MINUTES OF THE SECOND STAKEHOLDER MEETING

Project: *Development of standardization methods for eco-design and energy labelling of photovoltaic products.*

Date: 03/07/2025. Meeting starts at 10:00 am

Place: Brussels (CSIC premises) and online

To: Participants

Minute taker: CENER

Participants from the European Commission:
Pablo Vicente, CINEA
Maria Getsiou, DG RTD
Davide Polverini, DG GROW

Project Team:
CENER: Jaione Bengoechea and Ana Gracia (Minutes, Q&A organization, session control)
TÜV Rheinland Italia: Giorgio Bardizza
PTB: Stefan Riechelmann

Agenda:

The second stakeholder meeting of the project was conducted as hybrid meeting in Brussels. The meeting's minutes and presentation slides can now be accessed on the project's website https://ecodesign-pv-testing.eu/. Number of attendees is 40 between stakeholders following in person and online. After the meeting the list of participants is downloaded from Teams. List of the participants' organizations is shown in Annex 1.

1 WELCOME (CENER)
2 POLICY BACKGROUND & PROJECT OVERVIEW (DG GROW and CENER)
3 Q&A
4 ENERGY YIELD OF BIFACIAL PV MODULES (PTB and CENER)
5 Q&A
6 LONG-TERM PV PERFORMANCE DEGRADATION (TÜV)
7 Q&A
8 NEXT STEPS (CENER)
9 Q&A
10 CLOSURE (CENER)

Minutes:

1. **Welcome (by CENER, 10')**

CENER welcomes the attendees and defines the ground rules of the meeting.

Introduction of the Project Team and the European Commission´s representatives.

CENER reminds the audience that all the information about the first stakeholder meeting, which took place in April 2024, can be found on the project's website (minutes and slides).

The meeting is being recorded to better analyse the questions and comments received during the meeting. Only CENER can access the recording, which will be deleted once the minutes of the meeting are prepared and approved.

2. **Policy background and Project overview (by DG GROW and CENER, 20')**

DG GROW introduces the policy framework to this project, which includes the Ecodesign Directive and the Energy Labelling Regulation. In 2017 the European Commission (EC) launched a feasibility study for the application of those policy tools to PV products. The final draft documents of the Ecodesign and Energy Labelling measures for PV products (modules and inverters) are currently under final consultations inside the EC.

DG GROW highlights the exploratory nature of this project and how the conclusions and outcomes of this project, which ends on November 2026, are not expected to be implemented in the Ecodesign and Energy Label regulation being discussed at the EC level at present. However, they could be incorporated in future revisions and could be also considered in future standardisation requests launched by the EC to the European standardisation bodies in support of the said regulation.

CENER summarises briefly the project, which was presented in detail during the first stakeholder meeting. The project´s main aspects like objectives, duration or participants are presented again.

A summary of the consultation activities carried out so far is presented. These include the feedback received after the first stakeholder meeting and the online questionnaire launched after that meeting focused on the technical aspects of the project like the pre-selected PV technologies to consider in this project or the envisaged methodologies to develop both tasks of the project.

3. **Q&A Introduction (-).**

There are no questions.

4. **Energy Yield of Bifacial PV modules (by PTB and CENER, 35')**

This task aims at the calculation and testing of the energy yield of bifacial PV devices. The methodology that is being followed is presented.

The relationship between this task and the IEC 61853 Standard series is explained, including the ongoing IEC TC 82 WG 2 activities to develop the amendment to all four parts of the Standard

series. The work on Parts 2 and 3 is well advanced with new versions already developed and shared within IEC for revision. While the work on Parts 1 and 4 is at initial stages.

The testing activities of this task, carried out by PTB, are presented. These include mainly the power matrix (power output under different conditions of module temperature and in-plane irradiance), the spectral response (from both sides of the module), the angle of incidence parameter (from both sides of the module) and the thermal coefficients (u_0 and u_1). Additionally, the nominal power output at STC and the bifaciality are measured.

The new mounting configurations that will be considered in this study for bifacial modules are presented. In addition to the ground mounted free standing rack used in the current IEC Standard series (focused on monofacial devices), for bifacial modules three new configurations are proposed: the previous one but assuming albedo and irradiance reflected from the ground, a vertical East/West configuration (front side of the bifacial module facing East) and horizontal single axis tracking system where modules face East in the morning and West in the afternoon.

New reference climates will be developed for the three climates relevant for Europe from those defined in Part 4 (subtropical arid, temperate coastal and temperate continental). The new datasets will include front and rear in-plane irradiance for the four proposed mounting configurations.

The definite selection of bifacial modules to be tested is presented. This includes one heterojunction device, three TOPCon module types, one PERC frameless module and one interdigitated back contact module. The bifaciality measured ranges from 70% to 88%. The bifaciality of the IBC modules has been measured as 41%.

The status of the testing activities is presented. Measurements are expected to be finalized this summer.

The *Climate Specific Energy Rating* parameter (*CSER*, as defined in IEC 61853-3) adapted for bifacial devices has been estimated for the different bifacial modules tested for two different climates using preliminary new climatic datasets.

The following activities include the development of the new reference climatic datasets, the analysis of the effect of the illumination, front side only or bifacial illumination, on the determination of the temperature of the bifacial modules and the analysis of the bifaciality under low irradiance conditions.

5. Q&A Energy Yield of Bifacial PV modules (coordinated by CENER, 10')

- Question: TL from JRC.C2 thinks the fourth configuration (tracking system) may complicate the testing methodology. Furthermore, this configuration is mainly applied for large-utility scale systems (normally assessed by energy yield estimations for the place of installation), while Ecodesign is based on energy rating and it is mainly focused on small (residential) installations.

  – Answer: PTB agrees with this observation but reminds the audience that IEC applies to all modules regardless of their final application and that of the four proposed mounting configurations, it has to be decided yet whether or not all proposed configurations will be

considered for Ecodesign and Energy Label regulation. CENER explains that regulation will apply to any module sold in the European market, and that based on the results obtained from the different configurations, some may be removed if the performance of the devices does not differ much between the different configurations. PTB adds that results will be analysed in detail once the final new climatologies are available and used for the simulations. And regarding the concern about making the methodology more complex, CENER explains that the testing activities on the modules would not change and that the climatic datasets for this configuration will be provided, so the methodology will not become more complex. Therefore, the only impact for the user would be the need to repeat the simulations for this other configuration as well.

- Question: LT from TÜV Nord asks about the values shown in the results table.

  – Answer: PTB explains the values are the *Climatic Specific Energy Rating* parameter (*CSER*) according to IEC 61853 series and modified to relate to bifacial modules.

- Question: BY from the French Ministry of Energy asks how overseas European territories will be considered since regulation will be applicable there also, and whether specific testing would be required.

  – Answer: DG GROW explains that in order to consider these territories in the new climatologies, their relevance in terms of extension in the EU will be considered since regulation has to aim to be representative of most EU areas. PTB adds that the testing on the modules and the simulations would be the same for any climate. And DG GROW ends by highlighting again the exploratory nature of this project, which constitutes research work that could serve as preparation for future policies.

6. Long-term PV performance degradation rate (by TÜV, 35')

This task aims at the measurement and testing of the long-term degradation of the PV modules' performance. The methodology that is being followed is presented.

The bibliography review performed (Standards, Transitional method, Scientific publications and research projects) and the consultation activities with experts carried out are described.

Based on the information retrieved, the most relevant degradation modes are identified and the type of test to trigger them are defined. Furthermore, based on TÜV Rheinland´s data on degradation and power loss observed after the application of these tests on various technologies and module configurations, degradation modes are quantified.

Considering all this information the testing sequence is defined. It includes PID and Damp heat tests at three different temperatures, UVID and outdoor exposure at two different locations (Cologne and Pamplona). The first two tests will serve to define the activation energy to estimate the long-term behaviour of the PV modules.

The final selection of PV technologies to be tested is presented. Based on current market share and market share projections and considering the availability in the retail market, the selected modules include one heterojunction model (glass/backsheet), two PERC models (glass/backsheet), four TOPCon models (two glass/backsheet and two glass/glass) and one

interdigitated back contact model. The selection may be extended by another one heterojunction model (glass/glass).

The first results from the stabilization and first characterization phase are presented.

The next activities include the application of the testing sequence to all devices and the estimation of the activation energy.

7. Q&A Long-term PV performance degradation rate (coordinated by CENER, 10')

- Question: GB from Dow Silicones Belgium wonders if combined stress tests are foreseen in this project.

– Answer: TÜV acknowledges that this option was considered by the Project Team since combined stress tests could derive in different results compared to applying single tests. However, this option was excluded for practical reasons as it would complicate and extend the duration of the testing sequences even further. This could be a limitation of the study.

- Question: SW from TÜV Nord asks if UVID could be applied to the rear side also. For example, HJT modules tend to have a special treatment on the front side on the encapsulant material but as they may not have it on the rear side this could derive in a more severe impact.

– Answer: TÜV agrees that this is a very important issue which is currently under discussion at IEC level (UVID stress test) but for this project, UVID won't be applied on the rear side of the modules. Besides, for this task mainly monofacial modules will be tested.

- Question: SW from TÜV Nord wonders about the relevance of PID tests. Even though it is one of the most common failure modes, most inverters in the field have PID protections or anti-PID mechanisms. Therefore, PID may not be so relevant, but it could be interesting as a combined test.

– Answer: TÜV agrees that it could be the case in the field but based on the bibliography review performed and the Project Team's experience, PID still plays a main role and so it was included in the testing sequence.

- Question: CMH from SolarPower Europe would like to know more about the transitional method and the five-year monitoring period defined. She asks whether it could be possible to define the degradation rate by the value declared by the manufacturers, so based on warranty values, and whether this proposed testing sequence could be applied to new technologies.

– Answer: DG GROW clarifies that this proposal aims to improve the methodology defined in the transitional method, with the proposed testing sequence which should not exceed one year nor be too short.

– Answer: TÜV explains that the aim is the definition of a testing sequence whose results will then be used to estimate the long-term degradation rate. The objective of this task is not the definition of new degradation rate values for the various PV technologies. As

stressed during the first stakeholder meeting but not so much in today's meeting, this task does not aim to update the default degradation values included in the transitional method.

– Answer: TÜV explains that the defined testing sequence and methodology to extrapolate over the lifetime of the modules could be applied to any PV technology, including new technologies or thin-film modules, which unfortunately could not be included in our study.

8. Next steps (CENER, 5')

Stakeholders are invited to send their comments and feedback to the Project Team until August 3rd. Please send your comments to info@ecodesign-pv-testing.eu.

The next stakeholder meeting is scheduled for September 2026. The final results and the final report will be presented and discussed.

Project´s updates and possible new consultation activities will be announced to registered stakeholders.

9. Q&A final session (-)

There are no questions.

10. Closure (CENER, 5')

The minutes and the slides presented at today´s stakeholder meeting will be shortly available at the project´s website https://ecodesign-pv-testing.eu/documents/.

Meeting finishes at 12:10.

Annex 1: List of attendee organizations:

SolarPower Europe

Dow Silicones Belgium SRL

Biosphere Solar

TÜV Nord

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT)

The Netherlands Enterprise Agency

German Environment Agency (UBA)

French Ministry of Energy

Fraunhofer ISE

Scuola universitaria professionale della Svizzera italiana (SUPSI)

Embet

Holosolis

SESKO

Teknologisk Institut

REC Group

PV-plan

Trinasolar GmbH

First Solar

First Solar Recycling Gmbh

UL International Germany GmbH

HoloSolis

Bundesanstalt für Materialforschung und -prüfung (BAM)

Topten International

Alexander von Humboldt Fundation

Joint Research Centre C2 unit - ESTI