# Minutes of the stakeholder meetings on Enterprise servers preparatory study and technical assistance study

First Stakeholder Meeting – DG ENTR Lot 9 on Enterprise servers and data equipment - 5 December 2013

Second Stakeholder Meeting – DG ENTR Lot 9 on Enterprise Servers and Data Equipment - 13 October 2014

Third Stakeholder Meeting – DG ENTR Lot 9 on Enterprise Servers and Data Equipment - 24 April 2015

First Stakeholder Meeting for 419/PP/ENT/IMA/14/11931A - Ecodesign Technical Assistance Study Product Group "DG ENTR Lot 9" – 13 November 2015

Second Second Stakeholder Meeting for 419/PP/ENT/IMA/14/11931A - Ecodesign Technical Assistance Study Product Group "DG ENTR Lot 9" - 25 April 2016

# Meeting Minutes

Project	DG ENTR Lot 9 – Enterprise servers and data equipment		
Event	1 <sup>st</sup> Stakeholder Meeting		
Date	5 December 2013		
Location	Centre Albert Borschette (CCAB), Room AB-1B, rue Froissart 36, 1040 Brussels		
Participants	See list in Annex		

# Welcome and opening by the EC

Davide Polverini (DP) welcomes the participants and shows the agenda and the objectives of the meeting.

A brief introduction of the attending members of the project team follows: Davide Polverini (EC DG Enterprise and Industry), Shailendra Mudgal (BIO Intelligence Service), Dr. Lutz Stobbe (Fraunhofer IZM), Thibault Faninger (BIO Intelligence Service), Anton Berwald (BIO Intelligence Service), Ferenc Pekár (EC DG Environment).

Since there are no suggestions to the agenda, the agenda is approved.

# Introduction to the Study

DP presents the objectives of the meeting, which are:

- To give an overview of the ongoing work on this Ecodesign lot which is in the preparatory phase;
- Getting feedback and comments during the meeting and up to four weeks after the meeting; and
- Promoting the data gathering exercise.

DP reminds that the general goal of the study is to work on potential implementing measures under the framework of the Ecodesign Directive (2009/125/EC). The Ecodesign Directive is aimed to remove worst performing products from the market.

This Directive is part of a larger framework, the "Sustainable Product Policy", also consisting of:

the Energy Labelling Directive (2010/30/EU), which introduces differentiation into the market via compulsory labelling schemes, which allow the consumers to distinguish between different products;



the EU Ecolabel and the Green Public Procurement, which are voluntary instruments, helping to identify in a clear way the best performance in the market.

The Ecodesign Directive is a framework Directive based on a life-cycle approach and the practical enforcement of the rules applied to specific products is done by implementing measures that are sometimes called "daughter Regulations". Another possibility is that manufacturers might decide to organise themselves and promote ecodesign measures through voluntary agreements.

The standardisation of work is very important, since it is very difficult to proceed without clear standards that help to identify and to measure relevant parameters. Three basic conditions have to be fulfilled by product groups in the scope of the Directive, to be potentially covered by implementing measures:

- i. Significant environmental aspects
- ii. Significant potential for improvement
- iii. Significant trade and sales volume (approx. 200.000 per year, but subsidiary to conditions i. and ii.)

The aim is to improve the environmental performance, which can be related to energy efficiency, emission values, water consumption, and other environmental impact indicators.

Setting Ecodesign implementing measure is a long complex procedure taking five major steps (see slide on preparatory and adaptation procedure for details):

- 1. Preparatory study
- 2. Consultation Forum and first proposal: Official meeting with Member States (MS) representatives, NGOs and industry representatives who give their views on the potential measures, which are foreseen. In parallel to the consultation forum an internal impact assessment process is launched which is linked to the practical development of the Regulation.
- 3. Draft Regulation: The Commission begins to write a draft of the Regulation and then goes for inter-service consultations (to take into account comments and views from the rest of the Commission and typically any other DGs can contribute).
- 4. Approval by Regulatory Committee: notification of the WTO, regulatory committee vote and scrutiny by the European Parliament and Council
- 5. Final Regulation: adoption by the EC and publication in the Official Journal.

It is a complex and long lasting process (around 55 months), often very challenging and debated but the tendency is to find the optimum and to ensure that a good level of transparency is respected.

End of introduction – No questions.

# Overview of the Project and the Methodology

Thibault Faninger (TF) distributes the attendance sheet and presents BIO Intelligence Service, its general role and field of expertise and the project team that is working on ENTR Lot 9. Respectively, Lutz Stobbe (LS) presents Fraunhofer IZM and the project team.

TF reminds the objectives of the preparatory study are to identify and to recommend ways to improve from the design phase the environmental performance of the product throughout its lifecycle. This happens inside the framework of the Ecodesign Directive (2009/125/EC) and the Methodology for Ecodesign of Energy-related Products (MEErP). TF explains the Implementing



Measures concept and the Legislative Process. He underlines that the preparatory study is the first step for stakeholders to get involved in the process and points out that their opinions on the draft materials that soon will be published are needed (Note: the document has now been published and is available here: <u>http://www.ecodesign-servers.eu/documents</u>). TF highlights that the project team is keen on bilateral discussions and that the sooner the exchange takes place, the better it will be for the process.

TF presents the methodology, which consists of seven tasks that can be grouped in two subsections: Data Collection (Tasks 1-4) and Modelling (Tasks 5-7).

- Task 1 focuses on the scope of the study;
- Task 2 provides a market analysis of the product group such as annual sales, installed stock or average prices;
- Task 3 highlights the user side, since user behaviour has an important impact on the environmental performance of the product. This task will help to understand different use patterns, end of life practices and how products interact with the environment in particular.
- Task 4 provides details of different products categories from a technological point of view.
- Task 5 comprises the environmental and economic assessment of base cases, which rest upon average, potentially fictive products and follow the EcoReport Excel tool.
- Task 6 describes the available design options to improve the product environmental performance and assess them from an environmental and economic point of view, like for the base cases in Task 5. At this stage, it will be possible to assess potential improvements for existing products.
- Finally, Task 7 comprises the construction of scenarios at EU-28 level, a sensitivity analysis and recommendations for potential ecodesign implementing measures.

TF underlines that the analysis will be supported by sensitivity analyses, since modelling can be very sensitive to several parameters and that it will be important to show that the results are robust.

TF reminds that consultation of stakeholders will take place all along the study and that 136 stakeholders are already registered on the website to date (<u>www.ecodesign-servers.eu</u>). He asks the attendees to spread the word if they know other interested stakeholders.

TF finishes the presentation with the received feedback from the first consultation questionnaire, which took place from 2 October 2013 to 4 November 2013. The project team received five written replies including one of Digital Europe that answered on behalf of several manufacturers. The contributions have been very useful. However, there are still several data gaps that will be further discussed during the meeting. Additionally, several bilateral discussions with stakeholders took place that were very useful in order to get information that go beyond the written replies to the questionnaires.



## Questions

<u>Peter Gibson:</u> Noticed in one of the first slides that we go through a process, which includes inter-service consultation, regulatory approval so we are not following the new Lisbon approach. Is that correct?

<u>Davide Polverini:</u> The presentation gives a screenshot of the situation as up to day. Stakeholders may have heard about the so-called "lisbonisation process" of the Ecodesign Directive. But today, we cannot say for 100% that it will be lisbonised at some point. That is why we prefer to stick to the current approach. This administrative procedure could change if the procedure is lisbonised in the future.

<u>Hans-Paul Siderius:</u> Remark on Slide 13: The EU Parliament is listed but the European Council is missing.

<u>Pierre Sicsic:</u> Does the "lisbonisation" of the Directive require a revision of the Directive?

<u>Davide Polverini:</u> You may refer to the other ongoing process of the review of the Ecodesign Labelling Directive. Please consider that these two things are linearly independent. One potential option that is under study is a potential merging of two Directives, but then it has to be seen under which form. But this is not linked to the procedure of lisbonisation.

# Task 1 presentation

Lutz Stobbe (LS) starts with the presentation of the scope and highlights that the question of what kind of products are covered by the study and potential implementing measures will continue to show up and be refined all along the study, in different Tasks, as planned by the MEErP.

The European Commission made it clear that this study should cover servers, storage and networking equipment in an enterprise environment, but this is not a very homogenous product group. In order to understand what kind of products are investigated in this study, basic considerations were fixed:

- B2B Products
- Operation Environment (specific server room like a data centre)
- Infrastructure Equipment like power supply or cooling etc. is out of scope of the study; however, the interactions between these equipment and the IT equipment in scope of the study will be analysed under the "extended product approach", in particular for what concerns for cooling systems.
- Modularity (minimum configuration of Hardware and Software is required)
- Quality of Service: it is important to understand who the customer is, since the set of customers is very diverse. The customers set the rules how the products have to be made. This will influence the performance of the products tremendously.

The Ecodesign Directive is a product-oriented approach but the environmental impact could be strongly consumer-related. It has to be clearly defined what an enterprise environment is since the same products can be used in offices or in big data centres for uses related to banking, telecommunication, etc.



LS points out that not only integrated complete products but also modular products (systems) are covered by the scope of the study. The components are an interesting aspect of the study since they are the ones that consume energy and require resources.

LS describes the first product group (Enterprise Servers) and provides several definitions. The basic definition of a server is a computer that provides a service via a network. He continues with the presentation of the existing Regulation No 617/2013 and mentions the exceptions from this Directive: blade system and components, server appliances, multi-node servers and computer servers with more than four processor sockets.

This is interesting since a combination of technical parameters (e.g. multi-node vs. single-node) can be used as distinction criteria for servers. The question is what is the purpose of that distinction? Is it related to a difference of performance, having an influence on the environmental profile of the product?

LS mentions the second set of existing definitions according to the US ENERGY STAR<sup>®</sup>, which are the result of over 5 years of work. The ENERGY STAR<sup>®</sup> programme gives a complex set of definitions (6 pages of definitions) to cover a certain scope. In particular, the specifications only cover configuration of max 4 CPUs per unit. The background for that is that if you have more than 4 CPUs, your thermal management has to be made in a different way. Another distinction is made for managed servers and resilient servers (redundant system).

LS points out that base cases are very important since the environmental scenarios are based on these base cases. Making the right selection of the base cases is very important to show the impact of the product group. There is a full range of very different products (technical requirements, etc.) so that it is very important that the project team match the products with market data.

When we look at market data, we see different types of categories between Digital Europe categories (micro servers, managed servers, unmanaged servers, and resilient servers), Lot 3, ENERGY STAR® and Gartner categories, which makes comparisons and matching difficult. Thus, understanding the market data is difficult because of these various definitions, and there is still a need to how to allocate existing market data to the product scope.

# Questions:

<u>Sylvie Feindt:</u> Very important asterisk is omitted that says that managed, unmanaged and resilient servers from Digital Europe are definitions from the ENERGY STAR®.

<u>LS:</u> Agreed, but we still do not know if these are rack mounted servers or blade servers or multi-node server, etc. and a perfect match is still not possible.

<u>Piere Sicsic</u>: Another consideration about categories: is it an objective of the study to make the categories match with the number of base cases that will be assessed?

<u>LS:</u> We do not have to, but it is helpful. We make this differentiation because these products are not doing the same. They do not have the same configuration and energy consumption. It would make sense to break them down in order to make appropriate Ecodesign requirements and to investigate these requirements. We would need to have a good match between product definitions, which can identify the product and then assess the market data. However, for the study itself, we do not necessarily need the precise breakdown.



<u>Pierre Sicsic:</u> Yes, except if the differences in the environmental impact and energy consumption are so different from one category to the other. Imagine that the conclusion of this assessment is that there are 12 big segments: does it mean that you will have to assess all of the 12 segments? The differences between each of the 12 segments could be huge such that you could not make a base case.

<u>LS:</u> If we have an indicator from the market data in terms of where the majority of the products is, we can identify volume products, and define the base cases accordingly.

<u>Jan Viegand</u>: When you get definitions from different sources, it is always difficult to match them and it will be up to the consultants to find a proper way of handling it. Do you have a definition for managed servers?

<u>LS:</u> It is basically the unmanaged servers that cause problems. Managed servers cover a big range of servers with different form factors and configurations. The question is why the unmanaged servers are mentioned here. What is the characteristic of an unmanaged server? What makes it different from managed servers in terms of energy consumption, what kind of components are included that have different environmental impacts.

<u>Jan Viegand</u>: I think that this distinction between managed and unmanaged server is mainly used for the one and two socket server.

<u>Hans-Paul Siderius</u>: Assumes that the EU/US ENERGY STAR® agreement will be considered in the context of this study.

<u>Davide Polverini:</u> This scheme will be presented in detail later.

LS goes on with the presentation of enterprise data storage equipment, gives definitions and shows the basic data centre architecture. He provides the scope according to the ENERGY STAR® specifications for data storage equipment and mentions the different product categories. The project team will stick to the definitions given by the ENERGY STAR® Programme when possible. No further questions are raised concerning the data storage equipment.

LS concludes with the presentation of the network equipment. Technically this also covers telecom network equipment but the focus will be on Local Area Network. LS shows existing definitions and the chosen preliminary product definitions and further considerations. It is important to recognise that the equipment is also be used on the telecommunication side, but under very different conditions (highly regulated in terms of data security).

# Question

<u>Tom Moriarty</u>: Another highly regulated sector is the banking sector, which has high requirements on data security. How would you go forward in this field?

<u>LS:</u> This is a very important question because it is to some extent a dilemma. The only way to handle this dilemma is to close your eyes a little bit and to cover the full scope first. Maybe later in the Regulation process (which is not in the scope of the study) some conditions would be set to make some exemptions. What we can do in the study is to provide all the basic information that outlines these kinds



of conflicts. The networking architecture is not in the hands of the OEM but in the hands of the telecom company.

LS continues the presentation and points out that it is important to look into switches (which are volume products) and that wireless systems are usually not implemented in data centres (for security reasons) but they may become more important in the future and we cannot exclude it.

LS presents several slides on existing test standards. This is important since the energy consumption has a tremendous impact on the environmental impact of the products. Being able to measure the energy performance is important to assess the energy consumption. SPEC gives two sets of benchmarks: SPEC Power since 2008 and SPEC SERT which is more recent.

# Comment:

<u>Reinhard Höhn:</u> SPEC Power shows results for specifically configured systems. It cannot be assumed that this is showing the whole picture.

<u>LS:</u> These kinds of aspects (critical assessment of the standards, advantages and disadvantages) are indeed covered in the report.

LS continues with the presentation of SPEC SERT. Since there is no database yet, it is not possible to make a comparison. It is assumed that by 2014 fist comparative data will be available. After assessment, it will be possible to see how valuable this test standard is and if it shows components' aspects in relation to energy consumption in an appropriate way.

LS presents the Storage Networking Industry Association standard (SNIA Emerald<sup>™</sup>) and points out that he does not know whether there are testing and if there is a database available for tested products. Attendees made no comment. He continues with the presentation of the Telecommunications Energy Efficiency Ratio (TEER) and the Energy Consumption Rating (ECR).

# Comment

<u>Klaus Verschüre</u>: Our industry has been applying the TEER approach. Even Juniper who developed ECR is stepping away from this approach. Some isolated instances use ECR, but generally it is the TEER approach that is agreed upon.

# LS: Is there a database of tested products?

<u>Klaus Verschüre:</u> This week there is an ITU meeting in Peru where they are discussing on how to we collect data on this. There are many discussions going on since efficiency numbers can vary a lot.

LS continues with the presentation and highlights that the study has a clear product approach, not a datacentre approach.



TF takes over with existing relevant EU legislations and mentions the WEEE Directive (2012/19/EU), the RoHS Directive (2011/65/EU), The Electromagnetic Compatibility Directive (2004/108/EC) and the Low Voltage Directive (2006/95/EC).

# Comments

<u>Reinhard Höhn:</u> Points out that this list is not complete (REACH, telecom related Regulations, etc.) Why this selection?

<u>TF</u>: The team has not investigated telecom related regulations yet because of the uncertainty around networking equipment. REACH is not specifically addressing the Lot 9 products, or ErP (very horizontal) but will be added as suggested given its relevance for substances management.

<u>Pierre Sicsic</u>: Another type of Regulation which is not necessarily EU but which is affecting data centres covered are national regulations like the CRC in the UK.

TF continues the presentation with already implemented Ecodesign Regulations like No 1275/2008 on standby and off mode electric power consumption of electrical and electronic household and office equipment and states that the understanding of the project team is that the Regulation No 1275/2008 does not cover Lot 9 products. Considering its amendment, the understanding of the project team is that small-scale servers and computer servers are explicitly excluded from the measures until 2019 but that storage and network equipment would be concerned by the maximum power consumption measures.

#### Comments

<u>Hans-Paul Siderius:</u> Regulation No 1275/2008 covers ICT equipment as listed in Annex I and covers class B equipment. "Domestic" environment is a shortcut for class B and does not mean that a product should be used in homes and not in offices. The amendment introduces requirements for networked equipment but the scope of the amendment has deliberately kept the same as in Regulation No 1275/2008 in order to avoid any discussion and confusion.

<u>Reinhard Höhn</u>: Agrees with Hans-Paul. In addition to this, the purpose of the study on Lot 9 is typically datacentre servers, switches and storage products. These mostly would not be covered by this Regulation, they are completely different types of products. What we are talking about would be pure professional devices, i.e. Class A products<sup>1</sup>. Please make sure that the terms that are used in the study and the report are clear and harmonised, otherwise it may result in a lot of confusion and discussions later on.

Class A products are intended for use in non-residential/non-domestic environments. Warning: In domestic environment these products may cause radio interference in which case the user may be required to take adequate measures. Class B products are intended for use in residential/domestic environments but may also be used in non-residential/non-domestic environments.



<sup>&</sup>lt;sup>1</sup> According to (CENELEC) EN 55022:2010 "Information Technology Equipment - Radio disturbance characteristics - Limits and methods of measurement":

<u>Davide Polverini</u>: The EC asked to cover the largest part of products in this preliminary analysis. We are currently not sure where this analysis will derivate exactly in the end. It is important to understand fully the environment where the products are used (household or business). At this stage, it is clear that the products covered by Lot 9 will entail products used in the business environment. However, it is useful to take this Regulation as background information.

<u>Pierre Sicsic</u>: It is possible that some Class B products would be covered by ENTR Lot 9. However, if Class B equipment were excluded from the scope of the Lot 9 study, the team would not make a big mistake as most of them are not used in datacentres.

<u>Hans-Paul Siderius</u>: Agrees with Pierre to concentrate on Class A as a first step because the word "professional" is always difficult to handle in regulatory contexts. In the end, a clear distinction is needed and the word "professional" is not sufficient. However, later it could be useful to look sideways to some of the products that are Class B and used in B2B environment and make some indications whether this is a large share. A clear distinction is essential.

<u>Tom Moriarty</u>: supports the idea to limit the study to Class A products. One other comment is on the last statement of the slide "Power consumption requirements in a condition providing networked standby (not applicable to small-scale servers and computer servers)": it actually becomes applicable for small-scale servers from January 2019.

<u>Jan Viegand</u>: Thinks it is a good idea to concentrate on Class A but it would be good to give an estimation on how large the part that is not covered would be. One specific product he is thinking about are network switches in offices and it would be a pity if they could not be included in the study.

<u>TF</u>: this issue of Class B vs. Class A products will be further investigated through the market segmentation description.

<u>Hans-Paul Siderius</u>: Concerning Regulation 278/2009 the discussion on Class A or Class B products will be the same issue as for Regulation 1275.

<u>Reinhard Höhn:</u> EU Regulations concerning fans are also missing, as they are important for servers. You might even have to consider the Regulation related to pumps (if you have water-cooling).

DP provides information on the EU Energy Star, which is one of the most relevant pieces of legislation. It is important to study potential interactions of the Energy Star Program with the Ecodesign measures. He gives information on the US/EU ENERGY STAR® agreement and mentions that the criteria of the Energy Star program became compulsory public procurement requirements for the European Commission, several institutions and central government authorities. Furthermore, the Energy Efficiency Directive (Article 6) foresees to foster the use of the energy efficiency criteria at regional levels.

Upcoming versions of the Annex C will have provisions for enterprise servers and data storage devices.

# Comments:

<u>Reinhard Höhn:</u> How do you rate the provision in the Regulation establishing the Energy Star Program concerning the recognition of compliant products? If a product is listed in the US, is it recognised already in EU? Is the EU unofficially applying the "not yet adopted" provisions?



<u>Davide Polverini</u>: The Annex C contains the latest versions for a specific category of products which then becomes active in Europe. This transitional period (entry to force of a new version in the US and the effective adoption in the EU) is a very specific issue for the Energy Star Board.

<u>Hans-Paul Siderius</u>: Formally, regarding public procurement, it is only enforced if it is published in Annex C. General remark: Because ENERGY STAR® has put a lot of work in general in the preparations of the specifications and because the EU already has a kind of legal use for ENERGY STAR® specifications, he would very much encourage the Commission and the consultants to build up on ENERGY STAR® work. Defining separate definitions with product classes or measurement methods, would only lead to multiple work for the industry. Energy Star levels will show the most advanced products and Ecodesign can set levels that can cut off the worst products from the market.

<u>LS:</u> Understands the wish for harmonisation. However, two factors have to be distinguished: The definitions on one hand, and the scope on the other hand. These are two different things. The definitions of products, technical aspects as well as the test procedures are without any doubt very helpful. But the ENERGY STAR® Program sets a specific scope that exempts products and we have to understand why several products are exempted. The reason is partly because some test procedures do not work for the products or several form factors, application areas and so on. This is why the Ecodesign Directive has to address not only the top-runners but give a broad scope. The project team will try to take over the definitions but not necessarily the scope.

<u>Hans-Paul Siderius</u>: Agrees with this approach. If the team finds products that are exempted from the ENERGY STAR<sup>®</sup> Program, but are still useful in the scope of this study they should be included. But a problem might occur when the ENERGY STAR<sup>®</sup> is evolving.

<u>Jan Viegand: A</u> comment on transposition from US Energy Star: formally, it is the US government and the MS that set requirements but in in reality the requirements are also coming from enterprises (other stakeholders). Consultants could get some input from US EPA on network equipment.

<u>Pierre Sicsic</u>: Another aspect that can be taken into consideration is the perspective of the adoption of the ENERGY STAR® on the market. Because of its limitations, the first version of the Energy Star has relatively few models that are qualifying. The evolution to version 2 and the move from the SPECPower to the SERT benchmark brings some perspective (at least from HP point of view) that there will be a large adoption of version 2 in terms of numbers. In terms of market volume, it will be important in the future.

<u>Davide Polverini</u>: The representativeness of products in the market compared to the total market is important. However, this is a fast evolving market and something that represents 25% of the market today might evolve to 40% in two years (this is a tricky aspect, which has to be taken into account).

<u>Tom Moriarty:</u> Since the study is going on for several years, will there be some intention of revisiting data that has been gathered already?

<u>Davide Polverini</u>: This is a horizontal issue that applies to the overall Lot 9. The EC cannot ask the consultants to get new data every month and a certain starting point has to be fixed to get to a conclusion in the end. Gathering data on the evolving number of products that may be applied for the specifications will give useful information and it is likely that they will not be directly available but maybe only in one year.



<u>Peter Gibson</u>: A comment on EPEAT: You may be aware that there are some different opinions concerning the development of the appropriate standards. To some degree, we will potentially have two standards/specifications developed: one under the GEC (Green Electronics Council) and the other one through the IEEE. This has to be discussed at some point in the future.

# Task 2 presentation

TF presents first information related to Task 2, which focuses on market data and recalls the objectives of the task. PRODCOM is the official EU source statistics and six potentially relevant categories have been identified by the project team. However, the definitions are not very clear so it is difficult to draw reliable conclusions about the figures.

TF points out the differences between data received from Digital Europe and the estimation from public press releases and asks the participants about their opinion about possible reasons for the discrepancies.

<u>Sylvie:</u> Explains how Digital Europe came to these figures. They agreed on definitions to make clear to everybody that they are collecting the same data (correct categories) and then all members provided the data and Digital Europe added them up. This should therefore reflect not an estimate but actual data about what companies have sold. Unless that some members have inflated their numbers but they would not really have an incentive to do that. Personally, she has more confidence in her own data than in the estimate of Gartner or IDC.

<u>TF:</u> Agrees, but would like to crosscheck to have a proper understanding of the numbers and the market segmentation.

TF highlights that Gartner is regularly updating their data and that the Commission asked for a dynamic market data basis to stick to the market development as closely as possible.

<u>Pierre Sicsic</u>: The data of Digital Europe show that there is a decrease of the numbers of units. The sales perspectives confirm this. Because of the virtualisation and concentration in the data centres, the perspective asks for fewer units. The general rule of thumb in sales is that one server replaces 10 servers when a refreshing of the data centre is made. It can be therefore expected that the units sales will decrease.

<u>Jan Viegand</u>: Confirms this aspect. Furthermore, there is a more long-term trend that cloud services remove a lot of the computing power storage from the personal equipment to the data centre.

<u>Reinhard Höhn:</u> Reminds that one has to be careful. The virtualisation effect is limited. It can be only a one-time effect. The other effect bringing virtualised applications to higher capability servers can go on.

TF highlights that the final effect of virtualisation is important but difficult to predict and continues with the presentation with pointing out to remaining data gaps and the importance of the distinction between economic lifetime and the technical lifetime.



TF asks whether secondary lifetime estimates that are provided by Digital Europe cover products that go under repair and refurbishment activities, which is confirmed.

<u>Reinhard Höhn</u>: Concerning repairing and the bill of materials, it is difficult to say that a certain part is repaired and that a specific part is a new one. Some repaired parts are tested and reused, which makes assessment difficult. This makes is a very different type of activity and it is not sure if such data is possible to get.

<u>TF:</u> Understands that it is complicated, but wants to ask this question at this early stage. Still it has to be taken into account somehow because refurbishment is common for these kind of products and this will have a direct effect for the environmental assessment. The project team has to find a way to take this point into account by proper estimations and assumptions if data cannot be obtained from manufacturers.

# Task 3 presentation

LS highlights that the utilisation phase will have a strong impact on the environmental performance. He gives a short overview over the main environmental impacts with regards to the screening process and then focuses on use aspects.

The project team looked into existing Product Carbon Footprint (PCF) studies for servers. In particular the Fujitsu (2010) and Dell (2011) studies seem to be the most interesting ones. The use phase has the strongest impact on carbon emissions (different conversion factors have been applied for sensitivity analysis) even if this has to be confirmed by the proper EcoReport assessment.

In the server section, LS points out that the proportion of energy consumption seems scaled to the number of CPUs. There is also a wide range of CPUs available (e.g. from 6oW-15oW).

Another important thing to consider is that the energy footprint of a server changes under load (active and idle). The energy consumption is improving in time (Moore's law, Koomey's law) but it is not sure if this will continue like that. Looking at data obtained by SPECPower, it can be seen that the range increases over years, but the average energy performance increased as well (related to Moore's law).

<u>Reinhard Höhn:</u> But this not only due to chip performance but also due to system performance.

<u>LS:</u> Yes, this is also related to system performance but we will look into how much of this is chip performance.

LS continues the presentation by showing performances with different numbers of CPUs. These numbers and figures can be used in order to calculate annual power consumption and to see the magnitude of energy consumption related to servers.

A second point that has to be looked at is what the server is actually doing. On the one hand, servers that run services need a 24/7 availability (mails, etc). On the other hand, more application specific servers do not require permanent availability (e.g. virtualised servers).

The tendency is that cloud data workloads will increase in the future, whereas traditional data centre workloads are assumed to stay stable.



LS presents server related energy consumption in the EU-28. Calculations amount to a range between 7 TWh/year and 19 TWh/year of energy consumption. This type of calculation is helpful to understand about how much energy we are talking.

<u>Reinhard Höhn</u>: How is this figure related to the expected/calculated energy consumption of 55TWh as mentioned in the working plan?

<u>LS:</u> Cannot explain the figure of 55TWh, but can show with this calculation (realistic and transparent data) in which range the energy consumption should lie.

<u>Shailendra Mudgal</u>: Makes a remark to the working plan calculations, which are very rough. In the US, the number of data centres has doubled between 2000 and 2006 and the same assumption was applied to Europe.

<u>Reinhard Höhn:</u> The question is what the definition of a data centre is in that study.

<u>Shailendra Mudgal</u>: The given definition is related to traffic. Everything that is above 630Gbit/s is considered as data centre.

Jan Viegand: Does the estimation made by the project team include blade servers?

<u>LS:</u> Yes. The distinction here was not made based on the form factor but on the number of the CPUs.

LS shows the annual power consumption of enterprise servers and data equipment (EU-28 estimate).

<u>Reinhard Höhn</u>: This is only true if the operator looks at hardware and his own operation and how he manages the data centre.

<u>LS:</u> This is a good point since the operator now has not only the equipment but also the infrastructure. He has trade-offs between these two. Either the type of product he buys reduces the infrastructure or it increases the infrastructure.

Jan Viegand: What role does the cooling play?

<u>LS:</u> This will be analysed under the extended product approach.

LS continues with the presentation and points out the importance of representative base cases and lists the information needed (sales, application types, similarity, use patterns). LS repeats that both the hardware and the utilisation are crucial parts to properly asses the energy consumption of the products under consideration and comes to the extended system approach.

<u>Pierre Sicsic:</u> The debate about DC powering has been going on for a long time (e.g. within The Green Grid). Does not know if it is a big question in Europe.

<u>LS:</u> We are just mentioning and listing all impacts and factors and in order to do this, we start at the rack level/cabinet level (open systems, closed systems, systems with cooling, air flow systems, diverse set of rack types cold-hot, etc – it has all an influence but is out of scope).

LS points out that the power distribution unit conversion efficiency is an interesting instrument to measure power consumption (data gathering). The kind of power supply that is used has an influence on the system but not on the product itself.



Concerning ambient climate conditions and temperature setting, LS mentions that the product is interacting with the outside environment (fan speed, etc.). Therefore, there are standards such as ASHRAE, etc. making recommendations under which circumstances electric equipment can be operated (ambient temperature, humidity, etc). Current requirements are at 27°C, which allows for many companies in Europe to reduce artificial cooling and work with free cooling.

Many OEMs design products that can handle higher temperatures in order to give the operator the chance to further reduce the cooling overhead. The product gets more expensive (components have to be robust) but this could save the operator some cooling costs (trade-off). Therefore, there are two differently designed products of which one is optimised for higher temperatures. This is a very important observation. It is not possible to influence the purchasing decision of the consumer.

<u>Reinhard Höhn:</u> Mentions an additional point. The temperature range for the hardware also sets the operator reaction time if something goes wrong.

<u>LS:</u> Still, the decision is on the operator side, not on the hardware side.

LS points out that Ecodesign should consider sensors, measuring temperatures distributed on the system (fan speed, CPU, etc. – already exists). Auxiliary systems are listed but are out of scope.

<u>Jan Viegand</u>: The consumption of this part of equipment has to be somehow included, since it makes up a significant amount.

<u>LS:</u> Disagrees with this approach. The operator has a trade-off (hardware vs. cooling). All this auxiliary equipment has nothing to do with IT. The Ecodesign is not influenced at all (different level). This is something that The Green Grid is looking into. From the past, we know that correlating external support equipment with IT does not work. For this reason we will look only on the IT equipment.

<u>Jan Viegand</u>: Yes, but when you calculate the savings potential then you should consider the auxiliary equipment.

<u>LS:</u> If you run the same product in Africa, you do not have the same options and it will be different. We have to come back to the point and to say that we stay at a feasible temperature level. Products are not only made to run in a specific environment (e.g. Finland) but globally.

<u>Davide Polverini</u>: It can be useful to highlight what entails in terms of energy consumption when considering the pure energy consumption of servers, but also having in mind the part of energy consumption related to cooling systems. On the other side, we have to say that the systems that are currently on the market in order to produce the cooling are made of products that in some cases are under other Ecodesign Regulations.

<u>Hans-Paul Siderius</u>: Firstly, we are not talking about recommendations of certain temperature levels here, but about a methodology, which has to take into account the indirect effects. Secondly, if you make rough calculations, it is not about efficiency improvement of the air conditioning system, but it is about having less air conditioning. If that is the case due to less power consumption coming from less power consumption of the servers this is an indirect effect that should be taken into account. Since it is already difficult to make an estimate of the direct power consumption, the indirect effects will be even more difficult to estimate. However, the study should provide some insights about these effects.

<u>Reinhard Höhn:</u> Has to object on this. The indirect effect, which might happen, will happen later on. The temperature set point of the data centre depends on the entire equipment. The entire equipment has to



be able to run at the higher temperature. How long will it take to do a complete technology exchange in a given data centre?

<u>Jan Viegand:</u> If you remove one server from the centre, you will have an immediate effect on the cooling system.

# Task 5 presentation

TF presents the methodology for Task 5, which starts with defining the base cases. He highlights the importance of the base cases since they will have an important influence on the following tasks on environmental and economic evaluations.

The project team has to come up with a reasonable number of average products that can give a suitable overview of the situation at the EU level. It is therefore important that the data collected beforehand is approved by the stakeholders. There are no fixed rules: it is up to the consultants to understand the main drivers and to construct base cases.

<u>Reinhard Höhn:</u> How many base-cases would you like to get? There is a big difference between micro servers and special purpose servers.

<u>Davide Polverini</u>: The number of base cases is not a question that can be answered as such. The EC would be happy to get as many base cases as relevant from a market share and environmental aspect point of view.

<u>Reinhard Höhn:</u> If we look at market share, we have to set cut-off criteria and not spend time on niche products. We should add an indication of what market share should be covered.

<u>*TF:*</u> Not only market share matters, since small shares can also have significant environmental impacts.

<u>Shailendra Mudgal</u>: The number of base cases means also an increased data requirement for the stakeholders so stakeholders are welcome to provide insights on this question.

<u>Reinhard Höhn:</u> Agrees. Data collection in our industry is not easy. The project team has already received a limited number of data requested and going further in detail only makes sense if we know exactly what is needed. Certain organisations might push back the requests if too demanding. The team should first think about what kind of data can be useful such that the industry can focus on what is exactly needed, otherwise it will not be possible.

<u>Shailendra Mudgal</u>: Agrees. It is not useful to set base cases just for having them. What we will try to look at first is market data but technical data will also be very important.

<u>Hans-Paul Siderius</u>: Hopes that there is not a misunderstanding between base cases and scope: if something is not a base-case, it does not mean that it will not be regulated. Cut-off products can also be regulated. A base case is a fictional product and you should take as few base cases as possible but that will still be representative for what you want to regulate. If base cases are too specific, they are useless. Wherever he hears about usage times, applications etc., he fully agrees that this should be left to sensitivity analyses and not used to define base cases. If you have a certain product, you can anticipate that it will be used in a range of circumstances. With what was shown today, it is not clear yet how many and which base-cases there could be. He suggests that this step should be carefully taken with



several feedbacks from stakeholders. Not everyone has to agree but it must be ensured that the chosen cases are a good way forward.

<u>TF:</u> Agrees on the fact that the consultants will have to specify their needs before coming back to the companies with very specific questions.

<u>Reinhard Höhn:</u> Comes back to picture that LS showed. You see from this picture that you cannot compare the server types. If you start collecting data over the whole range of servers we already have, not even mentioning storage and networking, the difficulty will be to break it down to base cases. A server located in a scientific centre has a very specific design and cannot be compared to a floor-standing x86 server for example. It is important to think about the mass of the products that make sense to be further analysed.

<u>Peter Gibson:</u> Similar concern regarding the use of the terms: "good and bad products". We have to talk about servers being used in different configurations and applications rather than good and bad products. Is it not best if we concentrate on the units where we see the growth and try to target those base cases? At some point it is necessary to have a conversation about whether it makes sense to include niche products or niche applications.

<u>LS:</u> What is imaginable is that the project team makes a proposal looking into the product portfolio of major companies and based on the market data we have we create a representative product. When you look into companies, you can see to some extend similar product portfolios (form factor, configuration, and other performance aspects (e.g. memory)) and they list specialities. Form factors would be tower, rack, multi-note, and blade servers and from the configuration side we have seen that the 1-2 CPU servers are a majority. Based on the Fujitsu study, LS could already name a representative volume product but the question is if the stakeholders could agree to this approach. We have to start an interactive process where we have "give and take", considering time constraints of the study.

<u>Reinhard Höhn:</u> Asks if he rightly understood that the project team would focus on 1 and 2 core servers. This would be what he already recommended, namely to cut off tiny niches.

<u>LS</u>: Maybe the industry could define what is a niche product and the project team defines the volume representative product. The bigger problem is to identify which are the products with small market share. It can be seen from the Gartner data that the number of products with more than 4 CPUs is relatively small. This is why the project team would focus on the volume. What we do not know about for the time being are the multi-node systems and the micro servers. It would be good to get representative product cases for them.

TF shows the EcoReport Excel Tool and the different inputs that will be required.

<u>Reinhard Höhn:</u> We do not have the stock data for specific cases. We can tell what we sell but not the stock data.

<u>*TF:*</u> Yes, but the project team will do some estimations through a model.

<u>LS:</u> We may consider that some of the manufacturers are part of the PAIA project and there has been some development done in terms of data (for example on laptops). The experience from that project (on CPUs, RAM) can be a helpful input and could be scaled. The chip has a big impact and is usually a



component that is badly assessed (almost no data for the manufacturing phase). To make the assessment correct, it is good to focus on semi-conductor components as well as on the motherboard.

<u>Pierre Sicsic</u>: We can ask the PAIA experts to do this but it is doubtful that the data that have been created is the aggregation of data that can be found in the literature. It is concerning specific purposes like laptops or desktop PCs and the components in this equipment are not the same as in servers. He is not sure if it is possible to leverage what has been done in PAIA.

<u>LS:</u> But if you look at available options, it might be better to scale up from a laptop level. It is just an idea to make it easier to obtain data and rather argue why you use the data and how you scale it. It might be helpful to get it halfway right.

<u>Peter Gibson:</u> Agrees with LS. Will check if it will be possible to provide a projected set of figures for servers.

<u>Staman Silvitos (ECOS)</u>: Gives some brief reflection about the data collection. Has participated in a few preparatory studies and some of the mentioned points, especially with respect to data collection come up regularly. His recommendation would be not to forget that the aim and purpose of this study is to cover what is out there. At this stage, the discussion is not about what will be regulated or not. At the current stage, it is important to see what is out on the market and where the potential for improvement is. Whatever is excluded should be well justified. He reminds that this study is supposed to inform the Commission on potential future regulatory measures.

<u>Davide Polverini</u>: Agrees. Currently the scope of the study is described, which can be different from the Regulation. However, the findings from the study will be fundamental to this extent. Prefers not to have big exclusions at this stage, unless they are clearly assessed. On the other side, we are talking about B-2-B and we have to try to be as concrete as possible to not get dispersed.

<u>Reinhard Höhn:</u> Experiences from other studies show that the more complex and broad you define a scope of a study, the more problems occur later. Therefore, his approach would be to cut it down. Concentrate on the mass and start there (80-20 rule). Think again, what exactly you need and the industry will check if it can be delivered.

<u>Peter Gibson:</u> It was mentioned that there are 4 weeks to comment on the supporting document to be published – can this be extended a bit considering the upcoming holidays?

<u>*TF:*</u> Yes, it is formally 4 weeks but one or two more weeks will be included given the holiday period.

# Planning and action items

- Minutes and presentations to be sent to participants.
- The supporting document will soon be published. All stakeholders are invited to comment on it within the indicated time period.
- The project team will come back to stakeholders with specific questions on data gaps early 2014.
- Next tasks:
  - Task 4 Technologies



- Task 5 Environment & Economics: Definition of basecases
- 2<sup>nd</sup> stakeholder meeting: probably end of June 2014

Davide Polverini thanks all participants and closes the meeting.



# Annex

# **List of Participants**

Berwald Anton Lars Bruckner Thibault Faninger Sylvie Feindt Peter Gibson Jan Guetter Reinhard Hoehn Baijia Huang Takashi Imamura James Lovegrove João Marinho Tom Moriarty Shailendra Mudgal Jason Ord Ferenc Pekar Davide Polverini Dominique Roche Pierre Sicsic Hans-Paul Siderius Stamatis Sivitos Lutz Stobbe Noriko Takata Kurt Van der Herten Klaus Verschuere Jan Viegand Anson Wυ Bizhan Zhumagali

**BIO Intelligence Service** NEC **BIO Intelligence Service** DigitalEurope Intel Corporation AMD IBM & DigitalEurope Viegand Maagoe Fujitsu APCO worldwide Hitachi Corporate Office, Europe Dell **BIO Intelligence Service** ΗP EC DG ENV EC DG ENTR CENELEC ΗP NL Agency Ecos Fraunhofer IZM NEC IBM Cisco Viegand Maagoe for Danish Energy Agency Independent **ICF** International



# **Meeting Minutes**

Project	DG ENTR Lot 9 – Enterprise Servers and Data Equipment		
Event	2 <sup>nd</sup> Stakeholder Meeting		
Date	13 October 2014, 10:00-16:00		
Location	Centre Albert Borschette (CCAB), Room AB-3D, rue Froissart 36, 1040 Brussels		
Participants	See list in the Annex		

# **OBJECTIVES**

- Welcome and opening by the EC, Introduction and objectives of the meeting, tour de table
- Presentation and discussion of the main updates of Task 2, discussion
- Presentation of the base-case approach and draft Task 3, discussion
- Presentation of draft Task 4, discussion
- Presentation of draft Task 5 (EcoReport assessment), discussion
- Presentation of preliminary Best Available Technologies (BAT), definition of improvement options, discussion
- Next steps

# Welcome and opening by the EC, tour de table

Davide Polverini (DP) welcomed the participants, presented the agenda and the objectives of the meeting. He gave a brief introduction to the study and reminded that the outcomes will serve as a basis for the decision whether the equipment under consideration might be relevant for regulation under Ecodesign and/or Energy Labelling.

Afterwards all participants presented themselves in a brief tour de table. The list of the attendees can be found in the Annex.

# Presentation and discussion of the main updates of Task 2

Anton Berwald (AB) presented the updates concerning Task 2 of the report, which is related to markets.

He reminded that the project team had received sales figures from DigitalEurope that do not coincide with figures obtained through IT analysts such as IDC or Gartner and that both figures will be retained for the analysis. He continued with the presentation of the sales figures of storage, pointing out that no stakeholder data had been obtained and that the figures reflect shipment units as communicated by Gartner. Sales figures for network equipment (switches and routers) had been obtained from both stakeholders and Gartner. However, as far as switches are concerned figures are only available as "port shipments" and it was therefore not possible to make a direct reference to the number of switches shipped. The figures for routers showed that 75% of shipments are small office / home office (SOHO) routers, which are considered Class B products and not in scope of the study.



AB continued with the presentation of the stock models. He reminded that the estimated stock is geographically limited to EU-28 and projected until 2030. Furthermore, the projections have to be interpreted with caution, since the technology is undergoing very fast changes.

He explained that Model A is based on forecasts using yearly sales figures, expected demand growth and lifetime assumptions and that inputs from both DigitalEurope and IT research firms have been taken into consideration in separate estimations in order to check for consistency. Model B on the other hand is based on inferences made from IP traffic and workload projections provided by the Cisco publication "Cisco Global Cloud Index: Forecast and Methodology, 2012-2017 (2013)" and is used as an alternative approach to check consistency with Model A results.

Both models have been retained for servers, only model A was used for storage and network equipment.

The main message retained from the stock projections was that the stock is considered to remain relatively flat in the next years and might even decrease because of effects related to virtualisation and consolidation.

In the remainder of the presentation of Task 2, AB showed consumer expenditure data and concluded that:

- No specific form factor can be excluded categorically from the server scope, as they all have annual sales shares above 5% (>100,000 units).
- Micro-servers are a fast growing segment and represent one of the future trends that should be taken into account.
- Servers with more than 4 CPUs will be excluded from the next chapters since they only represent 0.3% of sales
- Content-Addressed Storage (CAS) will be excluded from the next chapters of the study, given its minor share in shipments, revenues and capacity.
- The stock models suggest that the tendency of the different stocks is to stay flat or even to decrease in the next years to come due to virtualisation and consolidation.
- Long-term predictions are difficult to make because of the very fast technology development.

#### Discussion

Henry Wong (HW) emphasised that what can be observed in the industry is that the stock transition does not follow a smooth path linked to failure rates and lifetime, but follows rather disruptive changes in the technology/transition in OS/warranty. There is an abnormal behavior that forces users to retain hardware for accounting reason (take into account depreciation costs, tax requirements, etc.).

For this reason it is unlikely that using the presented tool based on Weibull curves will be accurate (realistic) to represent the stock. HW would advise to look at the transition points, since it will be the technology changes and changes in operation system / software that will drive the change in stock.

AB explained that the hypotheses behind the stock model were not related to real failure rates, but to operational lifetimes, which can be manually adjusted by means of the parameters of the Weibull distribution. The tool was not generated to give a precise forecast for technologies, but to rather have a rough estimate of the installed stock and trends that can be easily adjusted.

HW added that technology transition themselves are going to induce big changes and gave the example of the iPhone to highlight the importance of the user behaviour. Lutz Stobbe (LS) reminded that in this approach servers are treated as units, but in practice they are part of a system and that the problem is availability of data.



# Presentation of the base-case (BC) approach and draft Task 3

AB continued with a feedback on the second stakeholder consultation and recalled that two socket servers constitute the lion share of sold servers which was one of the main reasons to focus the base-cases on 2 socket rack and blade servers.

LS presented the BC approach, giving an overview of the retained BC to keep in mind during the presentations of Tasks 3 and 4.

LS continued with the presentation of Task 3, reminding the main objectives which are the identification, retrieval, and analysis of data on user behaviour and associated environmental impacts during the use phase for the products in scope. In this case, LS pointed out that several aspects have to be scrutinized:

- The functionality of the product
- The intended use or application of the product
- The user and his location in the market
- How and under what conditions are the products used
- What a typical use pattern might look like
- What the power consumption is
- What influences the energy performance in the use phase

LS presented two main aspects that determine environmentally sound use which are the hardware and software configuration and the user who determines the application, utilisation and therefore the resulting effectiveness of the product. Furthermore, LS emphasized that servers are working most often not on their own but are part of a system for which reason the user benefit is a result from the whole system.

Furthermore LS pointed out that location is playing a very important role and that often IT experts and DC experts do not speak the same technical language. However, the communication is of high importance.

Afterwards, LS presented the main functionalities and applications of servers, storage and network equipment and pointed to the importance to know who the user of the equipment is. He presented a study showing statistics from Australia and New Zealand that suggest that the sectors *finance and banking, colocation and telecommunication and media represent* more than 50% of data center space. LS underlined that it is important to know if the user of the product is the owner of the product or not, since incentive structures are different. No direct correlation between the size of the DC and the applications can be made, since no data is available and a lot of servers are used in small/medium DC.

LS referred to the study "Cisco Global Cloud Index: Forecast and Methodology, 2012-2017 (2013)" which is showing that cloud workloads are expected to increase very quickly in Data Centers in the years to come. A first conclusion that can be made is that there could be a (near future distinction) between traditional data center use and cloud data center use. This distinction determines both the hardware and software configuration of the product (product platform) and the use pattern of the product. It furthermore determines where certain applications are located: In small and medium size data center (higher redundancy might be necessary) or in large and very large data center (cutting of redundancy might be possible).

LS reminded that there are several aspects that determine the energy consumption and that load is highly depending on application/size. On average the project team took 20% for an average typical DC, knowing that large DCs obviously have higher rates. But no statistical data is available for them.

LS continued with the presentation of SPEC data and noted that products are typically tested with minimum configuration. SPEC SERT is a Multi-Indicator-Tool assessing performance and configuration specific energy consumption. The HYBRID SSJ worklet reflects a combination of a wide variety of processor and memory-intensive tasks. LS raised the question if the Hybrid SSJ worklet could be a universal indicator for energy efficiency of volume servers (Note: This idea was not discussed in the draft reports). LS showed afterwards the SERT test results analysis.



Afterwards, LS presented aspects of system integration (power, airflow and cooling) as well as recommendations and allowances from ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers). Furthermore, LS recalled the notion of Power Usage Effectiveness (PUE) and informed the participants that the project team will take an infrastructure energy overhead (PUE, but related to a single hardware unit) of 2 during the study.

The project team finished the presentation of Task 3 with a focus on the end-of-life aspects of the equipment under consideration and pointed out that more detailed information on the end-of-life treatment of enterprise servers and storage equipment would be required from the stakeholders.

## Discussion

HW said that he was impressed by the coverage of this task but would suggest minor items that could be helpful to address some of the concerns. Although the qualitative aspects have been very well treated, quantitative data requires a different set of questions. HW suggested that responses might be more successful if questionnaires are tailored in a way that they address the quantitative data gaps directly. He added that some of the new technologies will address some of the problems highlighted (PSU, redundancy). These changes are not necessarily only on the server side, but are also related to storage and network. In this respect according to his opinion storage including archival might be underestimated. There are regulatory activities that may restrict these products. This will impact the consolidation and deduplication that is trying to emerge as a technology in the storage infrastructure. Software defined networks will also change the behavior as well.

Laura Ausberg (LA) noted that information about recycling/secondary use were included but not at a device level (e.g. information on how servers are processed etc.)

Thibault Faninger (TF) answered that this is still one of the aspects that needs to be refined. In terms of quantification, it is difficult to get the big picture at the EU level in terms of what is sent to recycling/disposal, etc. LS added that for storage there are some requirements on HDD erasing. There seems to be no standardisation for erasing data from SSD but the team has no further information.

Chloé Fayole (CF) said that she understands that there is an opportunity to improve efficiency, based on the different modes (idle, etc.) but would ask for in depth analysis to identify the use of the different modes, the power consumption of each of them.

LS acknowledged this but noted that other aspects also have to be taken into consideration (e.g. failure aspects and that this may change the whole situation if thermal management is changed at the room level). Powering up and down and up and down again, is not an ideal situation (since it causes oscillation within the system). Powering up a larger network can take between 30 and 120 minutes. Large storage providers tell the same story. With more SSD, there might be more opportunities. Thus, there are functional considerations that make such approach (automated power management) more complicated than for a PC for instance.

# **Presentation of draft Task 4**

LS continued with the presentation of draft Task 4 which is related to technologies. He reminded the main objectives of the task which are complex, since according to MEErP, this task aims to explain in easy-to-understand wording for non-experts what physical or chemical processes are involved in the functional performance of the product, and in particular where such processes are responsible for resource use and emissions. At the same time, the explanation is also directed at technical experts, presumably the designers and developers of the industry placing the products on the market. This means that it should be identified and reported what the latest research findings are and what they would imply for the future functional and environmental performance.



LS also reminded the complexity of the functional units and that in order to fix base cases and the BAT, a time stamp would be needed in order to distinguish already available and implemented technologies and those that will play an important role in the future. In this respect the software part plays an important role but is difficult to account and measure.

LS continued with the presentation of the component level, showing technologies and eco-aspects as well as different processor and system architectures and focusing on technical characteristics of the processor. Continuous performance improvements can be observed from SPECpower, but frequency is not increasing anymore with rates reached in the past and still observed for transistors. The industry started to introduce more and more cores after 2005. The environmental assessment of the chips is challenging and can vary, depending on time and type of fabrication.

LS presented the market shares of the ten biggest manufacturers for semiconductors (66%) and pointed out that a very limited number of manufacturers have the financial capability to go on with the technological progress and that no EU companies are among the main players. For this reason, it is difficult to influence them at the EU level.

LS reminded the technical and environmental characteristics of HDDs and SSDs and focused on passive and active cooling at the broad level. LS noted that most of PCB are lead free, but that there is nevertheless an exemption in RoHS until 2016. Liquid cooling is very sophisticated, but has a low market share and fans are much more common. He also underlined that as far as connectivity is concerned the landscape is very complex with many protocols, distinguished latency, bandwidths and availability, different media, that energy consumption is related to technology, etc.

- For this reason the project team suggested to take network equipment out of the scope from Task 5 and to treat it in a separate study. The following reasons for this decision were presented. Network equipment are used in different environment (telecommunications and datacenters), and not in datacenters only. An estimation from an IT analyst suggests that only around 18% of the shipped ports find their destination in datacentres. The Lot 9 study cannot deal with all the different environments others than datacentres, as servers and storage are not concerned by these. Thus, it is not useful to study network equipment in one specific environment only to formulate recommendations that would apply to all the products sold, including the ones sold in totally different environments.
- Also network equipment always establishes a link between a sender and a receiver, which are
  in many cases not used in the same room/environment. It is not possible to assess such
  equipment but only to study or to gather information on one side of the link, as the
  performance is highly dependent on the overall picture.
- Network equipment have a lot of different functionalities (switching, routing, antenna, etc...), applications, and use different interface media (copper, glass fiber, etc.), which result in a very wide diversity of products.
- The QoS is very high for network equipment: the functionality and safety is key for such equipment which are intended to support the functionalities of other equipment.
- Network equipment are controlled in a way that influences their functionality but this does not come from the product design itself. Besides, this control is not necessarily done at the product level: there even exist central control stations (with a main switch for instance).
- Network equipment are highly software (applications) dependent regarding their efficiency.

# Discussion

Jens Gröger (JGr) asked about LCA of SSD and wanted to know if the project team found the point in time when it's useful to replace HDD by SSD. Öko-institut did an LCA and found out that it takes 9 years because of the embedded energy.

LS answered that the assessment to be presented in Task 5 does not consider individual components (HDD vs SSD) but the full product only. However in the EU-project "LCA to go", where a LCA tool was developed with a lot of technology providers giving new inputs, results show the importance of the testing phase of HDD, in terms of energy contribution to the lifecycle impacts.



CF noted that there should be a clear analysis of the consumption of servers when idle/working. There should be a discussion on the technology options to reduce the consumption of servers. Another topic that should be covered is the technology used to improve the activation latency and the reactivation after the sleep/standby modes.

LS answered that technically a comparison might be possible, like it was done for computers. He agreed with the improvement potential, but there are functionality requirements (e.g. telecommunications running 24h). No such technologies have been seen on the market so far but could be expected under BAT.

HW noted that the resuming latency will drive the idle state figures and that variability has a bit of an impact. The SSD topic is emerging and at Intel, they test SSDs but environmental performance vs. HDD is unclear because of a lack of comparative information (whether or not testing is included, etc.).

LS noted that regarding memory and SSDs, there are tradeoffs between additional hardware and better energy performance.



# Presentation of draft Task 5 (EcoReport assessment)

AB presented the draft Task 5 report which is related to environment and economics. He showed the main objectives which were:

- to use Base-Cases as a conscious abstraction of reality,
- to provide an environmental and economic assessment of average EU enterprise servers and data equipment using the Ecoreport (MEErP),
- to quantify the environmental impacts of the selected Base-Cases throughout their lifetime as well as the economic Life Cycle Costs (LCC) and the Societal Life Cycle Costs (SLCC).

AB pointed out new elements that are part of the MEErP that did not appear in the older methodology MEEuP. Basic new elements are:

- A "new materials sheet" that allows adding extra materials to the Ecoreport;
- The consideration of new policies, such as the REACH Directive and the strategy for Critical Raw Materials (CRM). A CRM calculator is included in Ecoreport;
- A recyclability benefit rate (RBR) for bulk and technical plastics (potential output for future recycling);
- A new data set for recycled materials;
- New LCC equations, including an escalation rate for energy prices;
- Base Case Life Cycle Costs for society (LCCS) using extended LCC equations with a CO2 stock price, societal damage certain emissions, etc.

At this point the project team does not have further detailed information on Critical Raw Materials and recyclability benefit rates (RBR) in servers and storage equipment and would need more inputs from the stakeholders.

AB continued the presentation with the overview of the Base-Cases and end of life assumptions.

Afterwards, AB presented the draft bills of materials. The project team asked the stakeholders to provide feedback on the bills of materials and pointed out that in particular the storage base case will be improved. For this purpose more information would be needed from stakeholders, like e.g. a bill of materials for 2.5 inch HDDs.

AB continued the presentation with inputs for the three Base Cases related to energy consumption, indirect energy consumption and economic inputs. Here again the opinion of stakeholders will be very important in order to improve the final results.

The Environmental Impact Assessment (EIA) was based on both the direct and indirect effects (PUE overhead) It showed that as far as energy consumption is concerned, the use phase is playing a predominant role (>90%) in all of the three Base Cases. However, the material part contributes to a large share of the environmental impact for several air and water related emissions like Persistant Organic Pollutants (POP), heavy metals, Polycyclic Aromatic Hydrocarbons (PAHs) or Particulate Matter (PM) as well as on the waste part. Because of the relatively high re-use and recycling rates, the end-of-life phase plays an important role in reducing the environmental impact of the product. This is particularly true for air and water related emissions such as POPs, PM and heavy metals.

AB also presented a comparison with other publicly available studies, showing that the outcomes of the EcoReport tool are in line with other LCA which use other software.

AB continued with the results of life cycle costs for consumers and society and finished the presentation showing the EU Total annual impact of the stock. Under the current assumptions (direct and indirect effect considered during the use phase) the current stock of servers and storage products is responsible for 2.4% of the European electricity consumption.

#### Discussion

Kurt Van der Herten (KH) asked what the societal costs were linked to.

AB replied that they were part of the new methodology, taking into account externalities that are affecting society through individual consumption. Externalities refer to situations when the effect of



production or consumption of goods and services imposes costs or benefits on others which are not reflected in the prices charged for the goods and services being provided<sup>1</sup>. In order to reflect those prices, the Ecoreport prices some externalities (see methodology for more details).

Sylvie Feindt (SF) wanted to know if this figure would look better if there was less video streaming for instance.

LS confirmed this, saying that the effect would be proportional.

HW observed that in the results, it is not possible to see the substitution aspect (effectiveness by IT and for IT). IT enables to improve the productivity and the trade-off is a sensitive issue for the IT providers. New technologies require sometimes new materials (e.g. small form factors). With particular material requirements it could be the case that hands of the engineers are tight for improvement.

LS replied that the trade-off benefits at the economic sector level are indeed not included in this type of methodology (MEErP). The costs presented are not the opportunity costs (best alternative), but life cycle costs of single products that are not put in relation to other products.

TF explained that this comment deals with two different things. First of all, the study does not aim at studying the overall benefits/costs of IT equipment/sector for all the other economic sectors where substitutions of services could take place. This would definitely be out of scope. However, potential trade-offs at the product level (use of different materials, etc.) are considered in the environmental and economic assessment and will be investigated in EcoReport with the BAT technologies, for the same considered functional unit.

LS noted that it would be useful to know certain technology trends and to get a list of the materials and technologies, in a quantified way.

DP asked for general feedback on what has been presented during the stakeholder meeting and reminded that the later people entry in the process, the less efficient it is. Exemplary questions are:

- Do you consider the BC to be representative?
- Do you agree on assumptions for energy consumption?
- Do you agree on assumption made for end of life?
- Do you agree with the bills of materials?
- Etc.

He added that two criteria out of the three needed for a regulation are met (product sales and environmental impacts). Now the savings potential still needs to be assessed.

KH noted that given the huge complexity of the scope and with the interlinkages with everything around, it will be difficult to highlight the potential savings. He asked about DP's vision on that issue.

DP replied that he and the project team had been discussing a lot on the focus, in particular if the assessment should be on a product or system level (data centre). It has been agreed that any requirement should be made at the product level. A regulation is only fully enforceable at the product level, since system level would be too complex. The product in itself clearly is impacted by the system around. It would be fundamental to see which parameters/standards could be used. However, as for today, not enough harmonisation exists at the EU level.

HW wanted to know if it is part of the study to look at unintended consequences when comparing the implementing measures (e.g. shutting down a server in the core of a data centre should be part of an analysis).

LS replied that two lessons from past studies have been learnt. There are always ways to make products/components more efficient: e.g. there might be improvement options on the PSU level or load adaptiveness of the fans. Power management could be an option (not necessary make it compulsory in its implementation but make it possible) since sometimes "having the option" of power management is important in order to optimise. Requirements could also come through the provision of

<sup>&</sup>lt;sup>1</sup> <u>http://stats.oecd.org/glossary/detail.asp?ID=3215</u>



more information (standard interface for monitoring, etc.). There are a few measures which could be "softer", e.g.:

- at component level (e.g. PSU efficiency)
- more information freely available to the customers/users, also understandable for those who do not speak the IT language

KH adds that there is a need for education of the customer. He does not know how this could be included in the IM but it is part of their daily job with the customers.

HW remarked that concerning storage, archival processes need to be looked at, since they require a different kind of technologies and have a different use pattern for energy consumption (SNIA).

# Presentation of preliminary best available technologies (BAT)

LS pointed out that the notion of best available technologies (BAT) has a time stamp and that the project team needs information associated with product configuration. Concerning the questionnaire, BAT examples should cover:

- The component and product level: consider in that respect both hardware and software aspects including power supply and thermal management.
- The product configuration and extended system level: Consider the operational requirements including interoperability, maintenance, condition monitoring, and active power management, modularity and scalability.
- Describe the functionality and important technical specifications of the BAT. Indicate when the BAT was introduced in the market and at which point in the future it may become a standard technology (mainstream).
- Most importantly: Please quantify the advanced performance of the BAT in comparison to existing standard technology, both regarding the technical performance and the environmental performance (such as energy and material savings into perspective of the technical performance such as workload performance, capacity, latency, and reliability).

It is important to quantify (with supporting documents) the results and the presence on the market: are all vendors involved? Are all products concerned or only high end products? LS underlined that in general, the project team needs data on the differentiation between standard technologies and BAT on the market.

KH wanted to know about the case when companies do not agree between each other or have proprietary solutions.

LS replied that BAT should not be confused with future regulations and that it is also a promotion for certain market segments.

HW said that they would face the same issues and recommended to make a clear distinction between what is marketing and what is reality. He claimed that what is communicated is often overextended on what is possible. In a lot of cases, it is not possible to know the benefits (when technologies are not disclosed yet). For this reason HW recommended to stick to technologies that have been already proven. For more information, the project team should go to where the application is, rather than taking the vendors' claims.

LS agreed and repeated that BAT should be available on the market today.

KH noted that some options may be applicable to products that are not in the scope. He was afraid that it might extend once more the scope.

LS replied that Base Cases are volume servers and storage products, those that are very common, and these are also the focus for BAT, even if the scope of Lot 9 is still wider and all different



**types of products may not reflected directly in the BC**. As discussed during the first stakeholder meeting, only recommendations in Task 7 and the future regulatory process (including impact assessment) would set potential exemptions, etc. There are specific aspects that are proprietary, but also aspects that are not (thermal management). There is a big need for better testing, how to describe the products on average. It will also be possible to see whether such standards have to be developed in the future, to come back on the subject in a few years.

Jason Ord (JO) commented on the Moonshot program and wondered if the project team would want BAT that are horizontal?

LS replied that all kind of information will be very useful.

JO summed up that information should then be provided at the top of the funnel, and the team will filter afterwards to keep the most relevant points for the assessment.

LS added that supporting SPEC SERT data for the BAT would be very useful.

HW mentioned that scalability is one of the considerations for these benchmarks. They are somewhat limited in the capability scale, because they are not able to replicate the performance advantages in certain configurations. Hybrid SSJ does a good job in scaling through TPCC TPCE: multi configurations benchmarks, but it is very costly. Most manufacturers can only do it once. E\* and TGG are looking at very similar scenarios. EPEAT: IEEE 1680.4, are not approved yet but the SPEC is considering looking at resume time, under the A3 and A4 conditions under ASHRAE. These are some opportunities for power management.

KH said that the code of conduct of data centers is setting a lot of important criteria and that it would be good to create a link. Many of these options have been applied already.

LS added that most of the products can be operated at 35°C, but this would create hot spots. He asked manufacturers if it is feasible to run the iT equipment constantly at higher temperatures e.g. 32°C and what the is on the reliability of the hardware.

KH mentioned that discussions were taking place at the CoC, but no discussion to include ASHRAE 4 for the time being. He added that free cooling would not be limited to Nordic countries only. There are also discussions on the use of the PUE and associated trade-offs.

Tom Moriarty (TM) commented that based on the outcomes it may be worth to check if the results can be integrated into Lot 3 (Personal Computers (desktops and laptops) and Computer Monitors) instead of creating a new regulation.

DP replied that an impact assessment (IA) study needs to be done before any regulation. In this IA products are checked more in-depth, and the outcome would be the draft text of the regulation. There has to be a good coordination with other ongoing Lots (e.g. Lot followed by Paolo Tosoratti on PC). DP is trying to do everything to respect the timeline. A lot of comments to define BAT (fast evolving sector) have been seen. DP would like to have the text for the potential regulation before 3 years, if relevant.

Kieren Mayers (KM) noted that utilisation depends on server types (facebook/centralized server could be 80-90%).

LS replied that one could create another BC if we get the market shares and if these are significant.

KM mentioned that for BAT there would be a need to take into account different sub-systems.

HW asked whether the focus is going to be on volume servers. LS confirmed this.

HW suggested narrowing the feedback, in order to focus to get quantification. This is not possible with a too large scope.

NN added that it would be good to have the BAT broader, even if they will not be included in the projections of the model in the end.



DP commented on the issue of different use patterns: this is the purpose of the meeting and feedback. He will ask the team to analyse it as detailed as possible.

TF added that since the documents are in a draft phase, the reviewers should be as critical as possible in the review now, at this point of the study. In particular, BC can still be changed/refined/added if stakeholders are able to provide more and relevant data.

KV wanted to know what the consequence would be for network since it was taken out of scope and no BC had been presented.

TF replied that there would be no regulation at the moment and that the team suggested that it would need a more detailed assessment studying all network equipment at the same time.

LS added that network equipment includes a broad spectrum of technology and that stakeholders could highlight areas where the project team needs to better harmonise with ongoing other regulatory activities including E\* Program.

#### Next steps

TF presented the next steps and asked for a realistic deadline for the industry to submit the questionnaire on BAT.

SF suggested the 14th November which is fine for the project team. HW added that consolidated feedback takes time.

TF thanked the participants for the collaboration and bilateral exchanges. The next stakeholder meeting will be around March 2015 and the final report is scheduled for May 2015.

DP added that the stakeholders can also contact the project team if they have questions on the rest of the MEErP.

DP thanked the attendees and closed the meeting.



# Annex

# LIST OF PARTICIPANTS

Laura	Ausberg	LA	Ökopol GmbH
Anton	Berwald	AB	BIO IS/Deloitte
Pamela	Brody-Heine	PB	Green Electronics Council
Lars	Bruckner	LB	NEC Europe
Thibault	Faninger	TF	BIO IS/Deloitte
Chloé	Fayole	CF	ECOS
Sylvie	Feindt	SF	DigitalEurope
Peter	Gibson	PG	Intel Corporation
Jens	Gröger	JGr	Oeko-Institut
Jan	Gütter	JGü	AMD
Takashi	Imamura	TI	Fujitsu
João	Marinho	JM	Hitachi Corporate Office, Europe
Kieren	Mayers	KM	Sony Computer Entertainment Europe
Tom	Moriarty	ТМ	Dell
Nils F.	Nissen	NN	Fraunhofer IZM
Jason	Ord	JO	HP
Davide	Polverini	DP	EC DG ENTR
Dominique	Roche	DR	ETSI OEU ICT Users' committee
Sara	Rodriguez Martinez	SRM	HP
Laura	Spengler	LSp	Ökopol GmbH
Lutz	Stobbe	LS	Fraunhofer IZM
Laura	Talens Peiro	LTP	JRC-IES
Kurt	Van der Herten	KH	IBM
Klaus	Verschuere	KV	Cisco
Henry M	Wong	HW	ISO/IEC JTC1 SC39 WG1
Bizhan	Zhumagali	BZ	ICF International/UK DECC



# **Meeting Minutes**

Project	DG ENTR Lot 9 – Enterprise Servers and Data Equipment		
Event	3 <sup>rd</sup> Stakeholder Meeting		
Date	24 April 2015, 10:00-16:00		
Location	DG Growth, Salle Michel Ayral BREY 12th Floor, Avenue d'Auderghem, Bruxelles - Brussels		
Participants	See list in the Annex		

# **OBJECTIVES**

- Welcome and opening by the EC, introduction and objectives of the meeting, tour de table
- Presentation and discussion of the main updates of Task 1-5
- Presentation and discussion of Best Available Technologies
- Presentation of draft Task 6
- Presentation of preliminary policy options (draft Task 7)
- Presentation of the next steps within the preparatory study
- Information on the planning after the preparatory study

# Welcome and opening by the EC, tour de table

Davide Polverini (DP) welcomed the participants, presented the agenda and the objectives of the meeting. Afterwards all participants presented themselves in a brief tour de table. The list of the attendees can be found in the Annex.

# Presentation and discussion of the main Updates of Tasks 1-5

Anton Berwald (AB) presented the updates concerning Tasks 1-5 and reminded the stakeholders that the detailed responses to the different comments are available on the website. In total, 10 stakeholders coming from industry, associations, environmental groups, citizens' organisation, etc. contributed to the comments.

As far as Task 1 is concerned, the project team received general comments and further definitions (e.g. on microservers), several updates of initiatives and tools (e.g. Certified Energy Efficient Data Centre Award (CEEDA), UK Data Centres Climate Change Agreement, EPEAT, etc.). In Task 2, additional inputs on storage data (IDC) were provided by DIGITALEUROPE. Task 3 was improved through additional (mainly qualitative) information on utilization trends, COMS, free cooling, tape drives, temperature and humidity levels, failure rates, etc., which was provided during the consultation process. In Task 4, further information on energy considerations for memory systems, power supply losses, processor groups, etc. were taken into account. Finally, in Task 5 comments on Critical Raw Materials (CRM), the manufacturing phase, End-of-Life (EoL), etc. were integrated.



AB presented the retained EoL assumptions and Base-Cases (BC) in more detail and explained how the team took into account the quantification of critical raw materials.

Furthermore, AB mentioned that the team had performed a sensitivity analysis in Task 5 with alternative LCI (Life Cycle Inventory) data for three categories (energy, GHG and acidification), provided by the JRC. The results showed that the manufacturing phase might be underrepresented with the Eco Report, but that the main message - the predominance of the use phase - did not change.

#### Discussion

Henri Wong (HW) wanted to know how many drawers the project team had considered for the storage base case. AB replied that the storage base case is a virtual product which stays theoretical and that with respect to the amount of drawers the project team would need to check and come back to him at a later stage.

# Presentation of the Best Available Technologies (part of Task 4)

Lutz Stobbe (LS) stated that the understanding of BAT is not limited to the single product but that different options need to be considered. In this respect not only the use phase, but the whole life cycle needs to be considered.

It is possible to structure the important BAT in primary and secondary aspects.

Primary aspects can comprise:

- Components (Energy and material efficiency of components / devices (e.g. PSU, Fan, CPU));
- Configuration (Effective selection and set-up of hardware and software elements in support of the intended use);
- Control (Active power management, load-shifting (virtualization), and (auto-) adjusting to changing operational conditions (system level)).

Secondary aspects (for which it is not straightforward to find the proper terminology) can be issues related to:

- System conditions (Rack and data center level (system) airflow, cooling, and humidity conditions and the capability of the Lot 9 ErP to safely operate under these conditions).
- Information (Energy-related information such as energy-performance benchmarks which supports the selection of the right product configuration, e.g. SERT)
- Interoperability (Interoperability of product and system level condition monitoring tools, e.g. power metering)

In a further step, LS explained primary and secondary aspects in more detail.

An important issue is that there are overlaps between what is considered BAT and general technology development, since it is not trivial to draw a clear line between the two.

In a next step, LS provided further information on the different BAT analysed by the project team. These comprise:

- CPU power management
- New storage media (SSD)
- Storage Capacity Optimization Methods (COMS)
  - Deduplication
  - Compression
  - o Delta snapshots
  - Parity RAID (now typically RAID 6)
  - Thin provisioning



- High efficient power supply units (PSU)
  - PSU according to industry initiative 80Plus (e.g. gold, platinum, titanium)
  - Right dimensioning (avoid low utilization = low conversion efficiency)
  - Two options for operating redundant PSUs (Balanced vs On/Standby)
- High efficient fans
- High efficient thermal pass and airflow
- Higher inlet temperatures (ASHRAE A1)
- Right configuration for intended use
  - Effectiveness before efficiency
- New form factors and modular architectures
  - Micro servers: Application-oriented, highly modular and scalable
  - o Hot swapping main devices is already long-time state-of-the-art
  - Utilizations trends: Virtualization vs parallel computing

#### Discussion

Bernard Gindroz (BG) wanted to know about the importance of maintenance for airflow inlets and possible electrostatic tensions that can occur. LS stated that there is no full utilisation and that for this reason operators are theoretically capable to perform maintenance work. This is also observed in practice, often in telecoms. However, there exist many data centres and not enough staff is available to cover all the work. During the study, the team did not consider repair works.

Jason Ord (JO) wanted to know if there might be a possibility to take the code of conduct (CoC) to a further level, beyond best practices. LS stated that as a first step it is important that everything that is done should be measured. Pilot projects are necessary to draw some first conclusions. CoC is a good idea and tool, which can give an orientation (numbers, ideas, and guidelines).

Henry Wong (HW) stated that the industry will try to capture these questions and could provide some insights on these topics.

Davide Polverini (DP) made a comment on the CoC, stating that the transposition of CoC into ecodesign requirements (in the hypothesis that this would be one of the envisaged policy actions) would be more an information requirement. For this reason, it could be a part, but not the core of a Regulation. Coordination with already existing initiatives will be ensured in any case.

Dominique Roche (DR) stated that they are working as users on this topic, with all layers from the industry. They are working on a new standard in order to have an operational measurement. They agreed to transpose the CoC in one standard in CENELEC in order to maintain the level of efficiency of this document year by year. It should be directly connected to the current existing standard of ETSI and be finished within two years.

#### **Presentation of Draft Task 6**

AB recalled the main objectives of Task 6, which are to

- identify and describe design options to be taken into account,
- quantitatively assess the environmental improvement per option using the EcoReport,
- estimate price increases due to the implementation of these design options and to
- assess both environmental and economic impacts.

Furthermore, AB gave background information about how design options have to be chosen according to the MEErP and showed an overview over the retained design options for the three base cases. As a further step, he provided more information about each design option, explained the underlying hypotheses and showed some calculation examples for potential energy savings.



Afterwards, AB presented and commented the EcoReport outputs for each design option. The main conclusions of draft Task 6 were that:

- It is not enough to concentrate on the environmental impact of a single physical product, within a data centre all the equipment is closely linked and interdependent.
- The EcoReport results show that from a life cycle cost assessment point of view it is often worth to opt for a better 80 PLUS PSU category.
- A lower PUE due to an allowance of somewhat higher inlet temperature conditions can lead to significant energy savings.
- Advanced processor power management and COMS can decrease the environmental footprint and save costs.
- There are positive energy saving effects of more completely configured products as well as a higher average utilization. Modular systems have considerable environmental benefits due to better performance scalability, maintenance, and platform refurbishment including the reuse of valuable components such as storage drives.
- SSDs are in general more energy efficient than HDDs but cannot substitute the latter due to different functionality and much higher costs for the time being. A reuse of storage devices might reduce increasing storage costs in future and improves the overall environmental impact.

## Discussion

Henry Wong (HW) stated that the industry (ITI) provided the Energy Star team with a summary of the near term best available technologies as they are beginning to emerge: e.g. non-volatile memories vs SSD, advanced power management, CPU customization (static/dynamic configurations) and it would be nice to see a convergence between this list and options suggested by Lot 9.

A second key point, HW mentioned, concerns the best integration option: a topic that was not identified is the notion of homogeneity and interoperability. Both of those items may prevent the unilateral adoption for newer technologies. There might be technological limitations in terms of integration.

Bernard Gindroz (BG) stated that he supports HW comments. As far as the A1 approach is concerned, it is stated in the report that the fans will have to run at higher speed. However, if a system approach is considered, the whole system can be redesigned and the system can be improved at the system level.

Catriona McAlister (CMcA) asked whether the possibility to have learning curves was considered, since technology is moving very fast. E.g., as far as the design option for SSD is concerned, today the cost is prohibitive but a learning curve could be useful. She also commented on the document distributed by DE during the meeting, which stated that the industry seems to be largely capable of reaching A2. Given this point, she wondered why the project team stayed with A1.

LS replied that this is linked to the fact that Ecodesign is not a top runner program and that the goal is to improve the average level of the industry. Surely there are some actors that are capable to reach A2 and higher, but this is not what is to be addressed in the study. As far as learning curves are concerned, the project team could apply this concept, but it would be more a top runner approach, which differs from the MEErP. The aim of the study is to understand what can be done on the complete industry level, and not only to concentrate on the best performers<sup>1</sup>.



Kieren Mayers (KM) had a question concerning the Base-Cases and in particular on advanced processor power management. He wanted to know what assumptions were made in terms of use of these features and whether it is representative for all services.

AB replied that the design option is based on information received from stakeholders. It shows the theoretical potential only. Since it is relatively vague, it is not picked up in the policy analysis. It cannot be said at this stage if it is applicable to all services.

Sylvie Feindt (SF) stated that if the industry is capable of going up to A2, and the PUE is set too low, the energy savings mighty be overestimated.

LS stated that the project team assumed that many datacentres are run in a suboptimal way and that for that reason a PUE of two is considered for the Base-Case. This assumption is based on literature review and information from other projects. Also, the potential estimation obviously does not take into account A2 because even if some equipment can currently handle these conditions, it is not really applied in practice in most datacentres. Thus, the stake is not only to have reliable equipment for A1 or A2, but to have this implemented in practice and a Regulation covering all products could incentivise this.

When calculating a lower PUE, the project team had a particular way of calculating the design option. It is clear that a higher temperature (e.g. through free cooling) is not a continuous condition, since it depends upon the different seasons within the year. For the high-temperature months, the project team added additional fan and cooling power. It is still a rather simplistic approach, but it shows an example. If one would argue with A2, industry would say that most of the technologies that exist do not have to be changed (see datasheets), which is true. However, if a failure happens, there would be not much reaction time left so the conclusion of the project team was that A1 could be a minimum requirement that the industry can do without any problem, but that would also leave some margin in case of failure. The team did not suggest any adjustment to the internal cooling system of the servers/storage.

HW stated that the PUE value highly depends upon the context of the datacentre. It is not possible to put the datacentre anywhere, especially with respect to response time requirements and resiliency level

LS replied that this was a good point and that he wanted to add some information to that. When the project team considers A1 as an improvement potential, this does not mean the operator will opt for it. However, giving the operator the opportunity to do it helps to explore this kind of option. In most parts of Europe, it is no problem to work under free cooling. It provides the option to change on the data centre level the cooling infrastructure and apply new mechanisms to scale the infrastructure better.

Bram Soenen (BS) mentioned that he would not see learning curves as a top runner approach, but that it would be an interesting approach for these fast developing technologies in order to estimate costs and savings. Furthermore, he wanted to know whether the two PSU are identical or not and if this has implications on costs and efficiency? As far as ASHRAE standards are concerned, this will also depend on how it is implemented (voluntary agreements or code of conduct). He said that he finds it difficult to see how these requirements can be part of eco-design on a data centre level. Market Surveillance Authorities would have big problems testing for it (compliance with particular PUE). A third question was related to re-use and why one particular option was chosen and not e.g. the recyclability of HDD.

LS replied that the project team does not fully understand how the concept of learning curves applies to regulations<sup>1</sup>. Concerning the PSUs, the project team assumed identical PSUs. As far as the PUE is concerned, the team is not demanding a specific PUE for a data centre. However, if a product is developed that it is able to run at a higher temperature, the operator has the option to use free cooling, which - as an effect - might reduce the PUE in the data centre. Concerning re-use, common practices in data centres were investigated. Some companies refurbish complete platforms and utilize them, which can be seen as best practice. Industry is also interested in recycling the products in order to recover the precious materials. Often, the controller board is recycled, along with the body (aluminium). Through the disassembly process, one might have the options to get to the motor and the neodymium. However, the neodymium concentration is rather low. LS agrees that on EU level, recycling of HDD is not optimal.

<sup>&</sup>lt;sup>1</sup> Ex post, LS noted that he had misunderstood the concept of the learning curve at this point during the meeting. Learning curves were not mentioned to be used in regulations, but rather to be used for cost estimations.



However, because the materials have a significant value, it is common practice to have a take back scheme. There is room for improvement, but it is difficult to assess it at the market level, and with the EcoReport.

AB stated that the restriction to the EcoReport was also one of the reasons why the project team had to choose this design option. Additional data on CRMs was collected and investigated and the project team has been in close contact with the JRC, which is doing a more detailed study on material aspects. As soon as this work will be made available, results might be implemented as additional information in the preparatory study.

Laura Talens Peiró (LTP) stated that in the EcoReport tool the resource use indicators are not well captured, for which reason the production results are low. She said that the JRC is working on an alternative study and is hoping to provide more inputs in one or two months.

DP stated that the definitive answer if there will be a procedure on regulating enterprise servers and storage will not be given this day. His first impression is that it seems to be difficult to use Eco-design to regulate rooms or parts of buildings (on the datacentre level). It is highlighted in the conclusion of the presentation that there are interdependencies of the product with the rest of the system.

HW stated that for the recyclability aspect one has to bear in mind that especially for storage, data is important from both a security and privacy standpoint. As a result, a number of industries have restricted re-use, since the security and privacy aspects are more important (compliance with data security regulations have higher priority).

Chloé Fayole (CF) stated that she would like to support the learning curve approach, which seems to be appropriate for this product group (e.g. the SDD price estimation). Furthermore, it is important to take into account the different modes and to optimize the energy consumption of the different modes. This should be reflected in the design options. Additionally, in order to promote the standby/lower modes, it is important to look at the design options concerning power management, taking into account aspects such as default enabling, latency, etc.

BS asked if testing PSU using specific load profiles could be done and if this could be addressed through eco-design requirements.

LS replied that the project team had addressed the issue of testing and benchmarking throughout the study, showing the capabilities of modern CPUs (part on SPEC SERT in the report). Concerning power management, the project team had checked this option showing different capabilities of modern CPUs. However, it is always related to delays when the system is reactivated. If delays are allowed, power management is possible. Otherwise, there is a restriction. The project team thinks that is better to improve the overall utilization level.

CMcA wanted to know whether there are technologies for latency issues.

LS stated that technology aspects related to power management on the CPU level are described in Task 4. It is even more complex on a system level. The project team asked the industry to what extend the ACPI standards are implemented. It is usually not implemented to the same extend than on a personal computer level, because of the delays. In the data centre, one never knows when the user tries to retrieve information.





# Presentation of preliminary policy options (Draft Task 7)

AB presented the objectives of Task 7 according to the MEErP, which are:

- a policy analysis including:
  - the description of the stakeholder consultation during the preparatory study,
  - the description of opportunities and barriers for improvements of the environmental impact; opportunities for Ecodesign measures,
  - a selection of policy measures for further analysis,
- a scenario analysis,
- an impact analysis on the industry and consumers and a sensitivity analysis.

AB stated that at this stage of the project, the team has worked out a preliminary policy analysis and a first scenario analysis that will be further refined, based on the discussions during the meeting. An impact analysis on the industry and consumers as well as a sensitivity analysis will be performed in a further step.

AB pointed out that throughout the project, the Lot 9 team was in direct and regular contact with different stakeholders from industry, associations, environmental groups, citizens' organisation, etc. There were stakeholder consultations through three questionnaires:

- 1<sup>st</sup> questionnaire: scope, market segmentation, environmental considerations
- 2<sup>nd</sup> questionnaire: data collection (bills of materials, metrics, etc.)
- 3<sup>rd</sup> questionnaire: BAT data collection

Furthermore, the team was in regular exchange with different established programs (ENERGY STAR, Green Electronics Council, etc.) and collaborated with similar projects like the Environmental Footprint and Material Efficiency Support for Product Policy - Benefits and cost of potential requirements on material efficiency for enterprise servers conducted by the JRC and the PEF Pilot on storage equipment. In a next step, AB presented opportunities and barriers for Ecodesign as identified by project team. Afterwards, AB gave an overview over preliminary policy measures, for further analysis. These measures included:

- 1. Energy Efficiency
  - a) Temperature and Humidity-Specifications
  - b) Power Supply Efficiency
  - c) Active State Efficiency Criteria (SPEC SERT)
  - d) Reduction of Idle Power and Idle State Efficiency
- 2. Information Requirements
  - a) Energy proportional design / Dynamic Range
  - b) Information on the negative consequences of overprovisioning
- 3. Software Aspects Storage Capacity Optimization (COMS)
- 4. Design for reuse, recycling

Subsequently, AB provided some more detailed information for each of those measures. Participants were asked to discuss the different points or to add further information after the presentation of each point.

The comments and discussions are summarized in the following section.



# **COMMENTS AND DISCUSSION DURING PRESENTATION**

#### 1. Energy Efficiency

#### a) Temperature and Humidity-Specifications

Pamela Brody-Heine (PBH) gave a short update over the ongoing work on the NSF 426 standard, which is currently open for public comments. In the current draft version, Class A1 is the required criteria and products that reach higher levels such as A2 or A3 get additional points. However, at the moment they need also more feedback in order to understand whether this is the correct level. It has also to be clear that Ecodesign is representing floor or average products and NSF is about environmental leadership.

Bernard Gindroz (BG) wanted to address points that are considered as barriers, e.g. how reliable air flows are and how important the noise level is. If one is moving in the sense of higher inlet temperature, there will be a need to redesign.

#### b) Power Supply Efficiency

HW stated that systems may vary in terms of their impacts (energy savings vs costs). In particular, there is a difference between storage PSUs (custom built, range of operations is more limited, they have been delayed a little bit regarding development compared to the server PSUs) and server PSUs (single output generally, dynamic range of operations).

LS wanted to know what the threshold is in terms of wattage.

HW answered that he would need to check this point and that industry will get back to the project team with more details. They should be somewhat higher in the 1250 W range. As far as storage is concerned, the power values are increasing when moving to Online 3 or Online 4 devices (more speed and density). On the server side, the power values are getting lower for microservers (750-1250 W range).

LS mentioned that in general, there is no technical hindrance to create these kind of PSUs and that mass production can be reached within a couple of years (5-6).

HW pointed out that one aspect in terms of technical barriers for storage is that they are still based on multi-output and one has to worry about different efficiency levels. This dedication to the multi-output level makes it much more difficult.

CMcA addressed a question related to the meaning of the "qualification period".

HW replied that PSUs have to undergo several qualifications like safety, fail-safe operation, EMC requirements, mechanical reliability, etc. All these qualifications take some time (1-2 years process) to adjust the characteristics and can be quite expensive. For these reasons a lot of manufacturers are hesitant introducing new qualifications on PSUs.

Darrel Gaston (DG) stated that they often have multiple suppliers for the same PSUs, since mechanically they have the same form factor. It needs to be made sure that they qualify independently, so that you can plug the PSU to any device.

LS agreed, but repeated that there would be no technical barriers and that it would just take some time.

HW came back to the morning discussion on dual power supplies, and added that the industry had provided the ENERGY STAR team with information on "cold redundancy", which is available since recently. It contributes to a better right sizing of the PSU.

Hans-Paul Siderius (HPS) had a semantic remark, since the notion of a "barrier" for overlapping regulations might be the wrong term to use.



DP added that any potential regulatory initiative will take into account existing legislation and other EU initiatives. Should the EC decide to go for an eco-design regulation for enterprise servers and storage equipment and should the EC decide to incorporate the suggestion of the consultants to incorporate higher requirements for PSUs, a harmonized approach will be sought. Either a new eco-design regulation for enterprise servers will be proposed, amending the existing computer regulation, or these aspects will be integrated in a review of the existing computer Regulation.

#### c) Active State Efficiency Criteria (SPEC SERT)

JO stated that it would be important to integrate this information requirement with the datacenter code of conduct to make sure that the customers understand how to use this information.

CMcA asked whether there would be any barriers to use these tools (SERT) or if they were entirely accepted.

HW replied that one potential barrier might be seen in the costs and that training would be required. The training should not only contain the ability to test but also the insurance in terms of the quality level of the data, in order to ensure consistency of the information. Other adoption aspects might concern the costs of licenses.

LS added that the license costs around \$2,800 (which is affordable) and all the worklets need to be tested. It is not possible to test only one worklet, which means that the test is a bit complex to perform. Another aspect is that the configurations are not defined per se (what is a typical configuration?). Nevertheless the team thinks that it is a very informative tool. A lot of companies already have online tools where one can configure products and this information could be just added to the tools.

LS noted that it is true that education is important for the use of the machines. Indeed, pushing these types of info with CoC would be a good idea.

Tom Moriarty (TM) commented that the major customers already require this kind of information.

SF stated that there is a mix between datacenter operators and the server providers. The question is who is going to be addressed through the regulation. Are manufacturers going to be obliged to educate the users and on which basis? How would this be possible to put it in a regulation? She noted that this would be something for the code of conduct.

LS replied that information is an important resource. As a vendor one should be consistent and improve resource efficiency, by providing information to customers (which is already done). One need to discuss to what extent more information is required. It would be possible to provide a benchmark, specifying the type of configurations (adding context to this kind of data).

DP added that there are no prescriptions for training through eco-design at the moment, but that there exist some obligations for information disclosure (information requirements).

BS noted that it might be difficult to verify that the declaration of information is correct.

DP replied that this is an aspect that needs to be kept in mind for the next steps after the preparatory study.

#### d) Reduction of Idle Power and Idle State Efficiency

HW stated that he does not think that anyone in the industry thinks that idle power becomes a good measure of efficiency. However, there are systems which are most of the time idle and there are several aspects associated to that, such as proliferation/utilization of virtualization technologies in order to better aggregate the workloads to certain groups of servers. If one is capable of doing that activity, not only



the utilization rates are going to rise, but also a phenomenon that the industry has been discussing and that one colleague constituted as "platooning". The term and concept comes from a military reference, where groups are formed and prepared as a group. Its context here is to group and stage servers to support increases in work demand. Similarly the group(s) can be identified to be put into a lower power state until some or all may be needed. That group would be orchestrated to support the compute demand and prepared to be part of the compute pool before the need. This orchestration requires coordination across multiple servers and is an example of a systems as opposed to per device approach<sup>2</sup>.

HW added that as one increases the capability, the idle power level increases. If one just addresses idle power it would be insufficient, since the capacity increase would be needed to be taken into account as well.

HPS noted that the title of slides (idle) seems different than proposals (low mode).

AB replied that this remark is correct.

HW commented on the two separate modes of operation. The industry came up with this formulation on inactive power states which are indeed different than idle. A better term would be "inactive power mode". When looking for some technologies to address this resume latency, one could challenge the technology providers asking how low they can go and still resume all the operations in a reasonable amount of time. That's the real challenge here.

BS stated that he would not be in favor of having an idle mode allowances that increases with increased capacity. Concerning the possibility of clustering servers (pertuning), such an aspect seems to be interesting and has not been considered within eco-design yet. It seems to be somewhere between a system and product approach. If it would be a product approach, a testing method would be needed and BS was wondering if it already exists.

HW noted that the claim that idle power is increasing is happening now and will always happen. If someone says that he does not need more capacity per unit, the only option to handle the situation is to buy more products, which means that the overall footprint will increase.

CMcA noted that ENERGY STAR does already address the idle power and have requirements.

HW stated that this is true. When they worked with ENERGY STAR they had to find a way of scaling the idle power allocation. The more capacity the higher the allocation for idle. It is consistent with the notion that the more capacity one puts in, the higher the idle power will go. The industry is fine tuning it with ENERGY STAR and their hope is to do the same for active mode efficiency. This is currently ongoing work.

HW was wondering where the silver and gold projections for Base Idle State Power Allowances come from.

PBH replied that these were draft criteria in the NSF standard (NSF 426 document) and explained the meaning of bronze, silver and gold levels.

HW stated that industry needs to go ahead and provide some feedback on those criteria.

LS mentioned that there are several studies on energy proportionality and dynamic range which address the level of idle to max power consumption. The analyzed data was from SPEC POWER. When analyzing energy proportionality one conclusion was that it does not improve anymore, that it is saturated. This indicates that further reduction of idle in relation to max power is getting more and more difficult, indicating what HW said before. This comes from the fact that Moore's law is slowing down a little bit. New architectures might help. One will see in the future specialized servers (e.g. ARM type architectures) where one is doing the same thing over and over again (cloud applications, etc.). There is a possibility to scale the system and to utilize the capacity one really needs. This does not address the idle state, but to a certain extent the dynamic range.

<sup>&</sup>lt;sup>2</sup> Explanation added ex post by HW



#### 2. Information Requirements

#### a) Energy proportional design / Dynamic Range

HW agreed that a mechanism would be needed to capture the top end. The issue with just a power ratio (E\* workstation classifications) is that the compute capacity on the top end versus the idle power is not capturing when one compares power vs power. One would want to see capacity vs power. Even if industry does not like such measures (same numerator and denominator), these kind of ratios makes sense to target efficiency.

#### b) Information on the negative consequences of over provisioning

JO noted that this might be an opportunity to bring in utilization rates as best practices in the CoC.

HPS mentioned that this subject has been also discussed with boilers and water heaters and the conclusions seem to be the same. It seems that there are useful things one can do but that this cannot be regulated with eco-design at a product level, unless some of the points can be translated into specific information requirements.

Markus Herber (MH) stated that it is a huge practical challenge to have a quantification on this topic.

KM mentioned that as far as overprovisioning is concerned, only the user can determine what an effective configuration is, the manufacturer cannot give an advice on that.

#### 3. Software Aspects - Storage Capacity Optimization (COMS)

HW noted that when assessing the savings, it has to be considered that the systems are not equal. The power profile of an Online 4 is very different from an Online 3. One Online 4 system can by far exceed several Online 3 systems from an energy consumption point of view. Some of the COMS activities mentioned here are only possible to use in Online 3 and Online 4. These tradeoffs need to be assessed from an energy footprint standpoint.

BS noted that this cannot be done in eco-design. Eco-design regulates the placing of products on the markets.

HW stated that the criteria for any individual part has to take into account what the intended and unintended consequences would do to the system in general.

BS was wondering if ENERGY STAR would then not be a good criteria for policy criteria.

HW replied that for the time being it is the best available. The challenge would be to establish an energy efficient system approach with criteria at a product level.

DP addressed a question to industry, asking if they know how many products (range) are compliant with the specific requirement of ENERGY STAR.

HW stated he would not know.

Peter Gibson (PG) noted that logically, if it is a new ENERGY STAR requirement, it has to be less than 25%, but this can change very fast within one year.

Pado Tosoratti (PT) highlighted that the type of usage and software are very important for energy efficiency.



#### 4. Design for reuse, recycling

JO asked a question about the JRC study. More precisely he was wondering whether it was looking at the value of the raw materials.

LTP answered that they look in particular on the environmental impact, thus checking the environmental perspective (not the economic value). There is a lack of literature concerning PCBs which was also one reason why this study was conducted, thus there is no information about different types of metals in different types of PCBs. Once this information will be available, one can also perform an economic analysis. The study should be finished in summer.

HW wanted to know if the project team would be breaking up the lifetime and motivations behind removal or disposal of particular parts. Most of the structural items are not changed for over 10 years sometimes. E.g. fans are changed more often than PSUs and so forth.

Kurt Van der Herten (KvH) wanted to know from LTP, if she had already observed the worst practices to be eventually removed from the market.

LTP stated that they did some dismantling by themselves, and can conclude on some bad practices. Some interesting suggestions were already suggested by the Lot 9 project team (accessibility, reparability, etc.)

SF wanted to know if the JRC had a look on who is taking care of the take back and the dismantling, since most of the big producers take back themselves. The question would be why they would write a manual for themselves for how to dismantle the servers.

LTP noted that this is an important question and that she would be happy if some of the manufacturers could provide information on the percentage of servers under leasing vs sold. As far as the requirements for the sketch of components are concerned, it might be not that important from a refurbishing point of view, but it is important from an end-of-life point of view (when the products reach the recycling sites).

HW stated that he would recommend looking for recyclers, to understand what they can do already and then to ask oneself the question if there is a real need for an enhanced design.

PBH noted that the GEC compiled the results from the NSF questionnaire and got very mixed responses. Some recyclers said it was very helpful and other mentioned that they knew what they were doing and that it was not necessary.

KvH stated that they could provide information on this issue, since they face heavy discussions on the Basel convention. They could do a quick exercise on focusing on servers only and can share the results. Since IBM is working on servers and storage only at the high end he could share what they are taking back either from IBM owned equipment or leased equipment. The figures are around 7-8% for direct reuse, 34% reuse after repair and more or less 50-55% reuse after dismantling (de-manufacturing/re-manufacturing activities). The remaining part goes to recycling operations and only a couple of per cent go in incineration and less than one percent ends up in landfill. It is already daily practice for the manufacturers and a quite well established mechanism since there is a big interest to recover the material.

One of the main question is what recyclers are doing with the materials and it is important to understand what the used technologies are. What are the processing possibilities and which choices are made? Another important topic is innovation.

HW agreed to this statement and does not see that new materials will be created. The set of materials to be worked with remains limited.

PT asked if the equipment KvH was talking about was related to warranty/maintenance contracts or if they would have take-back programs?



KvH stated that it was a combination. There exists IBM owned and operated equipment as well as lease equipment which belongs to IBM (EoL stays problem of IBM). Then there is IBM owned equipment where they offer the services (e.g. running applications). Finally there are sales (WEEE Directive) and take back schemes (EPR).

BS asked about the percentage of products IBM get back and if it is recycled in the EU or abroad.

KvH stated that around 60-65% of the products that have been placed on the market by IBM come back. These are global figures since IBM is acting on a global level. For IBM it does not matter whether it is recycled in the EU or not, since they require high standards everywhere. It might even make more sense that the materials will be recuperated where new equipment is produced (not necessary in the EU).

# Presentation of the next steps within the preparatory study

AB presented the next steps for the preliminary study which are:

- Submission of comments on Draft Task 6 until **8<sup>th</sup> May** (via template)
- Publication of Draft Task 7 by end of May
- Deadline for comments on Draft Task 7: four weeks after publication
- Finalization of project end of June 2015/beginning of July.

## Information on the planning after the preparatory study

DP gave some final considerations from his side. After the consultants finish the study in July 2015, the EC needs some time to decide if it should go for regulatory measures or not. DP wants to decide this in September 2015.

If a further procedure is considered (Impact Assessment Study) it would start in October 2015. One of the preliminary findings is that there is an urgent need for standardized methods if one would like to go further with regulation measures. In order to establish a bridge between the preparatory study and the potential impact assessment a "Technical Assistance" study is provided by Intertek on behalf of the Commission. It started in April 2015 and will last 14 months. There are two stakeholder meetings foreseen in this study. Since it is a technical assistance, there will be no more place to discuss policy options, but the focus will be on the methods of measurement. The website will be set up soon. Harmonization will be sought with existing EU legislations but also with ENERGY STAR, CoC and others.

SF noted that the scope of Lot 9 is not very clear throughout the study.

DP answered that network has been excluded after Task 4 and that the rest stays within the scope. This is visible in the conclusion/recommendation sections of the different tasks.

KvH wanted to repeat the fact that the use of a Base Case is a virtual approach and that the question will need to be answered how one can come to a well-focused recommendation based on clear metrics.

Thibault Faninger (TF) answered that it is important not to confuse the representation of the Base Cases and the scope of the study. If products are not considered as BC directly, this does not mean they are out of scope. The BC approach is useful to calculate the potential savings. The consultants are not drafting the regulation at this stage. There will be further discussions in the future and exclusions are possible at a later stage for specific products.



# Annex

# LIST OF PARTICIPANTS

No	Title	First Name	Surname	Ref:	Organisation
1	Mr	Matthew	Allison	MA	Access Partnership
2	Mr	Anton	Berwald	AB	Bio by Deloitte
3	Mrs	Pamela	Brody-Heine	PBH	Green Electronics Council
4	Mr	Thibault	Faninger	TF	Bio by Deloitte
5	Mrs	Chloé	Fayole	CF	ECOS
6	Mrs	Sylvie	Feindt	SF	Digitaleurope
7	Mr	Darrel	Gaston	DG	Server Power R&D
8	Mr	Peter	Gibson	PG	Intel Corporation
9	Dr	Bernard	Gindroz	BG	CEN/CENELEC
10	Dr	Mihaela	Grigorie	MG	Swiss Federal Office of Energy
11	Mr	Jan	Guetter	JG	AMD
12	Mr	Markus	Herber	MH	IT Supplier
13	Mr	Lars	Koch	LK	Orgalime
14	Dr	Kieren	Mayers	KM	Sony Computer Entertainment Europe
15	Mrs	Catriona	McAlister	CMcA	Intertek technical support to EC
16	Mr	Tom	Moriarty	ТМ	Dell.Inc
17	Mr	Shailendra	Mudgal	SM	Bio by Deloitte
18	Mr	Osamu	NAMIKAWA	ON	Hitachi, Ltd.
19	Mr	Jason	Ord	JO	HP
20	Mr	Stephen	Pattison	SP	ARM
21	Mr	Ove	Persson	OP	Ericsson AB
22	Mr	Davide	Polverini	DP	EC
23	Mr	Dominique	ROCHE Rodriguez	DR	ETSI OEU
24	Mrs	Sara	Martinez	SRM	HP
25	Mr	Hans-Paul	Siderius	HPS	Netherlands Enterprise Agency
26	Mr	Bram	Soenen	BS	Belgian Administration Environmental Product policy
27	Mrs	Astrid	Soriano	AS	TechAmerica Europe
28	Dr	Lutz	Stobbe	LS	Fraunhofer IZM
29	Mrs	Laura	Talens Peiró	LTP	JRC IES
30	Mr	Pado	Tosoratti	PT	EC
31	Dr	Kurt	Van der Herten	KvH	IBM
32	Mr	Klaus	Verschuere	KV	Cisco
33	Mr	Henry M	Wong	HW	ISO/IEC JTC1 SC39
34	Mr	Bizhan	Zhumagali	ΒZ	ICF International





# Minutes: First Stakeholder Meeting meeting for 419/PP/ENT/IMA/14/11931A Ecodesign Technical Assistance Study Product Group "DG ENTR Lot 9"

## Location:

BREY 07/46, B-1049 Brussels/Belgium, 13/11/2015, at 10:00 to 14:00

#### **Presenters:**

Davide Polverini (European Commission, DG Internal Market, Industry, Entrepreneurship and SMEs) Cat McAlister Intertek Testing and Certification Ltd Hansfried Block, Standard Performance Evaluation Corporation (SPEC) Anson Wu Intertek Testing and Certification Ltd

#### Attendees:

Pieter-Paul Laenen, Hewlett-Packard Jan Guetter, AMD Peter Gibson, Intel Corporation Bram Soenen, Environmental Product Policy Belgium Amit Singh, Ericsson AB Hans-Paul Siderius, Netherlands Enterprise Agency Carsten Wachholz, European Environmental Bureau (EEB) Bernard Gindroz, CEN/CENELEC Kaisa-Reeta Koskinen, Energy authority, Finland Henry M Wong, ISO/IEC JTC1 SC39 Tom Moriarty, Dell.Inc Jan Viegand, Viegand Maagøe Paul Finch, ASHRAE TC9.9 Sylvie Feindt, DIGITALEUROPE Kurt Van der Herten, IBM

# Points discussed:

- Welcome and tour de table
- Ecodesign Activities On Enterprise Servers And Data Storage Devices (D. Polverini, DG GROW)
- Project context and scope (C. McAlister, Intertek)
- Discussion of enterprise server and data storage standards gap analysis (C.McAlister, A. Wu, Intertek)
- Explanation of the SERT tool for servers (H. Block, SPEC/Fujitsu)
- Discussion of options for metric development for servers (A. Wu, Intertek)
- Next steps: Server testing etc. (C.McAlister, Intertek)

**<u>1. Ecodesign Activities on Enterprise Servers and Data Storage Devices:</u> Davide Polverini (D.P.) presented the latest ecodesign insights on the DG Grow Lot 9 product group particularly in** 

relation to the preparatory study conclusions and challenges, and discussed the policy measures to be analysed in the Impact Assessment.

He explained that the Final Preparatory Study report would be available at the end of November, but that it was not likely to be very different to the previously published draft report.

Regarding timing, he stated that if (on the basis of the impact assessment study) the decision was made to proceed with ecodesign/energy labelling measures, these would be likely to be discussed at the Consultation Forum meeting scheduled for the second half of 2016 (around September / October).

D.P asked that the discussion of policy should be reserved for the impact assessment work, and that the discussions in this meeting be focussed upon the technical issues.

Kurt Van der Herten (K.V.H.) of IBM asked how the work of the JRC on material efficiency and wider issues<sup>1</sup> related to the technical assessment study. Cat McAlister (C.M.). explained that the team had already been working with the JRC team and that some of the parameters that would be discussed later in the presentations had been drawn from their recent report on material efficiency considerations relating to servers.

**2. Project context and Scope:** C.M. presented the aims, priorities methodology and scope of the technical assistance project. She outlined the key policy initiatives identified, and the Henry Wong (H.W.) highlighted that in relation to policy, different policies had different objectives – for example Top Runner vs ENERGY STAR. C.M. acknowledged these differences, and highlighted that the detail on these aspects could be taken into account in the impact assessment study.

H.W. also highlighted the work of CNIS (Chinese Government) and the Korea Government in the servers area. C.M. explained that the technical assistance contractors had met with the CNIS representatives, but whilst they were aware of the Korean work had not been able to identify the key contact in this area to follow up with.

Action: H.W. agreed to try to put the EU and Korean contacts in touch with one another. H.W explained the need to appropriately address the issue of interoperability in relation to policy requirements. It was important to ensure that interoperability standards was not compromised by regulatory requirements, providing the example that power management requirements could interfere with the availability of devices on the wider system. Paul Finch (P.F) provided some insights on how ASHRAE dealt with the interoperability issue through coordination with their IT subcommittee.

# Action: C.M. agreed to draft some text on interoperability considerations in coordination with H.W. to be included in the next project report.

Further C.M. provided details of the approach to definitions for this contract, and some context on standardisation in terms of why it's important, the main bodies involved, the standard EC mandate / SR procedure.

**<u>3. Gap Analysis:</u>** C.M. presented on the parameters input to the gap analysis, the relevant standardisation mandates to Lot 9 products, and provided an overview of the relevant standards identified to date.

P.F. explained that it was not only temperature should be referred to in relation to ASHRAE, but that humidity was also an important consideration. P.F. highlighted that the 4<sup>th</sup> edition of the ASHRAE standard should be available later in 2015.

In relation to Mandate M462, H.W. highlighted the issue that as ETSI leading much of this work, it meant that there was a focus on telecommunications and network considerations more than server and storage energy efficiency, and that all necessary server / storage stakeholders (from an ecodesign viewpoint) were not involved in this process, so it did not necessarily take into account the wider (non telecom) considerations that were important to Lot 9.

<sup>1</sup> IRC project. "Rest Environmental Practice in the telecommunication and ICT services sector"

D.P. explained that in relation to standardisation mandates, these can be issued not only when a regulation is published in the OJEC, but also in some cases prior to a regulation. He explained that whilst the scope of M462 was very broad, he was keen that the Lot 9 aspects were considered under this mandate in order to save time due to the time sensitivity of standardisation processes. He also recognised that some more specific aspects could be launched in a dedicated mandate at a later point if it was identified that this was required.

Bernard Gindroz recognised that CEN was not actively involved to date with the standardisation activities related to M462, but that there was an opportunity to promote more active participation of CEN through the plenary that was to be held in 10 days' time.

H.W. highlighted that the telecommunications environment was different to other data centre environments due to the focus on transportation of data in telecoms, compared against wider priorities in other DC environments such as management, manipulation, transport and secure storage of data.

D.P. explained that just because a standard was delivered under the M462 workplan did not mean that it would automatically be the standard referenced by any regulatory measures, should these be developed for Lot 9 products.

In reference to progress regarding ISO/IEC 30134-4, H.W. explained that the timeline for a standard to be delivered was by early 2017 (due to the IEC rules on timing in relation to when the request was issued, which specify a three year limitation for delivery).

In reference to EN 50600, P.F. asked how standards development was being coordinated between CENELEC and the ISO work. H.W. provided some insights : Coordination is maintained by having the same experts sat on both groups ie H.W. but there is no formal agreement.

C.M. summarised the results of the gap analysis in terms of total numbers of standards identified, and highlighted the key priorities for interaction on standards going forward.

Peter Gibson asked for clarification regarding the listing of TEC as a parameter, as he believed this was a calculation rather than a parameter that could be tested against. Anson Wu (A.W.) responded that TEC was included for completeness and that this parameter reflected whether the test method would enable a TEC calculation to be made. H.W. emphasised that as far as TEC was concerned variations in usage were difficult to account for fairly. C.M. suggested such discussions were reserved for the discussion around metrics.

<u>**4 Explanation of the SERT tool for servers:**</u> Hansfried Block (H.B.) provided an overview of the SERT tool, and discussed the outcomes of the SPEC / Green Grid work to date on metric development. Some points of interest include:

- Tuning parameters: CPU technology providers come up with these, and the configurations are published on the SPEC website so that all users have to use the same parameters – this reduces "gaming".
- Very high power: SPEC would like to include a worklet for this (such as linpack) but do not have one currently.
- White paper October 2015: Highlighted that 100% utilisation is not the point of highest efficiency, therefore it is not necessarily a preferred strategy to max-out utilisation. The peak efficiency was found to usually occur in the 80 to 90% utilisation zone.
- Network controllers: Generally not power managed. Testing network performance with one server is not relevant other devices are necessary to create a system test and this creates complexity for the test setup to ensure the other device not under test does not influence the test results
- Scalability: SERT can be used on servers up to 8 sockets, although it is currently only supported up to 4 sockets.

 Metric recommendations: There will be a meeting with the EPA and ENERGY STAR stakeholders on Thursday next week to discuss results of TGG analysis and refine the approach to metric development. Due to the different usage and configurations of the servers, thoughts on definition to date are based upon the following approach:

## Compute-Intensive

Geometric mean:

- [Combined efficiency scores of all CPU and Hybrid worklets] \* high weight
- o [Combined efficiency scores of all Memory worklets] \* low weight
- [Combined efficiency scores of all Storage worklets] \* very low weight

#### • Memory-Intensive

Geometric mean:

- o [Combined efficiency scores of all CPU and Hybrid worklets] \* medium weight
- o [Combined efficiency scores of all Memory worklets] \* medium weight
- [Combined efficiency scores of all Storage worklets] \* very low weight

## • Storage Intensive

Geometric mean:

- o [Combined efficiency scores of all CPU and Hybrid worklets] \* medium to low weight
- [Combined efficiency scores of all Memory worklets] \* low weight
- o [Combined efficiency scores of all Storage worklets] \* medium weight

It is not clear how these different classes of configuration (compute, memory and storage intensive) would be defined and applied in a policy context. There is a further TGG report to be produced which will go into greater details

Bram Soenen asked if it would be possible to further aggregate the configuration classes into one single metric / result. It was not generally considered that this approach would be useful as it would require a weighting of already weighted figures.

H.B. highlighted that there was a SPEC meeting planned for March 2016 in Delft, Netherlands. He also highlighted that there was policy activity in China related to the SERT tool, and that there was some testing being carried out there, as well as some SPEC meetings. **Action : Technical team to aim to get involved in these discussions.** 

**5. Metrics:** A. Wu presented on the key issues identified from a review of the recently published SERT / Green Grid analysis. He outlined the methodological approach the project would take to investigating metric design, and detailed some of the main issues for consideration (idle power / scaling with load level, SME workloads, neutrality of metrics),

Regarding neutrality of a metric, H.W. explained not all of the features of a server are exposed by the metric itself e.g. the extra circuits contained in resilient servers. He also highlighted that for resilient servers, utilisation should be assumed at a lower level. In SERT development it has therefore been assumed that policy makers will define categories to account for this.

A.W. then opened up some questions for discussion, addressing the following:

<u>Reported poor-correlation between idle and efficiency score (how to account for idle if not in efficiency score?)</u>

- H.B. explained that efficiency relates to performance, and that it was therefore not appropriate to consider idle in this context. He noted that in high-end configurations the idle would normally appear high.
- H.W. explained that EPA recognised that the low-load end of the efficiency curve was important. The current emphasis on high utilisation including the ISO 30134-4 KPI was intended to inform procurers: from a provisioning viewpoint it was necessary to capture efficiency at the capacity level at which the equipment was being procured (100% loading point).
- P.F. highlighted that DC operators lease space by the kW, so provisioning to maximum power is important.

# Emphasis on max utilisation values (Preference to weight metric toward performance at lower loading)

Unexpected variations in idle power between processor power management states

• H.W. explained that there were some data points in the Green Grid data where further information was required to understand nuances. He recommended that the technical assessment team highlight these issues with the data set to the EPA.

Comparison of generational improvements (potential for alternative based on similar maximum worklet score or based on similar introductory price for apples-to-apples comparison)

• H.W. explained that it was being considered if an alternative approach might be to separate out the performance and power scores, but that it was important not just to look at idle as this would give a false impression of efficiency and prefer smaller, less powerful servers when more powerful servers may be a more efficient option

In the questions related to this discussion, the following additional points were raised: D.P. asked how scalability was addressed under SERT, in terms of number of sockets etc. B.S. also expressed an interest in this being explored. H.B. responded that the worklets are able to scale with relevant capabilities – this is integral to the design of SERT. H. W. further elaborated that the SERT tool was capable of scaling against different server configurations in terms of increased memory, different CPU etc, but that when the tool is used it only represents the capability of one server in isolation, and cannot provide a systems perspective on how the server would perform if 5 were in use in tandem. It is also not possible to predict how scalability will function with new architecture – it can only be based on known parameters. Hans Paul Siderius stated that the functional definition taking into account wider data centre aspects was not a necessary focus – that the focus was (correctly) on the product of a server in isolation in this case. P.F. highlighted that the ASHRAE aspect already took into account aspects of the wider system. **Action: D.P. and B.W. asked for some clarity to be provided on scalability with the technical assessment reporting.** 

Tom Moriarty (T.M.) explained that the 2<sup>nd</sup> generation of servers were seeing a large improvement in efficiency compared to previous designs, so the industry was clearly improving.

Jan Viegand (J.V.) asked how the wide variations in use of servers was taken into account – for example, a virtualised server operating 24 hours a day compared against an enterprise server sitting in idle much of the time. H.B explained that it was necessary to understand the application and map this to the classes.

**<u>6. Conclusions and Next Steps:</u>** C. McAlister closed the meeting with conclusions, a summary of the key issues going forward, and details of the next steps including testing.

B.S. highlighted a potential risk that the project testing could have a UK manufacturer bias. C.M. explained that the purpose of the testing was not to obtain results that were representative of the wider market, but rather to analyse the test process itself and provide insights on procedural aspects that could be clarified. There was some discussion around the presence of "certified bodies" for carrying out SERT testing in Europe. C.M. explained that under ENERGY STAR, the use of a certified body for testing was not required in Europe (only EU). However, that some certified bodies do exist in Europe (of which Intertek was one, and the full list can be obtained at: <a href="http://www.energystar.gov/index.cfm?fuseaction=recognized\_bodies\_list.show\_RCB\_search\_form">http://www.energystar.gov/index.cfm?fuseaction=recognized\_bodies\_list.show\_RCB\_search\_form</a> D.P. further clarified that, for ecodesign purposes, the manufacturers are in general free to choose the (testing and calculation) methods and practical arrangements, when assessing the compliance of their products.

C.M. explained that the next stakeholder meeting would be held in March/April and asked if there were any potential industry meetings that should be avoided as potential dates. Cebit was was highlighted as one such event, and would be held on 14 to 18 March 2016 (note: prior to 23 March would be ideal to avoid Easter holidays, and due to team availability it appears that most likely date will now be between 1<sup>st</sup> and 4<sup>th</sup> March).

Kurt Van der Herten / Sylvie Feindt of DIGITALEUROPE asked when formal comments on the interim report would be required by. C.M. and D.P. agreed that 4 weeks from the date of the meeting would be appropriate (Friday 11th December).



# Minutes: Second Stakeholder Meeting for 419/PP/ENT/IMA/14/11931A Ecodesign Technical Assistance Study Product Group "DG ENTR Lot 9"

## Location:

BREY 07/46, B-1049 Brussels/Belgium, 25/04/2016, at 10:00 to 14:00

#### **Presenters:**

Davide Polverini (European Commission, DG Internal Market, Industry, Entrepreneurship and SMEs) Cat McAlister Intertek Testing and Certification Ltd Anson Wu Intertek Testing and Certification Ltd

#### Attendees:

Pieter-Paul Laenen, Hewlett-Packard Amit Singh, Ericsson AB Bernard Gindroz, CEN/CENELEC Henry M Wong, ISO/IEC JTC1 SC39 Tom Moriarty, Dell.Inc Paul Finch, ASHRAE TC9.9 Sylvie Feindt, DIGITALEUROPE Kurt Van der Herten, IBM Johanna Whitlock, Swedish Energy Agency Klaus Verschuere, Cisco

# Points discussed:

# 1. Project Context and Scope:

Catriona McAlister (C.M.) Provided an overview of the project aims, scope and methodology. She highlighted that three documents had been distributed to stakeholders and that the presentations would be focused around these:

- 1. Gap analysis report
- 2. Standards listing document
- 3. White paper on metrics

C.M. explained that comments were due by 13<sup>th</sup> May. After presenting the summary results of the gap analysis, she asked stakeholders for comments on the related report. Key stakeholder comments included:

- The importance that scalability is taken into account in terms of how the servers were deployed in the data centre (Henry Wong (H.W))
- Where there were differences in the decisions made in different countries/regions (e.g. EU, US, Australia), there is a need for clarity around the reasons for these. (H.W)

# 2. Standards Gap Analysis:

C.M. presented a summary of the results of the standards gap analysis and asked if there were any comments on the gap analysis report that had been distributed to stakeholders. C.M clarified

that the purpose of the standards document was to map existing standards to the possible parameters that may be addressed in any ecodesign related initiative, as identified in the preparatory study or the JRC study. She highlighted the key standards included in the standards listing document to elicit comments from stakeholders, and asked for stakeholders to provide comments where any standards had been missed or incorrectly referenced.

Key stakeholder comments included:

- The need to reference the 1680.4 standard as well as the NSF standard in the standards tables. (H.W.)
- Recycling focus likely not necessary as recyclers say that this class of product is reused and dismantled (H.W.)
- Concern that the EC decision on the EU Ecolabel for Computers was extensively referenced, but that no manufacturers could comply with the chemical requirements of this label (Sylvie Feindt (S.F.))
- Importance that there are clear regulatory requirements before standardisation is developed (Kurt Van der Herten (K.V.H.))
- Potential to wait for the ENERGY STAR version 3.0 requirements on servers to be finalised before proceeding with ecodesign proposals for servers (K.V.H).
- Requirements listed in figure 4 of the document are from the 2010 document rather than the updated version 4 document (Paul Finch (P.F.))

D.P explained that:

- It was the role of the preparatory study to determine priorities for the product group.
- Standardised methods were very important to regulators to provide a robust foundation for requirements, so ideally standards would be established in advance, to feed in to draft proposals for regulation, although if they weren't available this could be handled via transitional methods.
- The project had deliberately taken a very coordinated approach to server standards development, coordinating with all the different entities involved at an international level, including EPA, but that it was necessary that the EC work to their own deadlines, rather than following those of other entities whose schedules it was not possible to control. Bearing in mind also that there could be different strategies and priorities in the various jurisdictions, the EC would not wait for ENERGY STAR to finalise their server proposals
- Lot 9 products are part of the business to business supply chain, where it appears that a good reuse rate already occurs. In any case, the feasibility of resource efficiency related requirements would be further considered in the impact assessment.
- As the depth of analysis on servers was deeper than that that had been possible on storage he anticipated that it would not be possible to develop an efficiency metric for storage to the same level of detail as had been explored for servers.

# 3. Metric Development: Anson Wu (A.W) presented on the SERT tool and the metrics paper.

# SME and low utilisation focus:

Key stakeholder comments included:

- Concern over the focus on low utilisation which is not so common in large data centre implementations, where there has been much improvement toward virtualisation and consolidation (H.W.).
- Concern that a focus on SMEs might run the risk that metrics were not agnostic (A.S.).
- Suggestion that the chart on utilisation be updated to something that was closer to current server performance as idle levels in relation to max power were now lower (H.W.).
- Concern over the definition of SME, micro SME etc and feeling that these would only represent a small subset of servers (S.F.)

The project team made the following points:

- Acknowledged the progress being made in the larger data centres the larger data centres already well-understood energy efficiency considerations which was why there was a focus for the metric on workloads that could also represent the smaller DCs who had less insight. Many SMEs were resistant to moving to the cloud and tended to have the least ability to consolidate their servers, and that around 50% of the market and 50% of the environmental impacts were down to smaller data centre workloads (A.W).
- Clarified that the idea was that the metric would capture the way servers behave across the market, not just those procured by SMEs (D.P.)

# Considerations around temperature and test conditions:

The project team explained the following:

- The draft metric is based on SERT which states a temperature range. It is assumed that the most favourable temperature will be used for testing purposes, and therefore no correction for temperature had been made (A.W.).
- Temperature performance has not been included include within the metric, but from a regulatory standpoint measurements at different temperatures could be interesting to inform data centre operators (D.P.).
- Whilst SERT is designed for one inlet temperature, there is potential for tests to be carried out multiple times at different temperatures (A.W.).

Key stakeholder comments included:

- Caution against thermal attributes being included in a metric as the design of a data centre will cater temperature to the worst case device most prone to failure. Any requirements around data centre temperature could mean that a whole new fleet of equipment was required.
- Importance of being clear on the purpose and impact of testing requirements around temperature. SERT aims to mimic worst case conditions whilst enabling tests to be carried out without excessive equipment. To test at very precise and possibly extreme temperatures would incur increased testing costs, mean that only a very restricted number of labs would be able to carry out the tests, and potentially result in inconsistent results. (H.W.)
- Clarification that the 20 degrees level would be the optimum at a server level and that increasing the operating temperature at a system (data centre) level would have an impact on the broader energy performance. (P.F.)

# Hypothetical curves and metric development methodology:

A.W. explained the way in which the hypothetical curves were used to compare the different metric approaches and observe if the relationship between curves was intuitive. D.P. highlighted that the metric was intended to be neutral.

Key stakeholder comments included:

- The importance of considering scalability i.e. the system vs product level. The deployed power or idle needs to be taken into account considering that a rack is never bought as a single server, and that two racks will always consume more power than one larger server, otherwise consolidation efforts may be reversed by forcing smaller systems to be used as it is technically easier to reduce idle power in smaller systems (H.W.)
- The "ideal" curve was not considered realistic /possible due to the intercept at 0 on the Y-axis, and therefore not suitable for other curves to be normalised against (H.W.)

# Dynamic range

A.W. explained the metric formula, and specifically the inclusion of dynamic range at a worklet level.

Key stakeholder comments included:

• Concern that the inclusion of dynamic range could result in overestimating of the trade off between idle and max power, which would ultimately be driven by thermal constraints. He alluded to two

papers on this, a US EPA paper showing max power has stayed flat due to form factor limitations and an Economist paper on the limitations to further idle power reductions. (H.W.)

• Variation in dynamic range is likely to reduce in higher capability systems in future, or there is a risk that if max power is flat and idle increases with technology developments, the dynamic range could reverse. (H.W.)

# Storage / drives

A.W. stated the assumption that SSD was 10 times more efficient than HDD. H.W highlighted that rotational drives could prove more effective at greater capacity.

## Data set and scatter plot / bubble diagram of performance of different generations

A.W. presented the bubble diagram showing how the different server models performed against one another. D.P. clarified that the diagram was intended to rank the relative performance of different servers and observe the trend towards performance improvements, with clear clusters by product generation improving over time. Key stakeholder comments included:

- Concern over the complexity of the scatter plot. Recommendation that the metric approach be simplified further to enable a better comparison based on efficiency. (H.W.)
- Insight that industry stakeholders have been exploring alternative approaches building upon the Intertek approach would be able to arrive at a more intuitive approach that can be more easily communicated to non-experts. (H.W.)
- Mention of a 2008 document (republished at the end of last year) that ASHRAE produced on power trends in the past 10 years, that might be useful to the study. (P.F.)

# Deployed power

H.W. introduced the concept of "deployed power" in terms of an additional metric that could account for the performance of a specific server if the server were scaled up to an implementation of (for example) 100 servers (e.g. 100 x the highest score of relative performance, based on for example the peak SSJ performance). In this way the real impact of servers in a data centre environment could be better accounted for, and the correct behaviour in data centre procurement encouraged so that energy bills are reduced.

# Configurations to test

A.W. presented upon the need to define products to test, and current proposals being considered, which were similar to those in the v2.0 ENERGY STAR specification. D.P elaborated that the way in which configurations for testing were defined for a regulation may not necessarily that currently proposed in the metric report – it would need to be tailored depending upon how the metric was going to be applied in policy terms. An ideal proposal where for each product placed on the market, the energy efficiency would be declared, and if/where this was not possible for all possible configurations, then that manufacturers would at least report the lowest efficiency of the product family. It would be useful to have manufacturer insight on the definition of a model family. Key stakeholder comments included:

- There is industry consensus with the ENERGY STAR approach on categories and configurations to test (H.W.)
- An industry authored paper had been sent to the EPA on configurations (H.W.)
- Consideration that declaration of the worst case is difficult as depending upon the customer could be a number of different things that can't be predicted i.e. number of drives. (H.W.)
- That it would be best to fix the requirements on one type of drive so that all products could be equally compared. (H.W.)
- Doubt that the difficulty compliance authorities have had in securing specific configurations in the past could be applied to servers due to the ability to highly customise procurement (H.W.)

The project team explained the following:

- That the ENERGY STAR approach to configurations to test was not fixed as version 3.0 was currently being drafted and the definition of configurations had already been highlighted by the EPA as an aspect that they were looking to refine in the version 3.0 (C.M.).
- That it would be useful to have insights on how configurations would reflect the majority of products on the market, and ensure that the configurations tested had real-world relevance (were not artificial). (D.P.)

# 4 Testing and next steps:

# Testing

C.M. presented findings to date on testing. D.P. explained that the testing findings would provide text on special considerations building on SPEC guidelines in order to inform future testing efforts. H.W. recommended the Intertek team get in touch with SPEC and consult their test guidance to resolve any testing issues. C.M. explained this was already happening and that the team was thankful to SPEC for being so responsive.

# Next steps

A.W. explained intended investigations into possible improvements to the metric taking into account industry feedback. C.M. explained that the next stage would be to revisit the analysis in light of the industry paper (possible metric improvements) to explore the alternative refinement options, and to consider how to refine the analysis around the ideal curve 0 intersect.

Key stakeholder comments included:

- Concerns that the timing for further revisions of the metric was short and that the conclusions of the project may be immature as a result (K.V.H.)
- Concern regarding on future opportunities for industry input on next revisions to metric. (K.V.H, S.F.)

Later it was clarified by C.M. and D.P. that the timescales were too short to allow a further full iteration with industry on the drafting of deliverables, so it was important that industry provided detailed comments by 13<sup>th</sup> May.

# 5. Closing comments:

# Coordination with other policies

P.T. explained that he was present in the meeting for the following reasons:

- i) as the ecodesign regulation on computers he is responsible for partly tackles servers (power supply efficiency for non-enterprise servers), noting that these requirements are currently being assessed, and if the current requirement were to remain it would only apply to non-enterprise servers.
- ii) as the performance based metric approach being considered in this project could also hold potential for the computer regulation, which at the moment is very complex in terms of many separate allowances for cards, allowances etc.
- iii) because he is responsible for the EU ENERGY STAR label, which currently covers servers and is under general evaluation to ensure policy coordination and coherence.

K.V.H. highlighted what DIGITALEUROPE viewed as a divergence in policy approaches in the BREF study being carried out on behalf of the EC by Ernst and Young, which they considered did not coherently referenced the EU CoC for data centres, as well as focusing extensively on non energy requirements. D.P. highlighted that the EU CoC is being assessed as an option in the impact assessment, and that whilst he does not foresee a regulatory clash deriving from the BREF study in relation to this work, if that arises it is important that industry flag this to him.

# Wider policy context and timings

D.P. reminded stakeholders of the deadline for comments by 13<sup>th</sup> May. In terms of wider timelines, he outlined that following the stakeholder meeting:

- The Intertek team would work on the comments, hopefully having received them in written format too, to derive and publish final version of documents by the end of the project (start of June), including practical guidance on testing.
- He would welcome any further comments from stakeholders on the list of standards as a supporting document for any policy requirements, this, which could assist in embodying findings in a draft working document in the second half of the year.
- Policy application of the metric was yet to be determined. The company Viegand Maagoe are working on the impact assessment:
  - A standard procedure to evaluate various policy mechanisms, which in this case should include the options of the EU CoC, ENERGY STAR, Ecodesign regulation and Energy labelling.
  - Specifically concerning the Ecodesign and Energy Labelling options, three main sub options should be analysed: MEPS, compulsory information requirements, or labelling. Whilst ecodesign requirements (thresholds) may not stem immediately from this work (further analysis seems to be required), the metric could be a fit for information requirements.
  - Will include an SME-focused activity in the IA, including a targeted questionnaire by the Enterprise Europe Network (EEN).
  - The earlier stakeholders can provide input the better the IA contractors had already been in touch with DIGITAL EUROPE.
- Consultation forum expected to be held by the end of the year.

Key stakeholder comments included the following:

- In terms of non-energy requirements, the involvement of recyclers is important (T.M.)
- DIGITALEUROPE input to IA in terms of reactions to the proposed scenarios etc. anticipated for mid-May (K.V.H.)
- DIGITALEUROPE could support the EEN work through their contacts at national trade association level in order to maximise the SME coverage (S.F.).

As there were no further comments or questions, D.P. closed the meeting.