the AK Steel designation), or "C5 over C2" according to international standards. This is a tension coating leading to tensile enhancement, resulting in core loss and magnetostriction reduction. It reduces compressive stress sensitivity of laminations, too.

A 3rd generation coating may consist of generating a smooth and particle free interface between surface and steel matrix and applying a DLC (diamond like carbon) insulation, but this technique is still under development.

The reduction of the thickness is a well known technique to decrease the core losses. Whereas CGO in thickness 0.18 mm is already available on the market from some limited GO producers, the development of HGO in thickness 0.18 mm is more challenging due to the more difficult control of secondary recrystallisation.

Discussing noise in amorphous transformers

MSa: The problem of noise in amorphous transformers is a lobby problem. For the same flux, an amorphous transformer probably gives 6-10 dB (A) more noise than a traditional transformer. For a traditional 400 kVA, noise is about 63 dB. If losses are reduced 10-20%, then noise is roughly 53 dB. An amorphous transformer will have a lower level of losses and about the same noise. Noise should not be the primary parameter in choosing technology.

AW: Specifying noise levels is economics. Sometimes this results in amorphous being uneconomical.

ME: A hypothetical regulation could be that a manufacturer must declare intention for use in order to allow for noisy transformers away from people.

CE: An amorphous Bk transformer cannot yet meet EDF specifications for noise, weight, and losses.

PVT: Is noise connected to the load factor?

MSa: Noise of the coil only contributes for greater than 10 MVA according to ISO 76-10.

AW: Core noise does not change depending upon load.

MSc: To minimise uncertainty, contract a third party that designs transformers. Optimized Program Service was used by the DOE and has the capability to provide an independent evaluation.

PVT: We use a simple spreadsheet and it is open for the manufacturers to verify it, moreover enquiry will be launched (see powerpoint presentation)

MSc: There are technical issues that complex software is needed to address.

MSa: It is better to have a simple example with simple data. An inquiry is the best way.

MSc: The relationship between cost and efficiency is the most important part of the study. A simple example is not sufficient. European manufacturers use there own design software.

(Note added afterwards(PVT): in what does it differ from obtaining info from manufacturers as the DOE information is single source data and crucial design parameters were not disclosed? Moreover, European manufacturers have their own design software and do not rely on OPS so the outcomes might not be representative either.)

ME: The European Commission is actively looking to fill in gaps and loopholes in standards, as mentioned on p. 77 of the report. This will avoid a situation in regulatory committee when a standard is lacking. The European Commission calls all stakeholders to provide this information very soon.

AW: The discount rate of 4% is not appropriate.

ME: The discount rate is standardised across European Commission studies and will remain at 4%.