Supporting study on Photovoltaic products: ongoing work on potential Ecodesign and Energy Labelling measures

Stakeholders webinar

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DG GROW

JRC

European Commission

Project team – virtual ‘tour de table’

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- Be brief and concise and do not forget to introduce yourself before you ask questions.
- After speaking, please mute your line again and lower your hand.

Setting the scene

Davide POLVERINI – DG GROW

Agenda

- Background & meeting objectives
- The preparatory study for solar photovoltaic modules, inverters and systems
- Activities foreseen within the current study
- Walk through the policy recommendations for new requirements under Ecodesign and Energy Labelling Directives
- Concluding remarks and the next steps

Meeting objectives

- Inform stakeholders on the process and the planned activities on the potential regulatory measures for photovoltaic related-products and systems, in particular in regard to Ecodesign and Energy Labelling requirements.

- The objective of the meeting is **NOT** to discuss the preparatory study for solar photovoltaic modules, inverters and systems

The JRC study – scope

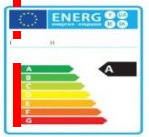
Modules, inverters and systems

In-depth analysis: market (residential, commercial, utility), technologies, performance measurement, life cycle cost and environmental impacts.

The JRC study – Q4 2017- Q4 '19

Concept: ONE research process for different policies

- ***Ecodesign minimum Requirements?***
- ***Energy Label classes?***
- ***Ecolabel criteria?***
- ***GPP criteria?***



The results: a policy mix with

Mandatory instruments + Green Public Procurement

Preparatory study – key outcomes

Nieves ESPINOSA– JRC SEVILLE

Main conclusions (1)

Product scope

- PV modules (BIPV excluded), inverters (hybrid included), systems (Residential, AC modules incl.)

Functional unit

- 1 kWh of electricity produced over 30 years

Market data and trends

- Stock built upon installed power plus projections from IEA
- Basis for the design options

Main conclusions (2)

Base case, BAT, BNAT

- Base case updated to 2020 with design improvements
- Close follow up on the BNAT

Policy scenario analysis

- Scenario modelling
- Policy recommendations

Policy instruments Summary

Policy Instrument	Stringency	Scope	Life cycle stage	Verification
Ecodesign	Mandatory	Products	Mandatory requirements can be set on tested use stage product performance, Information on material efficiency aspects can be requested	Market surveillance is carried out at member state level.
Energy label	Mandatory	Systems in residential sector	Energy Efficiency Index (EEI) shall address performance in the use stage.	Market surveillance is carried out at member state level.
EU Ecolabel	Voluntary	Can be products or services	Criteria can be set on any life cycle stage and can include manufacturing sites as well as tested product performance.	Member State Competent Bodies verify compliance evidence and award the label.
GPP	Voluntary	Can be products or services	Criteria can be set on any life cycle stage and can include manufacturing sites as well as tested product performance. The criteria must always link to the subject matter.	Verification is through evidence from tenderers provided during the procurement process.

Q&A

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Activities foreseen within the current study

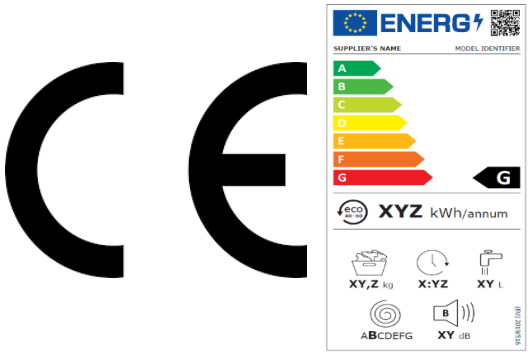
Nieves ESPINOSA – JRC SEVILLE

Ana GRACIA – JRC ISPRA

Objective & Deliverables

The objective (..) is to provide environmental, techno-economic analysis and scientific support for the policy-making process towards the development of implementing measures on solar photovoltaic modules, inverters and systems under the provisions of Directive 2009/125/EC and Regulation EU 2017/1369

- Techno environmental supporting study (B.5 Unit, JRC Sevilla)
- Support on technical and standardisation aspects (C.2. Unit, JRC Ispra)



Understanding of the market & related improvements

- Comparability needed in the market between claims relating to e.g. yield, degradation and life cycle energy impacts.
- Not all products on the market feature high quality and long-term energy performance.
- Ensure that designs are easier to repair and recycle.
- Not all solar inverters have a key role to play in the smart readiness of homes.
- Shift upwards the energy yield of photovoltaic systems through a combination of better design to take into account site-specific conditions, of learning applied to installation practices and of reduced losses due to equipment, cabling and maintenance practices.

Objectives of regulatory initiatives on environmental aspects

- Foster module and inverter designs that have improved long term energy yield, circularity and smart readiness.
- Take products off the market that are of a low quality and that have higher life cycle costs.
- Optimise and increase the energy yield of residential installations by enabling consumers to make an informed choice based on the performance of system designs offered by retailers and installers.
- Support the competitiveness of the PV industry through the expansion of the EU internal market for sustainable products.

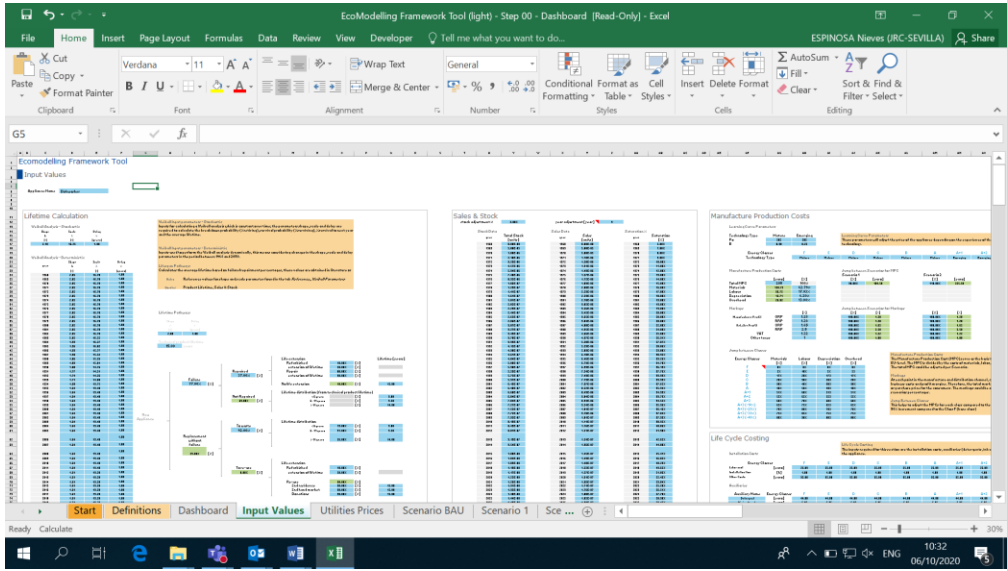
Modelling & data needs

- **Sales and stock data**

  Segmentation of technologies
  Lifetime calculation

- **Market data**

  Manufacturing costs
  Total life cycle costs
  Learning curves



Model developed by JRC and PRé sustainability

Q&A

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Support on technical and standardisation aspects

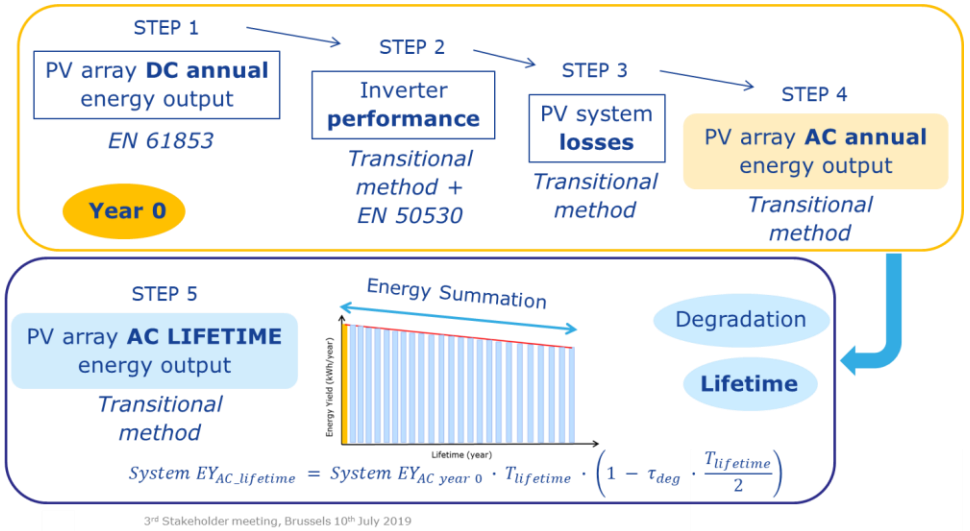
Ana GRACIA – JRC ISPRA

- Monitoring relevant standardisation activities
- Supporting the development of draft transitional methods
- Support in drafting of standardisation requests to relevant bodies

Metric/requirement	Standard	Transitional Method
Life cycle performance and yield		
Euro efficiency (Inverter)		
Energy yield (module)		
Energy yield (system)		
Design optimisation (system)		
Operation and maintenance (system)		
Long-term degradation (module)		
Life cycle GER and GWP		
Energy Return on Investment		
Smart readiness		
Material efficiency and circularity		
– Durability		
– Factory quality		
– Warranty		
– Reparability		
– Recyclability		
– Hazardous substances		
– Material content		

PV system lifetime energy yield

- Methodology proposed in the preparatory study
- Further development for Energy Label (energy efficiency index)
- Potential use of location-specific data



Q&A

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Potential Ecodesign and Energy Labelling requirements

Proposed measures for modules, inverters and systems

Mandatory instruments

Ecodesign
Energy Label

Metric/requirement	Eco-design	Energy Label
Life cycle performance and yield		
Euro efficiency (Inverter)	MR	As input data
Energy yield (module)	IR/MR	As input data
Energy yield (system)		EEI
Life cycle GER and GWP	IR	
Energy Return on Investment		
Smart readiness	MR	
Material efficiency and circularity		
Durability (IEC tests)	MR	
Factory quality (IECRE)		
Warranty		
Reparability	IR (MR?)	
Recyclability	IR (MR?)	
Hazardous substances	IR	
Material content	IR	

Key to acronyms used:

MR Minimum Requirement
IR Information Requirement
EEI Energy Efficiency Index

- Potential Ecodesign requirements for modules and inverters – energy related aspects
- Potential Ecodesign requirements for modules and inverters – material efficiency aspects
- Potential Energy Labelling scheme for PV systems

Potential measures for modules under Ecodesign

Requirements on lifetime electricity yield (2.1)

Performance aspect	Detailed proposed requirements
Preferred option: Module energy yield	The module energy output (yield) expressed in kWh/kWp and calculated according to IEC 61853-3 for each of the three reference EU climate zones shall be declared by the manufacturer.

- Information or quantitative requirement
- Input for the Energy Label calculation
- Losses due to intrinsic characteristics of the PV module
- Excel tool under review to incorporate different system sizes in the EL definition

Q&A

Please raise your hand or write "hand" in the chat

Potential measures for inverters under Ecodesign

Performance requirements on efficiency (2.3)

Performance aspect	Detailed proposed requirements
2.3.1 Euro Efficiency minimum requirement for PV inverters without storage	Require a minimum Euro efficiency at Tier 1 of 94% and Tier 2 at 96% measured according to EN 50530. *Allowances shall be provided for micro-inverters and hybrid inverters to offset for their other benefits.*
2.3.2 Euro Efficiency supporting information requirement	In addition the following supporting information shall be provided: - The efficiency values shall be presented in a tabulated form. - An annual temperature derating factor for the climate zones defined in IEC 61853-4 and calculated relative to 25°C
2.3.2 Efficiency requirements for PV inverters with possibility to connect storage or with integrated storage	Require a minimum system efficiency of 90% at 25% of nominal power, at minimum MPP voltage with the battery at around 50% state of charge. Measurement to be made according 'Effizienzleitfaden 2.0'.
2.3.3 Smart readiness	Manufacturers shall ensure that the inverter supports class C data monitoring according to IEC 61724-1. The inverter shall have physical and/or wireless connectivity and be capable of communicating with other devices using the Modbus data transfer protocol in accordance with IEC 61158..

- Mandatory requirement – minimum threshold
- Input for Energy Label calculation
- Excel calculation tool considers default/field data losses for different techs

Q&A

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Material efficiency requirements under Ecodesign

Performance requirements on quality, durability and circularity for **PV modules** (2.2) Part1

Performance aspect	**Detailed proposed requirements**
Performance requirements	
2.2.1 Durability product test sequency	Each model shall be certified to have passed the product test sequence required for qualification under IEC 61215. *This requirement could be further extended to require factory quality controls and auditing according to IEC TS 62941 and IECRE OD 405.*
Information requirements	
2.2.2 Lifetime performance degradation	The manufacturer shall declare the average linear degradation rate expected over a notional service lifetime of 30 years. This shall be the same rate that is used as the basis for the power warranty (if offered). The declaration shall be clearly identified as being either: – *Validated:* The manufacturer's claim shall be an average derived from a series of field observations made according to the Transitional Method, in regard to the number, geographical coverage and the time series. – *Unvalidated:* on the manufacturer shall report on the basis for their claimed rate with reference to accelerate life testing methods and modelling..

- Compulsory requirement
  Legal aspects:
  - *IEC 61215 testing requires 10 modules*
  - *Factory quality controls under Annex V (Management system for assessing conformity)*
- Only validated declarations on Degradation will be used in the Energy Labelling (otherwise, default values apply)

Material efficiency requirements under Ecodesign

Performance requirements on quality, durability and circularity for **PV modules** (2.2) Part2

2.2.3 Repairability	The manufacturer shall report on: – the possibility to access and replace the bypass diodes in the junction box [1], – the possibility to replace the whole junction box of the module *Note: the possibility exists to include semi-quantitative criterion if a product specific standard is developed in accordance with the forthcoming horizontal standard for repairability prEN 45554.*
2.2.4 Dismantleability	The manufacturers shall report on the potential to separate and recover the semi-conductor from the frame, glass, encapsulants and backsheet. Design measures to prevent breakage and enable a clean separation of the glass, contacts and internal layers during the operations shall be detailed. *Note: the possibility exists to include semi-quantitative criterion if a product specific standard is developed in accordance with the forthcoming horizontal standard for recyclability prEN 45555.*
2.2.5 Material disclosure	The manufacturer shall declare the content in grams of the following materials in the product: – Antimony – Cadmium – Gallium – Indium – Lead – Silicon metal – Silver – Tellurium For the encapsulant and backsheet the manufacturer shall also declare the type of polymers used (including if it is fluorinated or contains fluorinated additives) and the content in grams.

- Information/Compulsory requirements
  Legal aspect:
  - *Potentially based on the material efficiency requirements of 2019 ED Regulations*
- Complete the list of parts (repair)
- Include Aluminium in the substances declared

Q&A

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Material efficiency requirements under Ecodesign

Performance requirements on quality, durability and circularity for **inverters** (2.4)

Performance aspect	**Detailed proposed requirements**
2.4.1 Durability product test sequence	Each model shall be certified to have passed the product test sequence required for qualification under IEC 62093.clearly stating whether the product is for indoor or outdoor applications. *This requirement could be further extended to require factory quality controls and auditing according to IEC TS 63157 and the associated IECRE OD [pending a code].*
Additional information requirements	
2.4.2 Repairability requirements for inverters <30 kW	The manufacturer shall identify which of the circuit boards can be replaced on site.
2.4.3 Repairability requirements for inverters >30 kW	Manufacturers shall provide a preventative maintenance and replacement cycle. This shall include a list of parts that may be replaced and the timing of preventative measures to achieve a declared intended design technical lifetime (as required in IEC TS 63157). *Note: the possibility exists to include semi-quantitative criterion if a product specific standard is developed in accordance with the forthcoming horizontal standard for repairability prEN 45554.*
2.4.4 Material disclosure	The manufacturer shall declare the content in grams of the following materials in the product as a whole and in the replaceable circuit boards: - Lead - Cadmium - Silicon carbide - Silver - Indium - Gallium - Tantalum

- Capacity threshold of 30 kW (nominal power) to be reviewed
- List of repairable parts to be completed

Legal aspect:

- *Potentially based on the material efficiency requirements of 2019 Regulations*

Q&A

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Material efficiency requirements under Ecodesign

Ecological footprint for **PV modules** and **inverters** (2.5)

Performance aspect	Detailed proposed requirements
2.5.1 Life cycle GER and GWP product declaration	At the latest by [*delayed year of introduction*] and for a representative product from each module series placed on the market, an Environmental Product Declaration for, as a minimum, life cycle primary energy (GER) and Global Warming Potential (GWP) shall be developed and provided. *For further discussion: options are for the EPD to be in conformity with EN 15804 or the PEFCR and to have been registered with a Type III Product Category Rule operator.*

- Information requirement
  - e.g., energy mix
- Expand the scope of the analysis to other impact categories, e.g. freshwater ecotoxicity, resource depletion
- Methodologies/reference databases to be defined

Material efficiency requirements under Ecodesign

Initiatives	Description	Cut off criteria	Method
EU Member states PCR (Italy, France, Netherlands, Finland, Norway)	Databases and PCR for construction products/services where PV modules and inverters are part of for new and renovated buildings	n/a	EN 15804
European PEFCR Guide for PV modules	Guidance for calculating and reporting products' life cycle environmental impacts	n/a	PEF method
Italy's LCA legislation *Promotion of the Green Economy*	Legislation fully based on the Environmental Footprint methods. Voluntary "Made Green in Italy" label	No guidance	PEF method
France's public tenders for utility scale PV plats	Public tenders include carbon footprint requirements to prioritize projects with low-carbon manufacturing processes.	>1150 kgCO2eq/kWc (Nov 2020)	ADEME guidelines /ISO14040

Q&A

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Potential measures under Energy Labelling

System-yield based EEI (3.2)

Performance aspect	Detailed proposed requirements
3.2 System yield-based Energy Efficiency Index (EEI)	The system provider shall follow instructions for the calculation of the overall yield derived from the module yield and Performance Ratio for the system design. In addition the yield shall be calculated on the following basis according to the transitional method: – For a notional 30 year service life. – For the closest representative EU climate zone. – By applying the listed derate factors, together with prescribed (default) values, which will be provided in the Implementing Regulation. The EEI shall be expressed in units of MWh/kWp.m^2.
NOTE: the present analysis deals with techo-economic aspects. In parallel, a check is ongoing on the legal feasibility of an Energy labelling scheme for PV products/system, in the form of a delegated act in the framework of Regulation 2017/1369	

- Inputs from Ecodesign requirements
- Units of EEI under review

Legal aspects

Q&A

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Closing remarks & next steps

Davide POLVERINI – DG GROW

Thank you for your attention

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