2nd Stakeholder meeting for the Preparatory Study on sustainable product policy instruments for SOLAR PHOTOVOLTAIC MODULES, INVERTERS AND SYSTEMS

Wednesday 19th December 2018, 9.00 – 16.00
Room 2B
Albert Borschette Conference Centre, Rue Froissart 36, 1040 BRUSSELS

Draft minutes v5.0

Draft version

Agenda

09:00	Welcome and introduction Tour de table Update on the study (tasks, timing..)	(GROW) (GROW)
09:30	Task 4 – Technology review and analysis (1)	(JRC B5)
11:00	Coffee break	
11:15	Task 4 – Technology review and analysis (2) Task 5 – Base case definition, LCA/LCC results (pt 1)	(JRC B5) (JRC B5)
12:30	Lunch	
13:30	Task 5 – Base case definition, LCA/LCC results (pt 2) Task 5 - LCA literature review, non-LCA issues	(JRC B5) (JRC B5)
15:00	Draft transitional methods	(JRC C2)
16:00	Next steps	(GROW)
16:15	AOB and closing words	(GROW)
16:30	Close of meeting	

Draft version

Participant organisations list

Organisation
University of Bergamo
The Swedish Energy Agency
EuRIC
CEA-INES
PV CYCLE aisbl
AIE - EU electrical contractors association
Vaillant Group
Total SA
Interel
DG JRC
ECOS
Sungrow Deutschland GmbH
Fraunhofer ISE
imec
DSM Advanced Solar
Fronius International GmbH
Norwegian Water Resources and Energy Directorate
Danish Technological Institute
Gujarat Borosil Ltd.
VDE Renewables GmbH
ECOS/EEB
European Consumers Organisation
The Norwegian Water Resources and Energy Directorate (NVE)
European Copper Institute
DG ENER
DG GROW
Oeko-Institut on behalf of BEUC
VDMA
NorSun AS
TECNALIA
SolarPower Europe
Belgian Federal Public Service Health & Environment
Bundesanstalt für Materialforschung und –prüfung (BAM)
Volta
Wacker Chemie AG
Gujarat Borosil Ltd.
VITO/Energyville
First Solar GmbH

Draft version

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 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.

A recap of the tasks 1, 2 and 3 that were presented in the previous meeting in June 2018 was presented by JRC B5, together with a summary of the comments received and the resulting modifications to definitions of scope and functional units for modules, inverters and systems.

Task 4: Technical analysis including end-of-life

An overview of the Task 4 report on the technical description of the products was presented by JRC B5. It includes specific proposals for the product base cases, Best Available Technologies (BAT) and Best Not yet Available Technologies (BNAT) for all products in the study, i.e. PV modules, inverters and systems.

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 can be grouped as it follows:

PV module design options, BAT and BNAT definition

With particular reference to design option and assumption tables 4.2/4.3

CEA Ines asked why the silicon and thin film technology design option tables were not similar in terms of content and the parameters covered. The approach should be technology neutral. **First Solar** agreed that it would make more sense to make one consolidated table and to step back to a more technology neutral approach.

Oeko-Institut (representing ANEC/BEUC) queried the relationship between the improvement options and the BAT. They considered that lead-free modules should be considered as BAT.

Draft version

Wacker claimed that some of the silicon usage values are outdated (too high) in table 1. An average silicon use per wafer of 4g/W would be more representative based on manufacturers' published data. If there are future requirements on these numbers, it may imply that all manufacturers fulfil it. As a general note it was said that the main benefit of solar technology is the clean electricity generated, replacing fossil fuels. Therefore, no barriers should be put on solar photovoltaics.

The Federal institute of material research in Germany (BAM) asked the Commission to give more solid scientific references for the data on wafers grown using epitaxial techniques, rather that website URLs of the manufacturers.

ECOS pointed out the lack of clear differences between the BAT and design options.

ISE Fraunhofer stressed the importance to include data on lifetime and degradation in the BAT and BNAT design options. They also pointed out that life time in the functional unit definition of Task 1 was defined as 30 years. Lifetime assumptions require separate and careful analysis. They also considered that 30 years for the functional unit is realistic for some, but not all, technology options.

Borosil pointed out that glass and encapsulants play a big role in module longevity. e.g. if there is soda inside the glass that migrates out. Performance requirements are more demanding for bifacial technologies where the developments there should be captured somehow. For the recycling of solar glass the presence of antimony can be an issue because according to them, such glass cannot be recycled as antimony-free glass. Antimony is added to the solar glass for improving optical properties. However, according to them antimony can have toxic properties when leached into the environment and antimony-free glass with similar optical properties should be used. They claim to have such an alternative process without antimony. According to them this matter has to be resolved and they provided new background documentation. They cited recent discussions they had had with a Dutch recycler who had rejected batches of glass because of the antimony content. According to their figures, 3 million tonnes of solar PV glass is processed annually in Germany.. It was also noted that thin film products used float glass in which antimony is not present. Lead present in solder may be also an issue

First Solar reacted that glass coming from PV modules is not classified as hazardous waste. Glass cullet is sold directly to glass recyclers.

PV Cycle. 20 000 tonnes of module waste is currently collected in Europe. They were not aware of having received a single comment on antimony content in 8 years. It does not seem to have been an issue so far. Its presence does not necessarily trigger a classification of the waste glass as hazardous.

Draft version

In response to these comments, **the Commission** replied that the technical data for different PV module technologies could not be found with the same level of detail. Moreover, the reference year is for the study is 2016 and that the best performing products represent design improvements to this base case. Further feedback is welcomed in order to refine the performance and bill of material data. With regard to the technology neutral approach, it is a very important point to maintain the neutrality but there is also the need to map the market options for PV modules and this must be based on specific design options available in the market, which are different for crystalline silicon and thin film products.

About the differences between the BAT and BNAT design options, these are definitions from the MEErP (Methodology for the Evaluation of Energy related Products) methodology. Design options are not necessarily technology specific, they can be archetypes. **The Commission** agreed with the comment from **ISE Fraunhofer** and replied that this will be reflected in the modelling in Task 5.

For the issue of antimony content in glass, **the Commission** replied there is a need to understand from manufacturers the material choices and how these would influence the performance. Also, to investigate more possible recycling constraints and its relevance for EU Ecolabel if it is present at concentrations of >0.1% w/w. The references for wafer silicon usage will be updated. It will be possible to provide more scientific references for epitaxial growth wafers, especially since this is an area of longstanding research.

Inverter design options, BAT and BNAT definitions

With particular reference to design option and assumption tables 5/6/7 in Task 4.

Oeko-Institut (representing ANEC/BEUC) remarked that some of the technologies are not good or bad per se, but that it depends of circumstances: performance is application specific. How can this be considered in the MEErP modelling? They find there still to be a strong bias towards larger systems. Durability and reliability were considered more relevant for the smaller household systems, not for the well- monitored large installations.

The **EU Copper Institute** asked whether all the inverters to be defined as base cases are considered as transformerless.

ECOS noted that in general inverters are not resistant above 65^{o}C. Is this taken into account? The assumptions on micro inverter performance require further attention.

Draft version

Sungrow does not see micro-inverters as being relevant for all application fields. The failure rates quoted for single phase inverters was considered to be very high according to his understanding of the figures. In the market a figure of 2% is considered to be more representative.

Fronius asked about the definition of base case – what variety of products is included? An average is needed, but the actual situation is more complicated. In regards to micro-inverters, even in the residential market their usage is very narrow.

Tecnalia (correctly) understood that the 10% failure rate is a consequence of the 10 year the average life time. The actual rate is, in their view, lower.

The **Commission** responded that it acknowledges the need to define the system, scale and application field for associated inverters in a consistent way. Data that may warrant different treatment of inverters with transformers would be welcomed. Along the same lines, temperature dependency can be taken into account provided that there is data – see the later section on Transitional Methods. This is particularly important for the next generation BNAT technologies. The durability and reliability will be covered in the next section.

PV system design option, BAT and BNAT definition

With particular reference to design option and assumption tables 9/10/11 in Task 4.

Sungrow remarked about the size of the installations. A 100 kW inverter does not seem the appropriate scale. It should be 1.5 MW.

ISE Fraunhofer added that 2.5 kW was too small to be fully representative for residential scale. 50 kW is better than 20 kW for commercial.

First Solar made two comments. In regards to residential applications, are halogen free cables not a legal requirement? Optimised yield forecasting is standard practice. Such practices are utility scale should already be considered as BAT.

Tecnalia asked what is the source of the assumed performance ratio (PR) values? 0.75 seems too low.

European Copper Institute stated that power cables should form part of the considerations. How are they being considered?

Oeko Institut (representing ANEC/BEUC): They would be happy to see more accurate data for the small installations. 5% sounded like a low improvement potential.

Draft version

The **Commission** responded that a more distinct outlook on differences in possible installed quality between large scale and residential systems will be ensured. The scales and ratings can be adjusted if there is a good market rationale. At the moment they are aligned to categories reported on by the IEA PVPS and Solar Power Europe. The potential for improvements in residential scale systems will be modelled in Task 6. There is considered to still be margin to transfer the improvement options for large scale system, which seem already to be widely implemented, to small scale applications.

The PR scope for systems needs further defining and disaggregating – the assumptions underlying the defaults will be reported. Power cables are addressed within the transitional method proposals, but further information is needed on design options.

Task 5. Environmental and economic assessment of base cases

Task 4 presentation was followed by a review of the tables of input and modelling assumptions used in Task 5 and proposed for use in subsequent tasks 6 and 7. The provisional findings from first environmental and economic modelling of the 'base cases' was also presented, complemented by an LCA literature review and provisional check for relevance of additional non-LCA impacts.

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

LCA and LCC input and modelling assumptions

The Swedish Energy Agency asked whether location matters for inverters and modules?

NorSun asked about the place of production and upstream impacts.

VDE Renewables noted that module repair is not allowed. The CE marking certificates of the module are lost upon making a repair and when a repaired product is placed on the market again. Compliance is required with the IEC 61730 standard.

ECOS remarked that a 30 year module lifetime is not validated by current durability standards. The wafer thickness assumptions need adjusting. It ranges from 200 micron to 118 in other sources. The 5 kW for residential systems and 20 kW for commercial systems should be higher. The costs quoted are higher than today's. More stringent product testing is being used in the utility/large-scale market segment.

Wacker chemie asked whether module price indices had been used.

Draft version

First Solar asked whether the impacts of displaced emissions and environmental impacts associated with electricity generation could be included for information? They would be useful from a policy perspective.

Total thought there was no definition of a base case in Task 4 or 5. Does the base case implies that it is used for the impacts?

Oeko Institut (representing ANEC/BEUC) raised a concern that inclination and other conditions are fixed at optimized values. Is this representative of real conditions? Does it not make sense to replicate somehow more realistic conditions? It should also be considered how to capture the ability of a product to fit into a variety of application conditions.

CEA-INES remarked that the Energy Performance of Building Directive (EPBD) considers different locations. Could something similar be done?

The **Danish technological institute (**DTI) says the performance ratio seems low for the residential sector. Could it be explained in a footnote?

Fronius asked that the default Performance Ratios should be further explained and referenced.

The **Commission** remarked that the concept of a base case is defined in the MEErP methodology. It is an archetype, abstract, average technology representing the performance of average products on the market. Market data sources such as price indexes that are considered representative should be shared with the JRC.

A reference location and climate profile has been used so far for the modelling. For durability aspects the climate may also have to be considered. But catering for this can make the project very complex. For some energy labels the efficiency variance due to different climates has justified reporting on three climate profiles.

The use of optimised conditions is considered to be valid as comparability between products is the aim rather than local representativeness. In any case, this could be addressed by means of a sensitivity analysis.

The EU average electricity mix is used for operation and for production. The reference year, as already mentioned, is 2016, and as such, consistency will be sought when compiling data for the reference year, but this may not always be possible.

Draft version

Environmental and LCOE assessment results for the base cases

First Solar reiterated that at the first stakeholder meeting there was a commitment to benchmark the PEF pilot results with those of MEErP. This is not yet included.

ECOS asked whether the additional impact categories of material depletion (ADP) and nuclear waste would be included as they are not in MEErP. They also noted that transformers are still to be excluded from the scope. Could it be possible to use the results from the Ecodesign Preparatory Study on transformers?

Borosil noted that solar glass appeared not to have contributed to any of the impact categories related to hazardous emissions.

First Solar responded that they could not confirm whether solar glass had associated hazardous impacts in LCA. They emphasised however that glass waste is not classified as hazardous following on from the CENELEC work to define WEEE standards. The glass is sold to cullet producers.

Borosil moreover noted that thin film modules use float glass, which is different from that used to manufacture modules with crystalline silicon wafers.

PV Cycle supported First Solar's comments. They collect modules of mixed technologies and no comment has ever been made on antimony in glass. It is not hampering treatment of the waste.

LCA literature review and non-LCA findings

The presentation included a 'cross-check' of the results of the PEF pilot for solar PV and the base cases using MEErP. This will be released to stakeholders as a separate short paper.

First Solar emphasised that development of the PEF pilot was the result of a large effort by industry. They saw an issue with a lack of granularity of the MEErP results. How can the PEF results be used for policy making?

Oeko Institut (representing ANEC/BEUC) commented that they are worried about potential inconsistency in the basis for product policy, for instance if the PEF and MEErP results are used to inform separate instruments.

First Solar asked that, in relation to RoHS, to specify the exclusion related to professional installation of solar panels. It was emphasised that the REACH Candidate list now contains lead and cadmium. What definition of article is to be used?

Draft version

Wacker Chemie noted that silicon tetrachloride was an issue in China some years ago, but not today as it is fully converted back into the process. It is much too valuable not to be captured.The **Norwegian Water Resources and Energy Directorate (NVE)** requested to be included in the remit and scope of the study, and to include figures from the Norwegian market.

The **Commission** commented that it is likely that the MEErP will be reviewed horizontally on circular economy aspects next year. For Ecodesign MEErP is part of the well-established policy-making process, and is more geared to Least Life Cycle Cost calculation than purely LCA. An attempt could be done in making use of the conclusions of the PEF pilot on photovoltaic modules to the extent of deriving Ecodesign requirements, though it is preliminary judged as difficult, in particular because it could be expected that the PEF findings would not lead to requirements which are fully enforceable in the legal framework of Ecodesign regulations[1]. For ecolabel or GPP, the PEF pilot results will potentially be more useful, as the types of criteria are less constrained.

The definition of an article under REACH as concluded by the European Court of Justice is used, i.e. that subassemblies placed on the market as articles shall also be subject to the 0.1% screening threshold.

The main focus of the study is EU-28 with regard to data availability, and the understanding is that there is no legal basis to systematically include Norway market figures in the assessment. However, a practical approach would be to ensure thorough liaison with the Norwegian authorities and with stakeholders active in the Norwegian market.

Transitional methods

DG JRC C2 presented the initial proposals for standardisation and transitional methods, which build upon the standards review, published in May and a workshop held at the JRC in Ispra, Italy, on 31st October 2018. Methods were presented for modules, inverters and PV systems.

The **Swedish Energy Agency** supports installer labelling with geographic differentiation.

Volta was unsure about the possibility to include batteries in the study. They could not see how that would be possible as it would be dependent on the local grid conditions and their support schemes.

[1] As an example, the hotspot (identified under the PEF pilot study) for the impact 'acidification' is the 'Supply chain of electricity production'. It would be very challenging to derive an enforceable Ecodesign requirement on this, in particular given that it would imply the need of full traceability of data related to the production chain, to be inspected on the actual product (i.e. the photovoltaic module) at the moment of its placing on the market.

Draft version

ECOS wanted more clarity on the calculation of system losses and the link to the Performance Ratio. They wanted to ensure that it links to the best cases for residential. They also asked whether inverter temperature should be addressed, particularly for installations where they will be placed outside.

The **Norwegian Water Resources and Energy Directorate (NVE)** asked whether, in the module performance calculation, inclination could be optimized for different latitudes.

Borosil commented that 3 years ago they carried out some short term durability tests for degradation comparing glass from different manufacturers. These were carried out in a heat chamber. Some modules degraded 49%, others 17%. The results highlighted the importance of the encapsulant of the glass. The glass silica and soda content are critical.

ISE Fraunhofer considered that for outside exposure of modules and inverters there are some 'reasonable' approaches that could be considered. They asked whether we can expect any additional testing to complement the gaps in methods.

Oeko-Institut (representing ANEC-BEUC) asked how derate factors relate to energy yield. The MEErP study and the work on methods need better linking. Could industry best practices be referred to? They cited factory control methods as an example. Further consideration is needed as to how different system market segments and sizes will be reflected. Inverter performance at different temperatures is an issue.

VDE considered that degradation rates should be set at general values which could only be varied if additional test data could be provided. They asked that manufacturer's data, if provided, be anonymised.

The **Commission** noted that the setup of the PV system depends on the application. Battery performance aspects are to be dealt with in the battery Ecodesign Preparatory Study, which is ongoing.

In regards to modelling yield, a 20 degrees angle of incidence is the default foreseen in the IEC standard. The idea is to come up with a value that allows comparing systems in a controlled environment, but not to reproduce all climatic and installation possibilities in the EU.

For aspects of lifetime the question in general is how to move beyond prescribed values. This is difficult as Industry has not reached a consensus on relevant test methods and, moreover, they would need to be verifiable at market surveillance level. For some derate factors it is difficult to relate them to environments – for example, inverter temperature dependency may depend on how and where it is installed.

Draft version

Next steps and conclusions

The Chair thanked all the participants of the meeting for their fruitful contributions, and reminded stakeholders that they are invited to send their written comments to the study team by the 30th January 2019. The slides and minutes from this meeting will be circulated as soon as possible.

There will be separate webinars held to discuss possible criteria for the EU Ecolabel and Green Public Procurement in March. These webinars will be illustrative and will not have the same status as eventual EU Ecolabel Ad Hoc Working Group meetings to be held as part of a formal criteria development process. The product scope to be discussed will be the same as that already presented for the Preparatory Study. Stakeholders will be informed about the timing and will receive invitations as soon as the dates for the webinars are agreed.

The third Preparatory Study Stakeholder Meeting will most probably be held in June 2019 (place, date and timing to be confirmed, probably two days meeting). It will concentrate on draft findings of Tasks 6 and 7, including discussion on the findings from analysis of different policy scenarios.

The meeting closed at 16:30.

Draft version