



Standards for photovoltaic modules, power conversion equipment and systems

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**The European Commission's
science and knowledge service
Joint Research Centre**

Expert Meeting of the Preparatory Study to develop transitional methods for applying EU sustainable product policy instruments to solar photovoltaics, Brussels, October 31st 2018



PURPOSE

Support to the ongoing preparatory activities on the feasibility of applying the Ecodesign, EU Energy label, EU Ecolabel and Green Public Procurement (GPP) policy instruments to solar photovoltaic (PV) modules, inverters and PV systems.

1. Identify **functional parameters** for each product category
2. Identify, describe and compare **existing standards and new standards under development**, relevant to energy performance, reliability, degradation and lifetime.
3. Identify aspects not covered by existing standards, for which **transitional methods** may be needed.

Standardisation levels considered

1) Harmonised standard

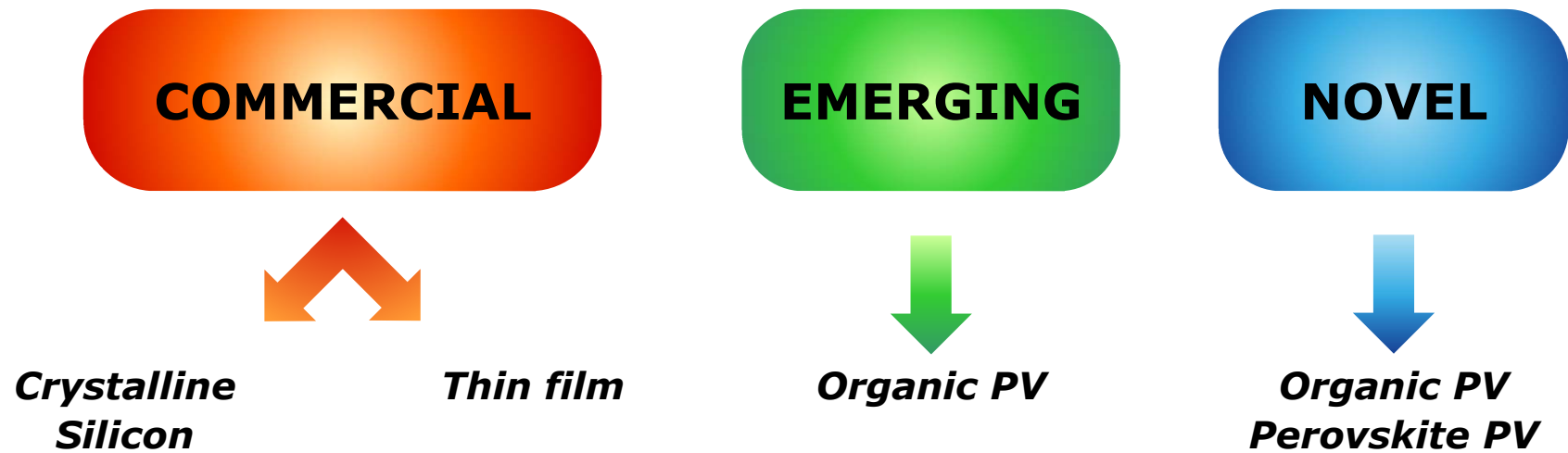
“European standard” that has been adopted by a recognised European Standardisation Organisation (i.e. CEN, CENELEC or ETSI) on the basis of a request made by the European Commission

2) CEN-CENELEC (EN)

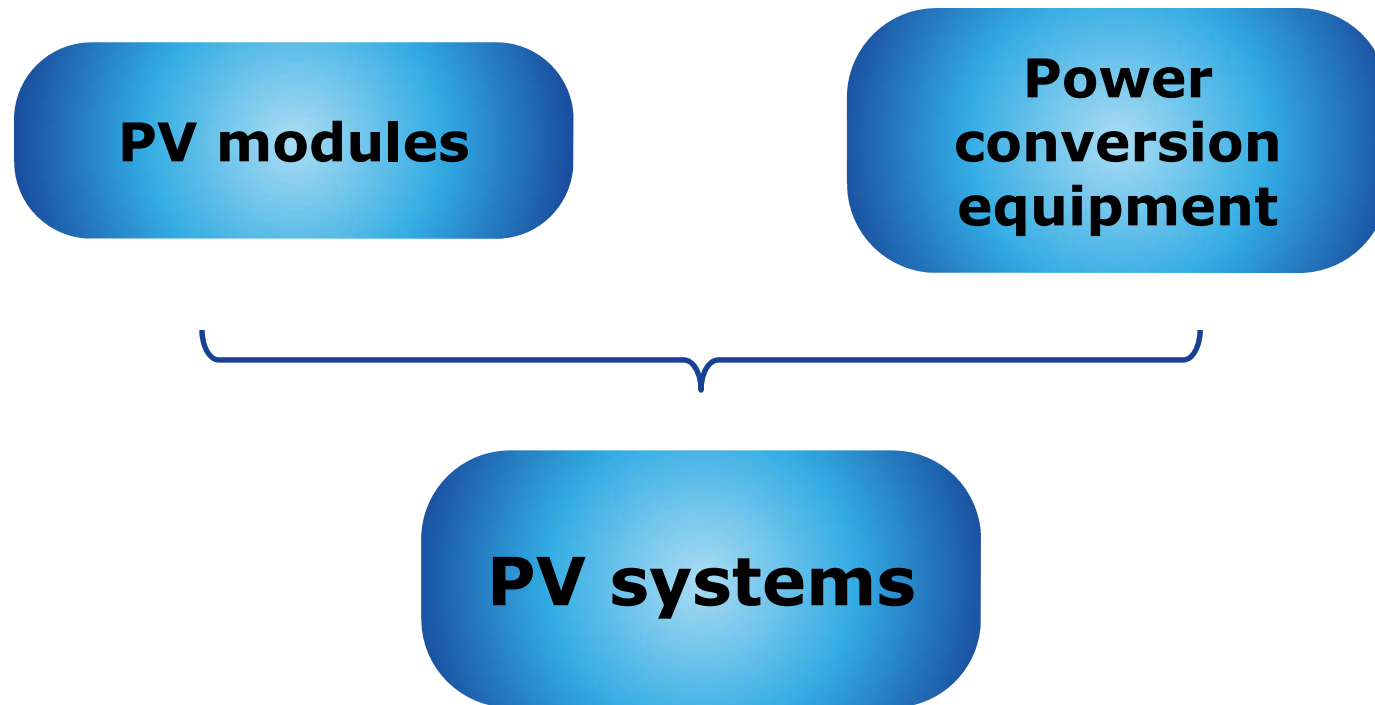
3) International Electrotechnical Commission (IEC)

4) International Organization for Standardization (ISO)

PV technologies



Product categories



PV Modules

Functional parameter	Standards
Module Energy Yield DC	EN 61853-1, EN 61853-2, (draft) EN IEC 61853-3, (draft) EN IEC 61853-4
Module Performance Ratio (MPR)	EN 61853-1, EN 61853-2, (draft) EN IEC 61853-3, (draft) EN IEC 61853-4
Maximum power at STC	EN 60904-1
Module Energy Conversion Efficiency	Possible next edition of IEC 60904-1 (under revision)
Module Degradation Rates	<i>Not defined by standards</i>
Module Operational Life	<i>Not defined by standards</i>

Proposal from preparatory study for Ecodesign:

1 kWh of DC power output under predefined climatic and installation conditions for 1 year and assuming an intended service life of 25 years.

Power conversion equipments (PCEs)

Functional parameter	Standards
Input range voltage, Grid range voltage, Start-up voltage, MPP voltage	IEC 62894 EN 50524 (withdrawn at present)
Inverter efficiency	IEC 61683
Inverter "European efficiency"	EN 50530 (withdrawn at present, new work item considered at CENELEC)

Proposal from preparatory study for Ecodesign:

1 kWh of AC power output from a reference photovoltaic system (excluding the efficiency of the inverter) under predefined climatic and installation conditions for 1 year and assuming a service life of 10 years.

PV Systems

Functional parameter	Standards
System Maximum power at STC	<i>Not existing, but it can be based on EN 60904-1, EN 61829</i>
System Energy output	<i>Not existing</i>
System Energy Yield	<i>Not existing</i>
System Performance Ratio (PR)	<i>EN 61724-1 (generic definition, not sufficient as it needs final Energy Yield as input)</i>
System Efficiency	<i>Not existing</i>

Proposal from preparatory study for Ecodesign:

1 kWh of AC power output supplied under fixed climatic conditions for 1 year (with reference to IEC 61853-4) and assuming a service life of 25 years.

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Transitional methods



Building Integrated PV Systems (BIPV)

Standard	Notes
EN 50583-1	PV modules used as construction products
EN 50583-2	PV systems integrated into buildings (structural aspects)
IEC 63092-1 (draft)	Based on EN 50583-1
IEC 63092-2 (draft)	Based on EN 50583-2
ISO 52000-1 and other parts	Energy Performance of Buildings
EN 15316-4-3	Method for calculation of system energy requirements and system efficiencies
prEN 50331-1 (draft)	Safety requirements for PV in buildings

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Transitional methods



Quality and degradation: EN 61215

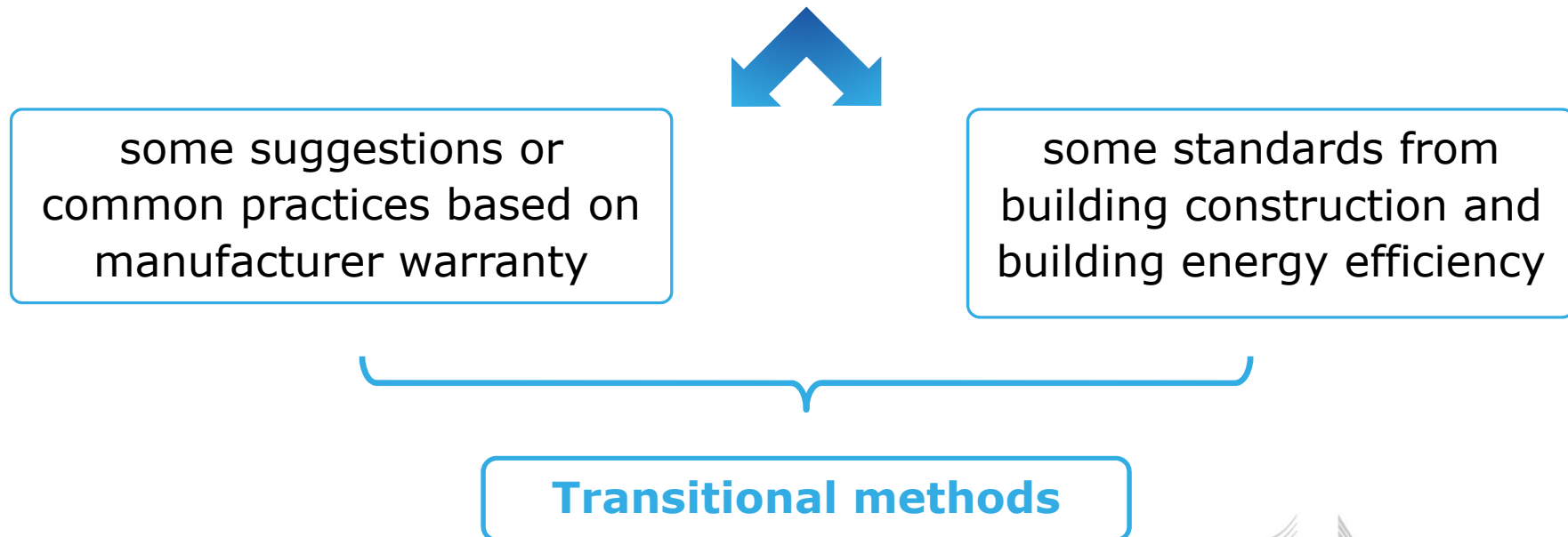
Standard	Subject covered
EN 61215-1	Design qualification and type approval - Part 1: Test requirements
EN 61215-2	Design qualification and type approval - Part 2: Test procedures
EN 61215-1-1 to -4	Specific requirement for each PV technology

Specific tests covered:

- *Thermal cycle test*, with temperature and electrical current as stressors;
- *Damp heat test*, combination of effects due to temperature and humidity;
- *Humidity freeze test*, on sealing materials and components;
- *UV test*, for polymeric components;
- *Static mechanical load test* simulates loads such as those by constant wind or homogeneous snow accumulation;
- *Hot spot test* linked to partial shading on modules;
- *Hail test*.

Operational service life and life cycle

Operational service life
of PV modules, PCEs or PV systems **not defined** yet



Conclusions

1) PV Modules

Standards available for the energy rating of PV modules in different climatic conditions, but degradation rate and operational lifetime need additional scientific and standardisation work (no specific standard at present).

2) Power conversion equipment

Standard available to define an overall efficiency according to a weighted combination of efficiencies.

3) PV systems

No standard available to predict the energy yield of a PV system:

- ✓ monitoring and measurement of already existing installations
- ✓ generic calculation for BIPV based on factors and data sets to be defined by the Member States.

Changes since 1st Stakeholder meeting

Some 25 comments were received specifically on the standards document (mainly issues with edition versions)

Answers have been drafted and correction additions to the report prepared

This will be distributed to all stakeholders before the 2nd Stakeholder meeting.