

**3<sup>rd</sup> Stakeholder meeting for the Preparatory Study on sustainable product policy instruments for SOLAR PHOTOVOLTAIC MODULES, INVERTERS AND SYSTEMS**

**Wednesday 10<sup>th</sup> and Thursday 11<sup>th</sup> July 2019**

**Room 2B**

**Albert Borschette Conference Centre, Rue Froissart 36, 1040 BRUSSELS**

**Draft minutes v1.0**

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## Agenda

**10<sup>TH</sup> JULY 9.30 – 17.00**

09:30	Welcome and introduction	(GROW)
	Tour de table	
	Update on the study (tasks, timing, progress)	(GROW)
10:00	Task 6 – Design options identification and overview	(JRC B5)
11:30	Coffee break	
11:45	Task 6 – Environmental impact and LCC results	(JRC B5)
	Task 7 – Policy analysis	(JRC B5)
13:00	Lunch	
14:00	Draft transitional methods	(JRC C2)
15:00	Task 7 – Scenarios overview and analysis	(JRC B5)
16:30	Next steps	(GROW)
16:45	AOB and closing words	(GROW)

**11<sup>TH</sup> JULY 9.00 – 14.00**

09:00	Welcome and introduction	(GROW)
	Tour de table	
	Update on the study (tasks, timing..)	(GROW)
09:45	Summary of background study including scope, market and technical analysis	(JRC B5)
11:00	Coffee break	
11:15	Assessment of the evidence for EU Ecolabel: criteria areas and need for the label	(JRC B5)
12:45	Assessment of the evidence for Green Public procurement: criteria areas and need for the label	(JRC B5)
13:45	Next steps	(GROW)
14:00	AOB and closing words	(GROW)

## Participant organisations list

Organisation
ABB
Belgian Government (CBBE)
Bundesanstalt für Materialforschung und –prüfung (BAM)
CEA-INES
Cycleco
Danish Energy Agency
Danish Technological Institute
DG ENER
DG GROW
DG JRC
Dupont
Ecolabelling Denmark
ECOS
EDF
EEB
European Copper Institute
Exxergy GmbH
Federal Environment Agency Germany
First Solar GmbH
Fraunhofer ISE
French Ministry for the Ecological and Inclusive Transition
Fronius International GmbH
German Solar Association (BSW Solar)
Gujarat Borosil Ltd.
Imec
Interel
LG Electronics
Netherlands Enterprise Agency
Oeko-Institut on behalf of BEUC
PV CYCLE aisbl
Solar Energy Cluster, Norway
SolarPower Europe
Solibro Hi-Tech GmbH
Spanish Consumers Organization (OCU)
Sungrow Deutschland GmbH
TECNALIA
Total SA
TÜV RHEINLAND

UK Ministry for the Business and Energy (BEIS)
University of Attica (on behalf of ECOS)
Vaillant Group
VDE Renewables GmbH
VDMA
VITO/Energyville
Volta
VOLTEC
Wacker Chemie AG

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## **Welcome and introduction**

*The meeting was opened by Davide Polverini, policy officer from DG GROW C1. He welcomed the participants and presented the agenda of the day, which was accepted by all present without comment. The Chair also explained the particular nature of this Preparatory Study for Solar PV, with regard to covering the techno-economic-environmental analysis of the feasibility of mandatory Ecodesign and Energy Labelling regulatory instruments, together with the voluntary instruments on EU Ecolabel and Green Public Procurement (GPP).*

*The participants consisted of a balanced representation of experts from the business sector (industry and trade associations), academia and research institutes, government departments and agencies, consumer organisations, and environmental NGOs.*

*To open the meeting a recap of the previous tasks 1 to 5 that were presented in the previous second meeting in December 2018 was presented by JRC B5.*

## **Day 1, Wednesday 10<sup>th</sup> July**

### **Task 6. Assessment of BAT, design options and improvement potential**

*An overview of the Task 6 report on the assessment of best available technology (BAT), design options and their improvement potential according to the MEErP methodology was presented by JRC B5. This included the results of life cycle assessment (LCA) and life cycle cost (LCC) modelling for module, inverter and system design options and the identification of best available technology (BAT) and least life cycle cost (LLCC) technologies.*

*Stakeholders were then invited to give their initial feedback, and also to contact the study team to provide feedback and to share any relevant information. The main comments raised were as follows:*

#### **Design options identification**

*Comments on the tables from the Task 6 report presenting the design options and technical assumptions.*

**Bundesanstalt für Materialforschung und –prüfung (BAM)** asks why in slide 21 it says BSF for the base case and then for the semiconductor technology it states SHJ or PERC. This is misleading. It was asked whether kerfless was considered a drop-in material for polycrystalline wafers or would be the basis for specific semi-conductor materials?

**Oeko-Institut (representing ANEC/BEUC)** asked why the selection of design options is based only on general energy efficiency improvement which are largely market driven? It is missing design options driven by environmental improvements or other improvement considerations. For example, options for lead-free or fluorine-free modules which could be considered as design options. Important as well is design for recycling as an improvement option. Design for reparability for modules should also be reflected here in Task 6 as it is in Task 7. Hazardous substances should be as well incorporated as design option for inverters. For systems the design options are largely based on combinations on best modules and best inverters but what about the optimal fit for the installation, to ensure the correct matching of the inverter. Even having the best components, if the size is not correct it can have an influence in the energy performance of the system. Mounting structures has not been considered in design options as a way to save material, or hazardous substances in the cabling.

**Athens University (on behalf of ECOS)** commented that the glass currently used for encapsulation is thinner, lower than 3.2 mm. Framework 7 projects have developed thinner glass. New production from 2016 was developed for high performance windows, and used in organic solar cells. It increases the durability of solar cells. The new silicon carbide based inverters require less materials and less cooling system needs, with 10-15% less losses quoted when working at higher temperatures. Regarding the balance of system, cabling is the main component where losses can occur. The installers bring costs down by using cheaper and lower cost materials or cabling sizes that aren't optimal, since they cannot reduce the price of PV modules and inverters. This information comes from practices in the field and inspections. Have you considered to use a minimum accepted value for efficiency?

**First Solar** queried why end of life and recycling costs are missing in the LCOE equation. They referred the JRC to a white paper published by the PV Technology Platform which contains dismantling costs. It is considered important to have an open approach to all PV market segments. Cadmium telluride should also be considered in the residential segment and CIGS in commercial segment. Why is Kerfless considered as a BNAT and not tandem crystalline silicon with perovskites? In their opinion this is closer to the market.

**Borosil** noted that the presence of antimony in solar glass is an environmental issue with leaching to the environment (water) occurring and creating a hazard. There are numerous studies conducted in China and India showing how antimony has leached to the environment. The rate of leaching from smashed glass is much higher than expected. There is one study carried out by Fraunhofer Institute in which antimony was found to leach 100 ppb in 24h while the maximum permitted level is 5 ppb in drinking

water. Recycling of modules should be considered far more than it has been as there is 50 GW capacity installed that will have to be recycled at some point. There might be problems when solar glass is broken.

**CEA-INES** asked which comments has the Commission taken into account in Tasks 4 and 5. The assumptions referred to in Table 4 should be taken from the ITRPV roadmap as this is an authoritative reference. In the table shown for the optimised base case (Table 4, Task 6) there is a mistake: in the title it says multicrystalline and then the semiconductor technology states monocrystalline. Reference to the reduced amount of silver and lead should be rephrased as the terminology used is not clear. The module power for a 2025 case seems rather optimistic (440 W). Where is this figure coming from?

**Cycleco** asked whether BIPV had been taken into account.

**EDF** asked what was the relationship between this study and the work carried out for the PEF. Has a connection been made?

**Oeko-Institut (representing ANEC/BEUC)** remarked that Ecodesign could be a driver to make design for recycling feasible and to improve the recycling of PV components, including the use of information requirements. The Commission has mentioned hazardous substances as having been addressed in the optimised base case. What implications would have this in the modelling? In tasks 6 and 7 you have considered updated data taken from Tasks 4 and 5, will you make available these revised reports? We are also surprised that BIPV is out of the scope.

**CEA-INES** questioned what was the rationale for the selection of the module design options as there are missing options such as the Topcon, or all the multiple combinations regarding the bill of materials, the different types of silicon, encapsulation, interconnections, half/whole cells, etc.

**Solar Power Europe** asked why there are two storage cases for the inverters if the balance of materials is the same, and that the preparatory study should be aligned to other studies under Ecodesign such as for batteries for e mobility and in this way avoid overlaps.

**EDF** asked if the recycled content of metals is taken into account as for the mounting system or the aluminium frame recycled metals can be used. The second question is about the two methodologies used in this study (MEErP and LCA) and why the Commission has chosen to focus on the primary energy content of the system rather than on the climate change effect (GWP) of the system.

**Cycleco** complements to their previous question that a focus on the cell performance would not solve the question on introducing requirements for BIPV installations. More aspects have to be factored in



since the BIPV installations can be using suboptimal conditions (inclination, orientation, etc.) and there may be aesthetic considerations in the design of the product so that the best performing cell may not necessarily be used. It was also asked whether trackers are included in the scope?

**The Norwegian Solar Energy Cluster (SEC)** asks why option 10 was not selected because it represents the highest efficiency. In case some option should be out they recommend to leave kerfless old out. A second question is regarding the waste during the production process of silicon, there are manufacturers that recover the waste for producing new wafers. Why not to create a design option on that?

**The Commission** agreed – from the theoretical side - with the comment from First Solar about the inclusion in the LCOE of costs from recycling and the material referred to will be reviewed (though it would seem that detailed data on recycling costs are not available, to date). As for the modelling of CdTe in residential sector as a design option, Tasks 6 and 7 are based on Task 2 market data and the forecast data does not indicate that option as a significant future one. It will however be re-evaluated. Tandem silicon/perovskites are classified as BNAT, but a design option was not considered due to missing data to model their production and performance as stability is still understood to be a problem.

What to consider in terms of technologies, which are the base case, BAT and BNAT is a challenge during Task 6. There are some technologies that are still in the R&D such as the aforementioned glass, and then the market penetration and forecast cannot be readily predicted. For the system installation aspects this is as well an issue that has been addressed in the systems approach for a possible Energy Label will be presented later. In the implementation of Ecodesign and Energy Label, requirements relating to system installation are not easy to implement or enforce. For the comment about silicon carbide as design option, the **Commission** replied that it is been considered but as a BNAT, since there isn't sufficient evidence for the moment even from the lead manufacturers of the advantages cited.

The table referred to containing technical assumptions for the modelling will be reviewed and edited according to the comments received about the semiconductor, metallisation and power of modules. The power had been taken from the ITRPV roadmap although today in utility scale modules above 400 W are being installed. It was noted that Tasks 4 and 5 have been revised and track changed versions made available on the JRC project website.

For the question about the feasibility of recycling, several options in Task 7 will be presented, that include proposals for requirements that target both hazardous substances and recycling/dismantling of several components. A BNAT case could however be created for the recycling. Design for recycling is not

currently a module design option because it is largely still considered a BNAT with only limited evidence of designs allowing for clean material separation. In regard to the possibility of reducing hazardous substances in the BOM, this could be modelled as a design option within the optimised base case, as the idea is that this case allows for the testing of the impact of more generic improvements that may apply across several design options.

The reply of **the Commission** on BIPV products was that they have very specific characteristics that made them difficult to incorporate in the evaluation. The huge variety of products and their associated costs from commercial facades to roof integration makes it challenging to establish generic requirements for all of them. In case the Preparatory study is taken through and there is a consultation forum, **the Commission** may consider the possibility to have criteria for cells that may be used in BIPV products.

For the issue of antimony content in glass, **the Commission** replied that it is important that leaching tests are based on the standardised EN test procedures linked to the classification of hazardous waste and the Construction Products Regulation. According to standardised tests made by Glass for Europe solar glass containing antimony would not be classified as hazardous waste for landfill purposes.

In relation to the Product Environmental Footprint (PEF) methodology **the Commission** replied that the pilot has been a key reference to be used where useful and relevant from the start of the study. However there is not a direct link to policies and their implementation as these are still under formulation.

In response to the question about the drivers to select the design options, they are the main technologies that have a representation in the market (based on data and intelligence from Task 2). The selection of the available technologies in the market is a responsibility of the research team, once they have studied from the market (the past evolution and those that are forecast) and the technical perspectives the field. Examples such as interconnections and half cells are not considered to be design options as such, but form part of the design option for the optimised base case. Specific options for raw material (as silicon) have not therefore been created but rather for technologies. **The Commission** asked for the bill of materials to be supplied for options such as Topcon in order to evaluate the creation of BAT or BNAT cases. In relation to trackers, these have been included in a system design option case, with only single axis tracking selected as market data in Task 2 suggested the use of double axis trackers are in decline.

The two cases for inverters with storage are intended to cover two distinct configurations of these systems - one in which the demand is well matched with the production and the other in which demand occurs when there is no production (at night). **The Commission** has ensured that there are no overlaps between the present preparatory study and the Ecodesign study for batteries, since the latter is focus on

components while the study on systems. In any case this is normally also ensured by the impact assessments conducted which seek to avoid overlaps or conflicts among pieces of existing and ongoing legislation.

In reply to the recycling of metals, **the Commission** stated that in the MEErP modelling there are some allowances to include recycling in the end of life of metals for waste, but not on the input materials as recycled content. Since the Ecoinvent has been used as an input for data, global production of aluminium is already embedding around 35% of recycled content of aluminium. As for the selection of primary energy instead of GWP as a lead indicator, this is due to the intention to leave the grid emissions of the manufacturing site aside and to focus on the intrinsic energy use of production processes and the improvement potential. Primary energy is not as tied as GWP to geographical or grid specific variation along the supply chain – as demonstrated by the sensitivity analysis reported on in the Task 6 report.

#### **LCA and LCC modelling for module, inverter and system design options**

With particular reference to the environmental impact and least life cycle costs results, the following comments were received.

**ECOS** noted an issue with the calculation of the impacts of climate change. The energy mix of the countries producing the equipment should be factored into this calculation, it is better to have a weighted mix. Otherwise the real impact of the equipment is underestimated, especially taking into account if it is produced outside the EU.

**Oeko-Institut (representing ANEC/BEUC)** expressed some difficulties in understanding why the design options only reflect general improvements in energy efficiency. Market forces are driving the energy efficiency up, so Ecodesign in their view should rather focus on the added benefits of other aspects not related to efficiency such as recycling etc. The impacts on costs are not clearly seen in the graphs. Secondly, a geographical discrimination in terms of energy supply mix should not be done but instead the opportunity could be used to discriminate in terms of supply of energy used in manufacturing sites. This is another perspective to come to the optimal supply arriving probably to the same result but not showing geographic differences.

**BEIS (UK)** asked for the reasoning behind the unit of primary energy (GER) used, why not to use Mtoe as otherwise they cancel each other out.

**The Norwegian SEC** asked whether the actual source of energy at local level may be an option to look at instead of certificates of origin. Secondly, they are positive in their opinion to have primary energy and

not CO<sub>2</sub> as an indicator, and also to address lead and cadmium content. Finally, what is the source for the cost data - are they all from 2016? In that case they are old figures, and much has changed since.

**Cycleco** would like to see the components accounted for in the calculation for the total primary energy (i.e. transport, transformation, etc.). Are primary energy and total energy synonyms? It is important to be consistent throughout.

**EDF** asks if the potential to use green electricity has been taken into account? A second question is why the primary energy is given per kWh and the costs per Wp. The better a system is the better the ratio per kWh. It would be better to report all results per kWh for consistency.

**Exxergy on behalf of IEC- RE** questions the results obtained for the three system design options at residential scale which in their opinion are counterintuitive. In figure 22 utility scale, the results as well comparing the package and the system options do not make sense in their opinion – the drop moving to SO1 appears too big. Could the IECRE rating system which is under development be considered to be used for assessing performance? With this scoring system the majority of technologies could be compared thereby capturing the differences between them.

**Solar Power Europe** asked why in the combination of best system options the best module is multisilicon and not CIGS.

**BAM** noted that in slide 27 there are technologies that may not make sense. For example multisilicon kerfless is not compatible with SHJ, so the results are doubtful.

**Athens University (on behalf of ECOS)** asked why if Ecodesign takes into account a full range of environmental impacts from all stages of the life cycle then why the focus only on primary energy and three additional impact categories?

**Cycleco** asked for clarity on the labelling used for some of the impact categories – namely heavy metals and to which pathways they referred. Moreover, these categories represent inventory flows and are not impact categories in themselves.

**Oeko-Institut (representing ANEC/BEUC)** noted that the inclusion of better system design is good but which factors does it take into account? Optimised design for any specific applications can be influenced by factors such as the temperature co-efficient of the module of choice as well as site specific factors such as shading. Different climates and related choices should have an influence.

**Borosil** noted that climate also changes the normal cell operating conditions, due to the temperature rise. The results under Standard Test Conditions are a fiction.

*The Commission responded that to the question on the greenhouse gas emissions that it has not been overlooked and internal debates have taken place as well as it having been a topic of the last stakeholders meeting. It acknowledges the production of PV equipment takes place outside EU. However it is difficult to take this into account because the granularity in the data needed may not be appropriate and secondly because it is the understanding of the Commission that energy cost and efficiency have been the driver of the manufacturers of PV equipment for their technological development, rather than the GWP. As the Commission is aware of this issue a sensitivity analysis on this aspect has been included in Task 6. However, although life cycle emissions results cannot be translated into Ecodesign requirements for manufacturing sites, they have been contemplated in the EU Ecolabel and GPP criteria. The use of green electricity has not been considered as a design option for Ecodesign (though relevant, it seems not feasible/enforceable in the legal framework of the Ecodesign Directive). It could, however, be considered for the EU Ecolabel or GPP. In relation to how the proposal for secondary impact categories was made, these were identified based firstly on a prioritisation exercise linked to the relative contribution of components of the products to different impact categories in Ecoreport and then by a process of eliminating those categories strongly influenced by primary energy use, being already addressed directly as the lead category .*

*The Commission replied to the question on the inclusion of more circularity aspects that a dedicated workshop on the MEERp methodology was recently held with the conclusion that addressing them within the MEERp as it is today may lead to proxies for which the method is not yet ready. There is a revision of the MEERp methodology starting soon with a focus on how to address this aspect specifically. However, some of the options commented do not really fit into Ecodesign, and moreover they have not been identified as LCA hotspots. They could be better addressed within the frame of other policy options.*

*The Commission has tried to ensure that the cost model for each base case is tied as close as possible to 2016, depending on the availability of data. The other costs for the design options have been obtained from sources that are as uptodate as possible, pieced together with input from experts and from different sources.*

With respect to the potential of the IEC RE rating system, that will be touched upon later in the presentation of the policy scenarios.

## **Task 7. Policy scenario analysis**

*The Task 6 presentations were followed by a review of the input tables and modelling assumptions used in Task 7. It included the identification of stakeholders positions and the basis for each of the four main policy instruments. The policy options for each instrument were identified and defined. Then the members of the JRC team in charge of standards and transitional methods presented the tool proposed to calculate the PV system lifetime AC energy yield on which the energy label policy option 3.2 is based. Finally, the modelling results for the policy scenarios were presented.*

*Stakeholders were then invited to provide their initial feedback, and also to contact the study team in order to share any relevant information. The main comments raised were as follows:*

### **Policy analysis and scenario definition**

**Volta** remarked that in relation to the assumption about module area versus yield a push for self-consumption could reduce the module areas installed. The Commission should signal which direction it wishes to go.

**EEB** added that an efficiency of 14.7% is out of date. They also remarked that a label only for business to consumers would be limiting when retailers and commercial sectors have already the knowledge and interest.

**Solar Power Europe** remarked that they had concerns that the stock data was old and does not reflect the current evolution of the market. After 2022 a contraction is not plausible. Are the short term and long term forecasts aligned? There is not foreseen a stabilisation of the market by 2022.

**First Solar** stated that if a technology split is assumed, why is it that the CdTe and CIGS products remain flat in slide 46? They will provide alternative data based on projected increases in production capacity.

**Oeko Institut (representing ANEC/BEUC)** Considered that in the aspects presented there should be more options for design for recycling and PV system adaption to local circumstances. Information requirements could be a valuable way of doing this and could communicate how to make best use of products.

**Fraunhofer ISE** asked whether non-technical issues such as working conditions will still be considered since they are an advantage for EU manufacturing sites.

The **Norwegian SEC** asked about the feasibility to set information requirements on recyclability and the circular economy since it is important for the future. As well as design for recycling, hazardous substances should be addressed in Ecodesign.

**Athens University (on behalf of ECOS)** stated that the repairability of products should be more present. However it was noted that in the residential sector, inverters are replaced not repaired.

**VDE Renewables** commented that there are projects focussing on design for recycling of modules but that it is still too early, with solutions 1-2 years away. These should be mentioned in the revision of the documents.

**CEA-INES** asked that if primary energy results show that cadmium telluride is the BAT, would this technology be a recommendation from the Commission?

*The **Commission** responded that any requirements taken forward as a result of the study will be technology neutral. It clarified that the stock projections were a composite of short term data from the PV Market Alliance and medium to long term projections based on the EU Reference Scenario from 2016 and assumptions about the split of renewable technologies that may be used to meet 2050 targets. It is open to further input in order to refine the projections.*

### **Transitional methods**

**JRC C2** presented the initial proposals for a calculation method of the PV system's lifetime performance and AC energy yield taking into consideration different design options including orientation and inclination of the array and PV system configuration (PV system losses) in support of policy scenario 3.2. The methodology is implemented in a tool, which was also presented at the meeting. Some additional notes on the proposal are included in the Annex to these minutes.

**TUV Rheinland** questioned if it does make sense to classify modules per efficiency since they are sold per Wp. They pointed out that they operate a label based on an energy rating. How would the proposals take into account the development of bifacial modules?

**BSW** asked who would award the label. They expressed concern that an F rated system would still be contributing to tackling climate change. It is also the case that installers are already complaining about the administrative burden associated with making an installation.

**Exergy** considered that such a label could be a good thing. There are currently standards at local level. They asked how conformity would be ensured on site. It would not be right if installers did this themselves and if it was self-regulating.

**First Solar** considered that it would be a devastating signal to the market to restrict sub-optimally performing systems, particularly if this was because they were orientated east/west to increase self-consumption. We will need TWh of renewable electricity to be generated and the graphic suggesting a decline in yield in some policy scenarios (particularly the BAT) is not credible. The degradation rate assumed for some technologies is not accurate given that field data can now be provided to demonstrate the improvements (e.g. 0.5% for CdTe).

**BAM** considered that an Ecodesign requirement and Energy Labelling package based on % efficiency would be too simplistic and would hinder new technology development. For example organic cells are less efficient but much cheaper and suitable for mass production.

**Fronius** remarked that if Ecodesign is meant to reflect the worst performers then the proposals are already too strict. The IP rating for example should set be at 65. The smart monitoring requirements are too onerous for residential and commercial scale inverters.

**Solar Power Europe** asked what would happen if a component or system was produced for one zone was then used in another zone?

**Fraunhofer ISE** remarked that the types of tests identified as being linked to IEA Task 13 have not been validated by field data. There should be no restriction on combinations of modules and inverters, they should be treated separately. Care should be taken with any requirements on hazardous substances to avoid trade-offs – for example, in the case of substituting lead with bismuth. Information on system yield would be useful to clients but should not discourage some design configurations.

**ECOS** felt that there should be measures to encourage good installers and that smaller systems should be targeted. This could include addressing the qualifications of electricians. In regards to the repairability of inverters, it is not usually offered in the residential market. Instead they are usually replaced. More transparent data is needed for inverters. The performance in higher temperature operating conditions was cited as an example.

**EEB** considered that monitoring and smart metering should be supported and encouraged and that the data would benefit the consumer. In relation to this topic it was asked whether inverters are covered by the network standby regulation? Requirements for PV systems should not block installations. Instead,



issues on non-recyclability, products that are hard to repair should be addressed. The potential of the new repair scoring system was mentioned.

**Oeko Institut (representing ANEC/BEUC)** expressed a preference for systems installed to be adapted to local conditions rather than a proposed Energy Label discrimination. An information tool or requirement could be appropriate/proportionate.

**Borosil** mentioned that in the Italian market there is strong demand for modules to replace existing ones as part of systems (repowering).

The **Norway SEC** stated that information for Norway's consumers based on a system design in Spain would not be useful. A focus on energy yield would be useful, but not on Performance Ratio.

**Netherlands Enterprise Agency** emphasised that Ecodesign and Energy Labelling are relatively straightforward –as well as effective - policy measures. They clarified that Ecodesign requirements shall be set to reflect the product with the least life cycle cost and that in some cases this could cut off a substantial proportion of the market, if deemed appropriate. Requirements should always be technology neutral. Care should be taken with definitions of intended use, with cut-off thresholds better set in a generous way to ensure that all targeted products are captured. They also noted that there will be manufacturers that will seek to exploit any loopholes so care should be taken with any exemptions. If F and G are left in the label scale they should be marked in red. It could be conceivable to mandate a scale as an information requirement. For repairability requirements recent Regulations provide simple and relevant templates for the photovoltaic product group.

**Volta** asked what the relative influence of geographical location would be versus improvements from component selection.

**VDE** remarked that the system engineer may be constrained by the site and may not have much flexibility.

*The **Commission** responded that although climate has a strong influence there is significant potential to improve yield through component selection and site specific design. It noted that the legal feasibility to apply the Energy Label Regulation to photovoltaic systems is the subject of ongoing discussions. It was noted that there had been some issues with market surveillance of current package labels, as described more in detail in Task 7. It was clarified that a smart requirement for inverters is currently proposed in the Ecodesign policy scenario. More feedback was requested on appropriate features for the residential*

*market and on proportionate requirements to cut-off the worst performers. It is understood that inverters are not currently addressed by Standby Regulations.*

### **Task 7 results for the scenarios**

*JRC B5 presented the provisional modelling results for the policy scenarios based on implementation of requirements and criteria using the four different policy instruments under study.*

**First Solar** noted that the Green Electronics Council (GEC) in the USA is in the final stages of making an update of the PV leadership standard and that it will be adopted as an EPEAT type I ecolabel standard in January 2020. Reference was also made to the recent recognition given to EPEAT standards in the EU's GPP Toolkit for computers.

**BAM** questioned the reference made by the JRC to the uptake of the IEC 61215 standard by only 10-20% of the market. They share concerns about degradation that may result from LeTID and PID. These may be addressed by additions to this standard. A problem with the proposed approach is that a component change may trigger each time the need for retesting.

**Oeko-Institut for BEUC** raised concerns about the exclusion of BIPV from the scope. Such adjustments should be properly documented as part of the study.

**CEA-INES** asked whether the impact of mounting structures had been taken into account in the analysis or sensitivity of the results. These impacts, particularly for large ground mounted systems, may be relevant and should form part of any focus on system components.

**BSW** suggested that the system yield calculation tool would not be sophisticated enough to handle BIPV systems because of the complexity of modelling, for example, the temperature effects of different forms of integration.

### **Next steps and conclusions**

*The Chair thanked all the participants of the first day of the meeting for their fruitful contributions, and reminded stakeholders that they are invited to upload their written comments in BATIS by the 13<sup>th</sup> September 2019.*

*The slides and minutes from this meeting will be circulated as soon as possible.*

*It can be expected that the finalised study will be available around Q3/Q4 2019. The findings and the conclusions of the present study will inform the decision making process of the Commission; if any, further procedural steps for the envisaged legal tools could be expected around Q4 2019-Q1 2020.*

*The meeting closed at 16:30.*

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## Day 2, Thursday 11<sup>th</sup> July

### EU Ecolabel and GPP

*JRC B5 presented a summary of the background evaluation work for the EU Ecolabel carried out to date, which has been carried out with reference to the evaluation criteria used by DG Environment to decide on whether to develop criteria for new product groups.*

**EEB** remarked that the Commission should try and align the requirements and criteria so that the type of requirements, the measurement standards and the calculation methods are the same. This would make verification processes easier.

**First Solar** remarked that the list of reference standards and labels can be broadened. Reference was made to IEC 62474 as means of declaring against an inventory of substances that may be present in a product. This may be a better and easier way of establishing a requirement given the dynamic status of the REACH Candidate List.

**Wacker Chemie** considered that pollution caused by silicon tetrachloride was no longer an issue. There is less than a 5% loss. It is a valuable resource and the Chinese Government had taken action to address the original problem.

**Fraunhofer ISE** highlighted that based on their own recent analysis substituting lead with other metals such as bismuth created other environmental burdens when seen from an LCA perspective.

**EEB** emphasised the need for a complementary approach whereby, for example, if there were an Ecodesign criterion on WEEE and dismantling potential using standard tools then if there was a similar criteria in the EU Ecolabel this would include additional more challenging extraction requirements. The EU Ecolabel should also seek to extend Ecodesign requirements on reparability and CRM content.

**France** asked why the EU Ecolabel criteria should be limited to small installations – why should a 12 MW project not be able to obtain the label? The CRE competitive tender process was referred to as an exemplar.

**Netherlands Enterprise Agency** asked for clarity on the interaction between the policy instruments. It is clear that compared to the large market volumes targeted by Ecodesign, the EU Ecolabel and GPP and more specialist. Can we find what additional value they could bring? Good information should however be provided as standard.

**CEA-INES** felt that the scope was restrictive – what about crowd-funded plant, for example in a village?

**Netherlands Enterprise Agency** asked that the Commission be creative in setting the scope and requirements.

**Ecolabelling Denmark** asked about the inclusion of social issues in the EU Ecolabel criteria. They also noted that the scope should allow for the purchase of PV systems for apartment blocks by groups of citizens.

The **Belgian Ecolabel Competent Body** remarked that in other EU Ecolabel product groups the hazardous substance criteria had been a problem.

**Norway SEC** asked whether these derogations would need to be made visible to the consumer.

**Voltec** considered that limiting the scope to smaller installations was too strict.

*The Commission responded that from a legal perspective the target audience for the EU Ecolabel is consumers, hence the proposed focus on residential systems. The various examples of collective purchases initiated by consumers were noted and would be considered within the scope. The proposal to use IEC 62474 as part of the verification for the hazardous substance criterion had already been used on other product groups and could work here. Social issues are generally only considered for criteria if there are major concerns in the public eye relating to the product group. To date stakeholders had not provided any specific information to justify a criterion.*

*JRC B5 then went on to present a summary of the background evaluation work for EU GPP criteria carried out to date, which has been carried out with reference to the evaluation criteria used by DG Environment to decide on whether to develop criteria for new product groups.*

**Exergy** remarked that the use of CPN (Cost Priority Number) as the basis for the approach should be reconsidered. This is because the figures appear too small relative to the results obtained from a recent survey and analysis of 3.600 insurance claim cases. The scale of the losses caused by the CPN items appears to have been significantly underestimated. A request was also made to clarify use of the term EPC and what it stood for.

**Netherlands Enterprise Agency** remarked that the GPP criteria can be in another league – they can cover the complete process and would be closer to EPC arrangements. There should be a close link between the EU Ecolabel and the GPP criteria.

The **UK (BIES)** asked what the scope of the regulatory potential was. Could it be possible to set thresholds for how much solar energy households generated?

**First Solar** remarked that the criteria of the NSF 457 leadership standard for modules and inverters were identified based on LCA hot spots. In relation to the current EU GPP criteria for electricity it was asked how far it has been applied across the Union and how the uptake could be increased? The proposals for solar PV systems in the EU Taxonomy for investment were highlighted as being of relevance, with a target of 100g CO<sub>2</sub> equivalents/kWh for the life cycle performance of systems proposed in the current draft. The calculation method shall be based on the ISO LCA standard 14044.

The **Netherlands Enterprise Agency** remarked that Ecodesign requirements should also be LCA based but to date they had not generally been set in this way.

*The **Commission** clarified that EPC should stand for Engineering Procurement and Construction. Normally the EU Ecolabel criteria can be used to provide verification for GPP criteria and also establish the ambition level for the 'comprehensive' criteria. In regards to establishing requirements or thresholds for household energy generation or self-consumption this was not considered to be possible or appropriate. In regards to the NSF 457 standard whilst it is an important reference point the criteria are largely process-based whereas the EU Ecolabel is performance based whereas the GPP criteria can include some process based criteria. In regards to GPP electricity criteria the uptake has varied across the EU and it is important to note that the criteria are on hold because during the 2017 revision the conclusion was reached that because of their reliance on Guarantee of Origin certificates for verification the 2012 criteria set is ineffective because it does not stimulate additional investment. Alternative approaches that could be considered include Power Purchase Agreements (PPAs). The inclusion of a life cycle target and methodology in the proposed EU Taxonomy was noted and could be an important cross-reference if life cycle criteria are considered.*

***JRC B5** then went on to present a summary of the findings from the evaluation of the feasibility and need for EU Ecolabel criteria for the possible new product group.*

**Volta** remarked that they did not see the benefit of packaging together modules and inverters in the proposed way. It was also noted that often system designs are made based on the use of inverter manufacturers' software tools.

**Borosil** asked that antimony be added to the list of materials of concern.

**Fraunhofer ISE** asked that 'lead-free' be defined.

**Norway SEC** remarked that there are manufacturers that have already made LCAs but that there are not so many drivers for them to use these results to show compliance with requirements or criteria.

**BSW** asked about how the yield method would relate to Energy Performance of Building Directive (EPBD) requirements. For example a building facing north may incorporate BIPV. Reference was made to an energy efficiency guide for batteries that was under development. The System Performance Index (SPI) proposed as being used in Ecodesign is considered too complex because of the testing needs. All combinations would need to be tested. It would go too far for a labelling system.

**First Solar** asked that in the final report an analysis is provided as to how the hazardous substance content restrictions will be handled. For example, what is a sub-component? This is important given the dynamic nature of the legislative process. Moreover, single substances or materials should not be singled out. Reference was made to the NSF 457 criteria which have a mandatory requirement to have carried out an alternatives assessment.

**Cycleco** considered that introducing a carbon payback time would be important from a regulatory point of view.

*The Commission responded that if hazardous substance derogations are required for the product group then specific substances and materials would have to be identified. The derogations also tend to be set based on the results of alternatives assessments i.e. reflecting the lower hazard profile of the alternatives. Use of the term 'lead-free' would not be possible – instead a residual threshold would have to be set. In regards to the package approach it is not intended to dictate the combinations, rather that installers end up with a list of ecolabelled modules and inverters that they can choose from. In regards to energy or carbon payback time either could be considered. It was noted that there are broader drivers in the market for carrying out LCAs than just ecolabels, such as the CRE auction requirements and construction product EPDs, so the market potential for such criteria could be greater than the current estimation.*

**JRC B5** then went on to present a summary of the findings from the evaluation of the feasibility and need for EU GPP criteria for the possible new product group.

**Volta** expressed a concern that the proposed selection criteria might only promote companies with experience and leave out start up companies. Reference to Power Purchase Agreements (PPAs) could be a way forward as they create an economic driver to increase investment. It was considered that the importance of energy yield will diminish over time as we see mass deployment of solar PV and that by

2030/2050 issues such as hazardous substances and circularity will be much more important so, given the lifespan of systems, they need to be considered within requirements now.

**Cycleco** remarked that BIPV will be relevant to public buildings so it should be mentioned how it will fit into the criteria.

**Oeko Institut** remarked on the need to understand the relationships between each policy instrument. Ecodesign should include a focus on a minimum duration for products and their long term performance. There could also be a comprehensive Information Requirement on system design and the future potential for repairability and recyclability. The EU Ecolabel could play a supporting role to GPP and could provide added assurance to consumers over and above that which is not addressed in Ecodesign. GPP can potentially be powerful as an instrument influencing specific portions of the market.

**Solar Power Europe** noted that beyond the existing monitoring reference to the IEC 61724-1 standard they have published an Operation & Maintenance (O&M) best practice guidelines.

**Norway SEC** remarked that the potential for carbon neutrality should be reflected. They asked about the geopolitical position in relation to encouraging the purchase of EU product given almost exclusive references to imported products.

**CEA-INES** asked for clarity on what was the overall aim of the study. The voluntary instruments will only address a small part of the market. More attention will be needed on the technical assumptions behind Task 6.

**VOLTEC** remarked that it will be important to consider how to stimulate continuous innovation to address environmental impacts. The drive to innovate will stop once companies have met any criteria that are set. Also how can they differentiate EU products?

**Oeko Institut** asked that slides presented be uploaded in order to support preparation of stakeholder's comments.

**Borosil** asked how the advancements and innovation reflected by the mix of stakeholders present in the meeting will be reflected in the outcomes of the study.

**First Solar** raised a concern about the BAT case that is presented in Task 7 results and re-iterated that it should be removed because it would raise issues around the credibility of the results.

**Solar Power Europe** asked about the Tasks 8 and 9 that were mentioned in the presentation of the MEERP method in earlier meetings.



*The **Commission** clarified that allow it would be welcome any opportunity to support EU companies any requirements should be geographically neutral in terms of trade. The issue of not discouraging new companies with GPP selection criteria had been faced in other product groups and a balance had to be struck. The overall frame of the study and the nature of the policy instruments under study was briefly summarised again in terms of the possibility for mandatory and voluntary instruments and that it is to be determined on the basis of recommendations from the study as to which instruments may be taken forward by the Commission. Tasks 6 and 7 are the last tasks to be subject of stakeholder consultation and the final tasks referred to will be a compilation of Tasks 1-7 and policy recommendations going forward.*

### **Next steps and conclusions**

*The chair closed the meeting by thanking all the stakeholders present for their participation and reiterated that deadline of the 13<sup>th</sup> September 2019 for comments to be submitted via the BATIS consultation system. It can be expected that the finalised study will be available around Q3/Q4 2019. The findings and the conclusions of the present study will inform the decision making process of the Commission; if any, further procedural steps for the envisaged legal tools could be expected around Q4 2019-Q1 2020.*

## **Annex**

### **Notes from the 3<sup>rd</sup> stakeholder meeting regarding the comments related to the JRC C2's proposed tool to support defining an energy label rating for residential PV systems**

A calculation tool to support the proposal for an energy label based on the lifetime AC energy yield of a PV system was presented. The proposed tool (an Excel file) calculates the lifetime AC energy yield of a PV system, taking into consideration the PV module performance (according to the IEC EN 61853 standard), the inverter efficiency (based on the EN 50530) and the PV systems losses, for which default values are provided. However, the user can use different values. The method used also considers the degradation of the whole PV system and a correction factor to the DC output of the PV array due to the orientation and inclination.

In addition to the lifetime AC energy yield, the tool calculates the AC energy yield for the year of installation and provides a performance ratio for the PV module and inverter package, and for the PV system as a whole.

Although there appeared to be broad acceptance of the technical aspects of the proposed methodology, some comments were received regarding the following points:

- The total energy yield labelling approach would be biased towards high efficiency systems and give consumers a negative impression of less efficient systems, like not optimally oriented ones, that nevertheless have potential to produce significant low carbon electricity.
- It could add complexity for installers who could be (depending on the exact formulation of the potential measure) the legal entities responsible for affixing the labels.
- Market surveillance could be difficult to implement, in particular in the case of photovoltaic installations
- Criteria to quantify the different PV system losses should be further developed, when feasible. Possibility to include location/climate dependent losses, such as soiling.
- Besides the energy label for the PV system, it could be useful to have separate ones for the PV array and for the inverter.

- In addition to the energy yield, a performance ratio or a similar normalised variable could be considered as well. Normalising energy yield to the received irradiance or to the efficiency, for example.
- A sensitivity analysis of the effect on the energy yield and on the energy label proposal of the degradation of the PV system, orientation and inclination of the array, PV system losses or module and inverter type could be useful.

Draft version