

Preparatory study for Solar PV modules,  
inverters and systems

# Webinar on options and feasibility for EU Ecolabel and Green Public Procurement (GPP) criteria

29<sup>th</sup> April 2019

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

# Introduction to the webinar

- 14:30 Welcome and introduction  
Update on the Preparatory Study (tasks, timing..)
- 14:50 Preliminary findings for the EU Ecolabel
- 15:15 Discussion with Q&A
- 15:45 Preliminary findings for Green Public Procurement (GPP)
- 16:00 Discussion with Q&A
- 16:25 Next steps

# Aim of the webinar

Preliminary evaluation of the **options and feasibility** of using two voluntary instruments EU Ecolabel and Green Public Procurement

Key discussion points:

- Whether the **scope/focus** should be different from the Ecodesign scope,
- Whether there is **a need for EU Ecolabel and/or GPP criteria\*** and what contribution they could make to **EU policy objectives**,
- **Possible criteria areas** and the feasibility of addressing identified LCA hot spots,
- The **scope of the public procurement routes and project stages** that could be addressed.

\*the justification for the need of EU Ecolabel and/or GPP criteria is linked, inter alia, to the study conclusions on the need of Ecodesign/Energy labelling measures (tbd on June 2019)

# Introduction to the Preparatory Study

## One policy development process: DGs GROW, ENER, ENV



JRC TECHNICAL REPORTS

Preparatory study for solar photovoltaic modules, inverters and systems

(Draft) Task 1 report:  
Product scope

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Bennett, Michael; JRC

June 2018



• Ecodesign minimum requirements



• Energy Label classes



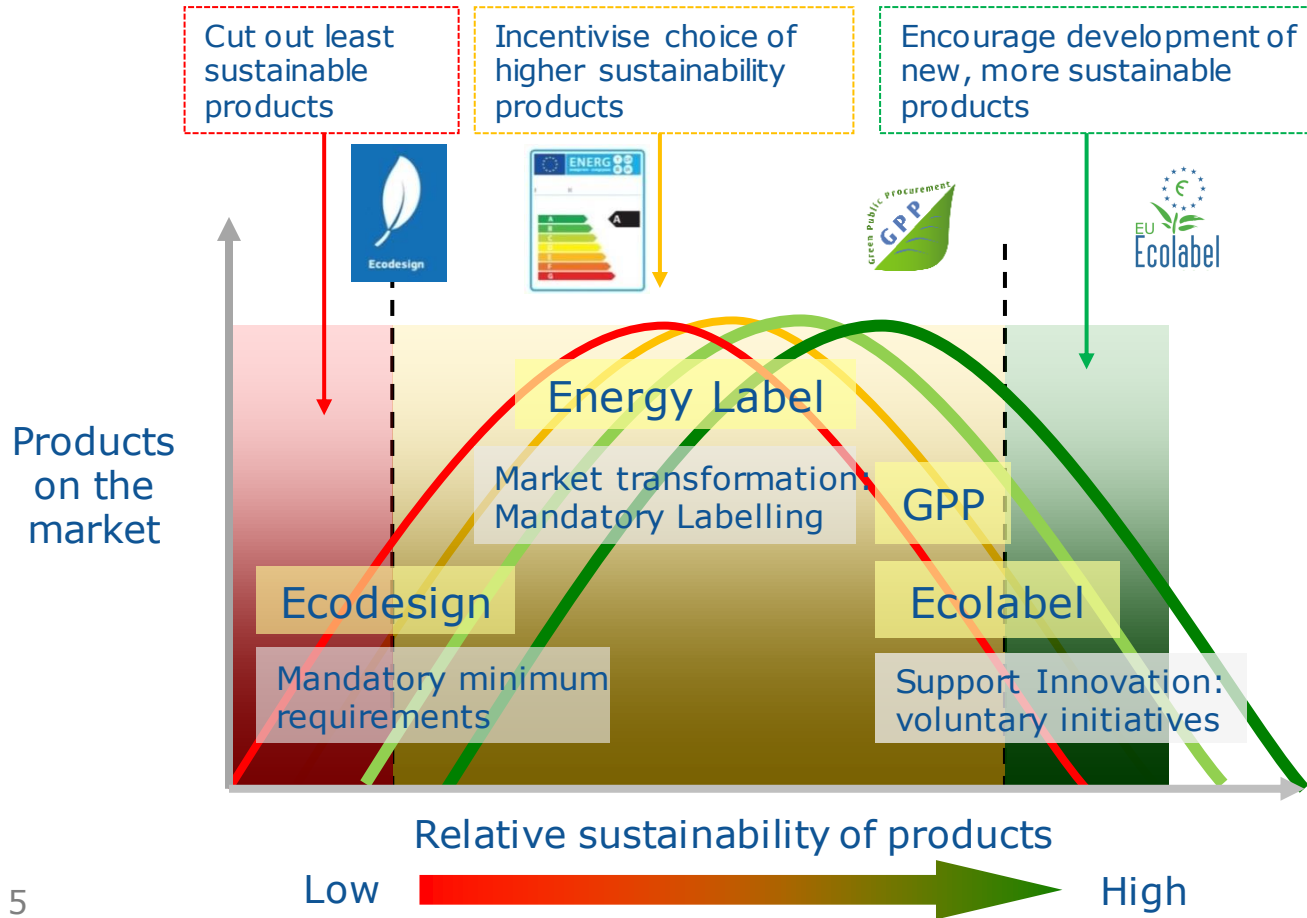
• Ecolabel criteria



• GPP criteria



# EU product policy instruments



# Study progress and outlook

1<sup>st</sup> stakeholder meeting, Brussels (29/06/2018)

- Scope and definitions, existing standards and legislation, market figures, user behaviour

PV experts, standards meeting in Ispra (31/10/2018)

- Development of transition methods

2<sup>nd</sup> stakeholder meeting, Brussels (19/12/2018)

- Techno-economic /environmental analysis: technological alternatives evaluation, hotspots analysis

3<sup>rd</sup> stakeholder meeting (June 2019) NEW!

- Identification and evaluation of potential policy options (Ecodesign, Energy Labelling, Ecolabel, GPP) for each of the 3 product groups (PV modules, inverters and systems)

# Study progress and outlook

- Comments on the background study for Ecolabel and GPP can be received through BATIS **until 17<sup>th</sup> May 2019**
- Updated background study will be circulated 4 weeks in advance of the next SH meeting **in June 2019**

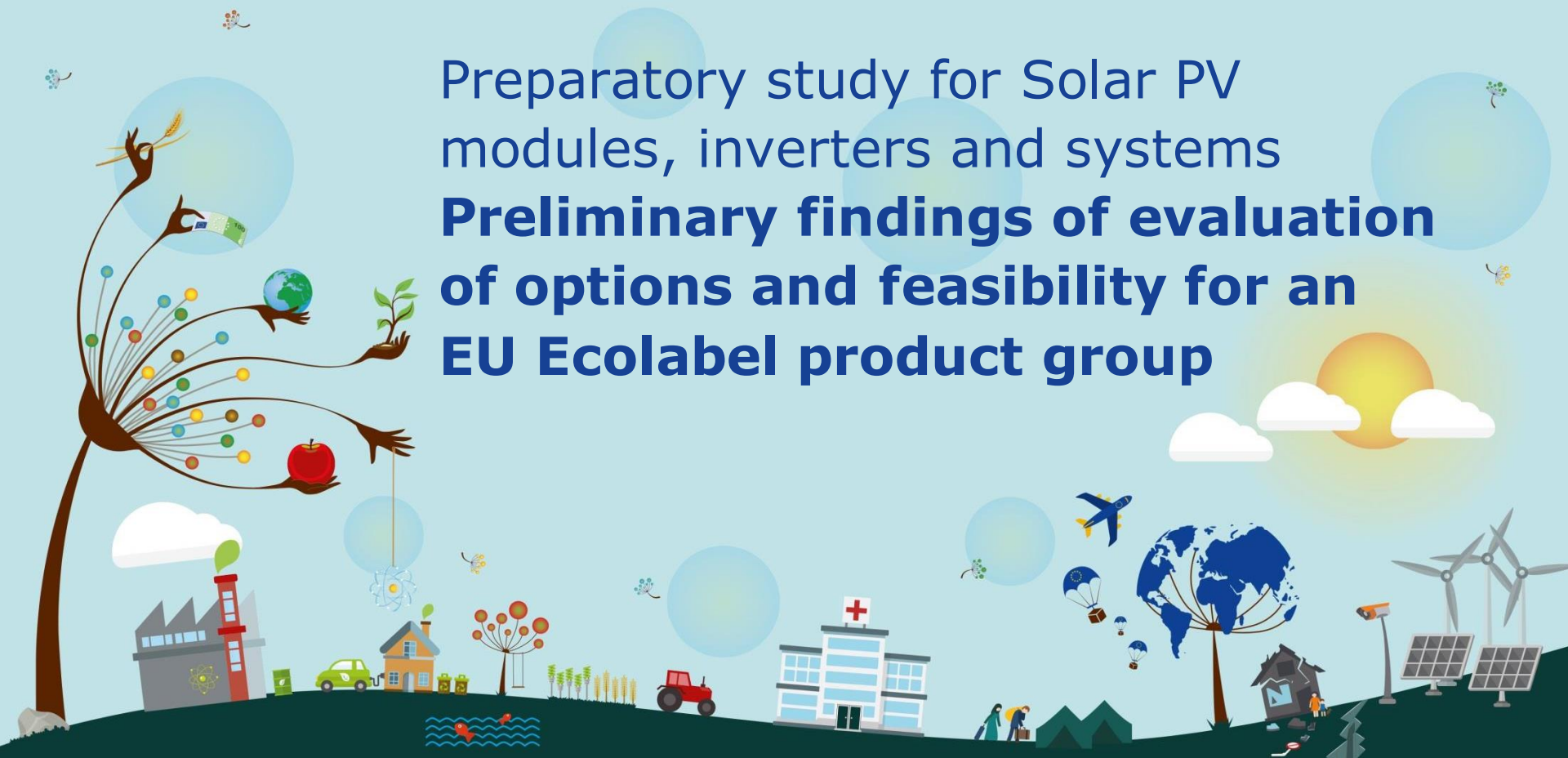
Please use **BATIS** to submit your comments

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Preparatory study for Solar PV  
modules, inverters and systems  
**Preliminary findings of evaluation  
of options and feasibility for an  
EU Ecolabel product group**



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# Ecolabel: market 'pull'

*'...promote products with a reduced environmental impact during their entire life cycle.... avoid the proliferation of environmental labelling schemes and to encourage higher environmental performance in all sectors for which environmental impact is a factor in consumer choice.'*

- *Regulation (EC) No 66/2010 on the EU Ecolabel*
- *Multi-criteria sets informed by LCA*
  - ✓ Shall indicatively reflect best 10-20% products on market
  - ✓ Aspects may include energy, chemicals, circularity, CSR
- *Identification of **front runner** product specifications*
- *Includes a focus (for products) on hazardous substances*



# Evaluation for new EU Ecolabel product groups

- **Feasibility of definition and scope:** Is it possible to clearly define and classify the product/sub-products as the basis for a criteria scope?
- **Existence of other ecolabels and schemes:** Is there an existing basis in the EU or internationally for product group criteria?
- **Market significance:** Could the Ecolabel criteria be effectively targeted at mainstream products identified from market data?
- **Visibility:** Would the product group provide a high level of consumer visibility for the ecolabel?
- **Potential uptake:** What existing indications are there of the potential?
- **Alignment with legislation and standards:** Could the Ecolabel make a positive contribution to specific EU environmental policy objectives?
- **Environmental impacts analysis;** Can practical, verifiable criteria be identified that address LCA hot spots and issues of significance?

# Module Scope

## *Proposed solar photovoltaic module definition and scope*

A photovoltaic module is a framed or unframed assembly of solar photovoltaic cells designed to generate DC power. A photovoltaic module consists of:

- → strings of photovoltaic cells (crystalline technology) and/or semiconductor layers (thin film technology);
- → a substrate, encapsulation and cover materials;
- → the interconnections of the cells;
- → the junction box and associated cabling, and
- → the framing material (where applicable).

The scope shall correspond to photovoltaic modules produced for use in photovoltaic systems for electricity generation. The scope shall include Building Integrated Photovoltaic (BIPV) modules that incorporate solar photovoltaic cells and form a construction product providing a function as defined in the European Construction Product Regulation CPR 305/2011. The scope shall include street furniture that incorporates solar photovoltaic cells, but it does not include street lighting equipment

Specifically excluded from this scope are:

- → Module level power electronics, containing micro-inverters and power optimisers
- → Modules with a DC output power of less than 50 Watts under Standard Test Conditions (STC);
- → Modules intended for mobile applications or integration into consumer electronic products.

# Inverter Scope

## *Proposed definition and scope of inverters for photovoltaic applications¶*

An inverter is as an electric energy converter that changes the direct electric current (DC) output from a solar photovoltaic array to single-phase or polyphase alternating current (AC). The scope shall correspond to: ¶

- → Utility interactive inverters that are designed to operate grid connected in stand-alone and parallel modes.¶
- → Inverters with a maximum circuit voltage of 1500 V DC and connections to systems not exceeding 1000 V AC. Hybrid inverters and micro-inverters sold separately are falling within this category.¶
- → String inverters falling within category 2 as defined in draft IEC 62093 ('String-level power electronics') and designed to interface multiple series or parallel connected modules and specified for wall, roof, ceiling or rack mounting. ¶
- → Central inverters falling within Category 3 as defined in IEC 62093 ('Large-scale power electronics') and designed to interface multiple series or parallel connected modules, but due to its complexity, size and weight are housed in a free-standing electrical enclosure.¶

Specifically excluded from this scope are:¶

- → Central inverters that are packaged with transformers (sometimes referred to as central solutions) as defined in Commission Regulation (EU) No 548/2014 on Ecodesign requirements for small, medium and large power transformers.¶

# System Scope

*Proposed solar photovoltaic system definition and scope¶*

A photovoltaic system is an assembly of components that produce and supply electricity based on photovoltaic conversion of solar energy. It comprises the following sub-systems: module array, switches, controls, meters, power conditioning equipment, PV array support structure, and electricity storage components. It also comprises cabling connecting these components.¶

Included in the scope of systems are therefore DC optimisers and module integrated inverters falling within category 1 as defined in IEC 62093 ('Module-level power electronics') and specified to operate at a PV module base level interfacing up to four modules.¶

The provision of energy generated by solar PV systems as a service shall be included within the scope for the purpose of public procurement.¶

Excluded from the scope are products which are only designed for the following specific applications:¶

- → For use only in street lighting, urban furniture, electric vehicles¶
- → PV integrated consumer and electronic products, i.e. power banks, watches, calculators, etc.¶
- → Systems in which there are modules with DC output power of less than 50 Watts under Standard Test Conditions (STC)¶
- → Substations and transformers for power conditioning. ¶

# Should the scope be different for EU Ecolabel?

## Possible considerations:

- Modules and inverters are largely B2B products
- Potential to label PV DIY (Do It Yourself) kits or system packages, with criteria on their main components?
  - Point in the supply to retail consumers at which the kit or package should be labelled would need to be clearly defined
  - Who would communicate any change in the composition of the kit or package over time?
- Potential to narrow PV system scope to focus on the sub-5kW residential scale?
  - the scale that retail consumers would look to purchase PV systems
  - Preparatory Study highlights potential to transfer best practices in design, O&M of large scale PV systems to smaller residential systems

# Possible contribution to EU policy objectives

Policy measure	Evaluation
Energy Union Framework Strategy and accompanying new Electricity market rules	<b>Moderate</b> for all products, or outside of the scope of this policy instrument
Renewable Energy Directive 2009/28/EC and the revised provisions	<b>Limited to moderate</b> role for all products – additional information and visibility for high performance products
Recast Energy Performance of Buildings Directive 2010/31/EU (EPBD) and 2018 update	<b>Limited to moderate</b> role in respect of building renovation and smart readiness
Construction Products Regulation (EU) No 305/2011	<b>Moderate</b> , in the case that module and inverter criteria on dismantling and durability are defined
Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)	<b>Moderate to strong</b> , in the case that module criteria are aligned with RoHS thresholds
Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE),	<b>Limited to moderate</b> , in the case of criteria on better design for recycling/depollution or a level of performance from take back/recovery
EU action plan for the Circular Economy	<b>Moderate to strong</b> , as an instrument to stimulate innovative design for repairability, recyclability and durability

# Existing voluntary labelling schemes

- ✓ **Blue Angel** ecolabel criteria set for inverters (2012)
  - Challenges faced establishing **module and system** criteria
- ✓ **NSF/ANSI 457** leadership standard for modules (2017)
- ✓ **Cradle to Cradle** certification awarded to module products (2016)

Only **Cradle to Cradle** has currently been awarded to PV products

- No specific PV product criteria
- General applicability to products
  - hazardous substances (safety to human health and environment)
  - production site energy use/GWP emissions
  - circular product design
  - social fairness



# Consumer perspective (1)

Drivers and motivations for those purchasing systems, as well their expectations of quality and performance.

Major consumer market testing exercises:

CLEAR project (2014), DG Justice (2017)

- Importance of financial savings relative to their current electricity source.
- Other factors?
  - Capital and running costs,
  - the payback time,
  - Aesthetics upon installation on their property
- Potential to reduce their environmental impact is an important, but secondary, driver

# Consumer perspective (2)

Important factor at the design stage:

estimation of a systems annual AC energy yield

- Entails an understanding of
  - a system's Performance Ratio, as defined in IEC 61724-1,
  - the annual solar irradiation for the location
  - Use of automated simulation tools and pre-defined packages of modules and inverters.
- Forms part of the quotation process for installers and retailers.

Other considerations?

Aesthetics, longer term maintenance, access for cleaning and repair/replacement

## Consumer perspective (3)

EU consumer organisations provide advice on the installation of PV systems, as well the purchase of modules and inverters.

- Own in-house performance testing and auditing of products
- Varying and sometimes non-standard methods and metrics
- Supporting checklists for contracting installers

### Test Achats (Belgium), Which? (UK)

- ✓ Audit PV manufacturers factory quality procedures and check production samples

### OCU (Spain)

- ✓ Field tests and rates PV module and inverter kits in comparison to manufacturers claims.

# Subsidy schemes: system and product tests

Qualification requirements impose requirements on all equipment, suppliers and contractors used.

- **Belgium & UK:** Compliance with EN 61215 and EN 61464, plus IEC 61730 where incorporated onto a building
- **Italy:** Performance Ratio (PR) of systems field tested in accordance with EN 61724.
  - PR >0.78 where inverter ratings <20kW
  - >0.80 where inverter ratings >20 kW
- **France:** Durability of mounting system, waterproofing of main components and halogen content of cables

# Technical analysis

	<b>Base case - 2016</b>	<b>Best Available Technology (BAT):</b>	<b>Best Not Yet Available Tech. (BNAT)</b>
Modules	Multi Si module based on back contact (BSF)	CIGS & CdTe PERC/PERT, back contact, heterojunction, bifacial crystalline	Lift-off or epitaxial growth Tandem crystalline perovskite
Inverters	R: 1 string inverter C: 3 string inverter U: central inverter	Micro-inverters Long lifetime and repairable inverters (20 y+)	MOSFET based inverters
Systems	R: BSF + 1 string C: BSF + 3 string U: BSF + central	Transfer optimised performance practices from utility scale to residential and commercial	-

# LCA literature and hot spot analysis

4 broad categories of potential identified:

- Those that have a metric and standardised method(s) but for which establishing a benchmark will be difficult e.g. module efficiency (product), and life cycle GWP emissions (supply chain)
- Those that have a metric but no standardised method(s) has yet been identified e.g. silver content of a module or the semiconductor recovery rate
- Those that don't have a clear metric nor the basis for performance benchmarks, e.g. glass thickness for an specific grade
- Those for which an initial benchmark can be identified, e.g. degradation rate

# Hot spot analysis

## MODULES

- For Si-based: ingot manufacturing or wafer production
- For thin-film, metal deposition together with flat glass production

## INVERTERS

Integrated circuit of the printed circuit board

## SYSTEMS

- The electricity demand in the supply chain of aluminium and copper production for the mounting structure and cabling
- The balance of system in thin-film installations

# Hot spot analysis – criteria potential

## MODULES

- 1) Use of less energy intensive manufacturing processes,
  - 2) Silicon ingot slicing, e.g. change of laser cutting, lift-off, kerfless (epitaxial), diamond wire sawing for multicrystalline
- Verification: Primary energy and GHG emissions reporting, e.g. ISO 14064, 50001 Energy Management System
  - Precedents: NSF 457 (7.1.1 required criteria)

## INVERTERS

- 1) Avoiding toxic elements, eg. Cd, Hg, Be, As, Pb, Cr
  - 2) Lead-free soldering techniques
- Verification: Declaration of content of substances from a list of targeted substances, or of no Pb content, or of protocols for the disassembly and recycling



# Hot spot analysis

## INVERTERS

- Precedents: Ecodesign regulations for WMs/DWs/fridges/TVs/servers and WEEE directive (PCBs > 10 cm<sup>2</sup>)

## SYSTEMS

Use of lighter structures or more sustainable materials, by e.g. having dual junction box design

- Verification: hardly feasible to capture in criteria. Integrated modules? how to credit the integration?
  - 1) Declaration of cabling material
  - 2) GHG emissions reporting standard production specific , e.g. 14064
- Precedents: None

# Sensitivities to take into account

- **Factory quality**  
e.g. procedures to minimise micro-cracks in modules
- **Product lifetime**  
e.g. estimated technical lifetime and repairability of inverters
- **Product efficiency and yield**  
e.g. kWh yield/Wp under standard climatic conditions (IEC 61853-3)

## Implications?

Hot spot derived criteria can be combined with criteria on quality, lifetime and yield in order to maximise improvement potential whilst avoiding trade-offs e.g. production PE + lifetime yield PE

# Other environmental impacts

## Hazardous substances in solar photovoltaic products

Ecolabel Regulation (EC) 66/2010 contains in Article 6(6) and 6(7) require that ecolabelled products do not contain hazardous substances

- **REACH Candidate List substances** (0.10% screening)
  - Five phthalates, cadmium sulphide, lead
- **CLP hazard classification** (0.10% screening)
  - *See the following slide*
- **RoHS Regulation**
  - Specific exclusion for modules
  - Manufacturer claims: absence/compliance for Cd, Pb, phthalates

# Non LCA environmental impacts

## Hazardous substances in solar photovoltaic products

- **Substances meeting criteria for CLP classification**

<b>Substance</b>	<b>Use</b>	<b>Alternatives</b>	<b>Information gaps</b>
<b>Plastizicers</b>	<ul style="list-style-type: none"><li>• Cable sheathing</li><li>• Module encapsulation</li></ul>	<ul style="list-style-type: none"><li>• Phtalate free plastizisers e.g. TOM, DOTP)</li><li>• Cable sheating materials (e.g. TPE, EVA)</li></ul>	<ul style="list-style-type: none"><li>• Extent of use of the Alternatives?</li></ul>
<b>Flame retardants</b>	<ul style="list-style-type: none"><li>• Polymer back sheet material for fire protection</li><li>• Cable sheathing</li></ul>	<ul style="list-style-type: none"><li>• Fluoropolymers</li><li>• Thicker materials, e.g. PET</li><li>• Metal phosphinates with TPEs</li></ul>	<ul style="list-style-type: none"><li>• Use in junction boxes and electronic components in inverters?</li><li>• Suitability of inorganic alternatives?</li></ul>
<b>Dirt repellents</b>	<ul style="list-style-type: none"><li>• Module glass</li></ul>	<ul style="list-style-type: none"><li>• Morphological texturing of glass</li></ul>	<ul style="list-style-type: none"><li>• Alternatives?</li><li>• Migration of existing coatings ?</li></ul>

# Non LCA environmental impacts

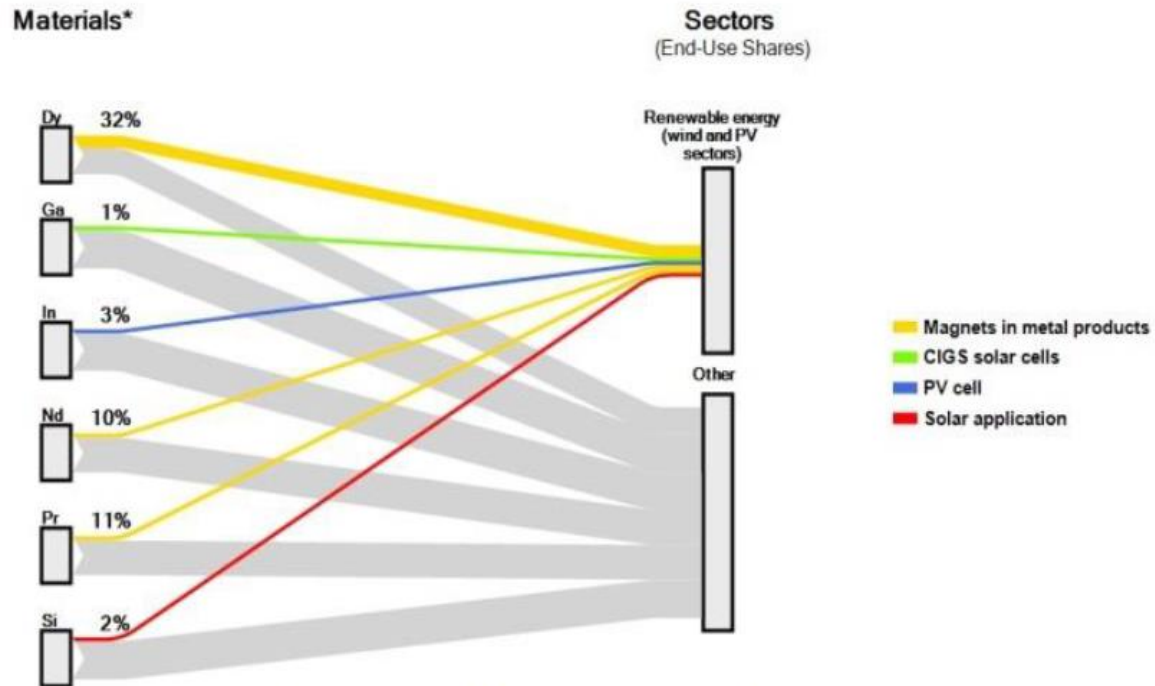
## Hazardous substances in manufacturing processes

- High GWP (Global Warming Potential) gas emissions not significant
  - Use of  $\text{CF}_4$ ,  $\text{C}_2\text{F}_6$ ,  $\text{SF}_6$  and or  $\text{NF}_3$  for edge isolation and reactor cleaning
  - NSF 457 requirement on avoidance or reduction of high global warming potential gas emissions
- Exposure to silicon tetrachloride by-product
  - Production of silane and trichlorosilane
  - Economic impetus to recover as by-product, e.g. polysilicon and fibre optics

# Non LCA environmental impacts

## Use of Critical Raw Materials

- **Indium (CIGS)**
- **Gallium (CIGS, tandem)**
- **Silicon metal**
- Antimony (glass)
- Cobalt (batteries)
- Tantalum (inverters and MLPE)



\* Only a subset of all CRMs used in renewable energy sector is included.

# Possible criteria areas (1)

- Life cycle primary energy/GWP
  - 1) Reporting the life cycle energy, ISO 14064
  - 2) Acting on individual components, e.g. kWh/wafer threshold
  - 3) Life cycle performance, e.g. EPBT
- Circular economy/Material efficiency
  - 1) Ease of dismantling flat glass
  - 2) Reduction of semiconductor materials content
  - 3) Recycled content of materials of concern, e.g. Cd, In, Ga, Te
- Lifetime
  - 1) Declared degradation rate
  - 2) Number of years at 80% initial performance
- Hazardous substances  
Content limitation in lead, cadmium and phthalates

## Possible criteria areas (2)

To be validated by further modelling and supported evidence in the Ecodesign Preparatory Study

- Circular economy/Material efficiency
  - 1) Design for repairability and recycling in inverter products, e.g. by stating the repair cycle
  - 2) Design for recycling of PV modules, providing protocol




# Summary findings of the evaluation

Evaluation criteria	Finding	Discussion points
Feasibility of definition and scope	Yes	Possible focus on kits/packages for residential systems (<5-10 kW) but point of award would need clarification
Existence of other ecolabels and schemes	Yes	Three standards/labels have criteria that could be reflected in an EU Ecolabel criteria but only one has been awarded to a PV products
Market significance	Unclear	No specific products that would achieve all of the identified improvement potential. A points system could allow for flexibility in award.
Visibility	Positive	A high profile green product but in reality the degree of visibility for the EU Ecolabel may depend on the point of sale for the PV system or components
Potential uptake	Positive	Industry consortium proposal for PV modules. Suggests potential verifiers and some manufacturers interested/ready to bring products forward for labelling.
Alignment with legislation and standards	Positive	Moderate>strong contributing role in implementation of some of the main objectives of energy, construction, electrical equipment and circular economy
Environmental impacts analysis	Variable	Lack of performance metrics, performance benchmarks and/or standardised methods for several of the possible criteria areas

# Issues for discussion

- Proposed focus on residential kits/packages (<5-10 kW)
  - *To whom would the ecolabel be awarded?*
- Existing criteria of relevant ecolabels and schemes
  - *Are there enough products in the market able to meet such criteria?*
- Setting EU Ecolabel criteria that address environmental hot spots
  - General problem: lack of performance metrics, performance benchmarks and/or standardised methods
  - *Is a label feasible at this point in time?*

# Discussion with Q&A



Preparatory study for Solar PV  
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of options and feasibility for Green  
Public Procurement (GPP) criteria**



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# Green Public Procurement: market 'pull'

*'... a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured.'*

- *COM(2008) 400 Public procurement for a better environment*

*Multi-criteria sets informed by LCA and LCC evidence*

- ✓ Core: minimum additional verification or cost increases
  - ✓ Comprehensive: additional verification or slight cost increase (EU Ecolabel)
  - ✓ Criteria: Selection, Technical Specification, Award and Contract Performance
- *Accordance with the Procurement Directive 2014/24/EU*

# Types of GPP criteria

**Selection criteria (SC)** assess the suitability of an economic operator to carry out a contract

**Technical specifications (TS)**, the required characteristics of a product or a service including requirements relevant to the product at any stage of the life cycle of the supply or service and conformity assessment procedures;

**Award criteria (AC)**, qualitative criteria with a weighted scoring which are chosen to determine the most economically advantageous tender

**Contract performance clauses (CPC)**, special conditions laid down that relate to the performance of a contract and how it shall be carried out and monitored

# Evaluation for new EU GPP product groups

Step 1: Contribution to objectives

Step 2: Determine the added value of GPP to existing policy instruments

Step 3: Determine if GPP is the most effective instrument to achieve the objectives

Step 4: Determine the best form of GPP implementation

# Contribution to EU policy objectives

- A more active role on the part of public authorities
  - ✓ Increased deployment of solar energy (Renewable Energy Directive)
  - ✓ Decarbonising of the existing building stock (Energy Performance of Buildings Directive)
  - ✓ Citizen engagement via reverse auctions (the Energy Union Framework Strategy)
- Ensuring that for any given geographical location the energy yield is maximised and the energy payback time and LCOE is minimised
- Reduction in the presence of hazardous substances in electrical equipment (RoHS Directive 2011/65/EU)
- Promotion of more repairable, durable and recyclable products (EU Action Plan for a Circular Economy)



# Potential contribution to GPP objectives

## Life Cycle Cost (LCOE) perspective

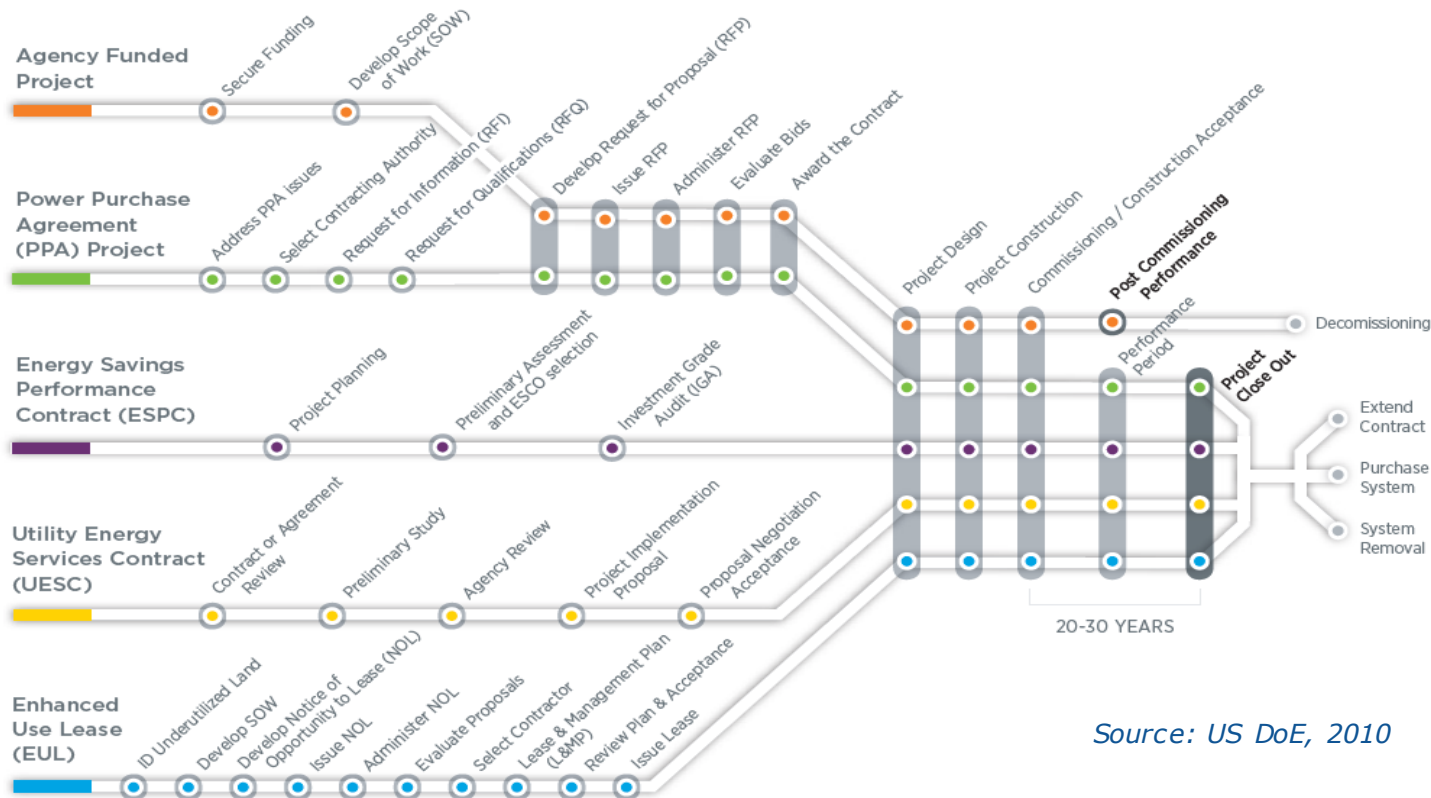
- ✓ Contribute towards **achievement of grid parity**: promote best practices in design optimisation and component selection.
- ✓ **Stimulate innovation** in module and inverter design as well as system solutions e.g. smart monitoring.

# Existing public procurement practices

Initial evidence from a [search of tenders published in OJEU](#) and example calls for tender and contracts.

- [Award of points](#) and establishment of [performance clauses](#) on the basis of:
  - AC output power,
  - warranty length,
  - failure response services and
  - availability of spare parts.
- [Monitoring](#) of performance upon grid connection had also been specified.
- Some evidence of [PV services](#) on the basis of Power Purchase Agreements (PPAs), energy service agreements and community investment funds.

# Novel procurement routes (1)



Source: US DoE, 2010

## Novel procurement routes (2)

Public authorities use procurement to attract private investment and facilitate greater residential deployment

- **PV services** based on Power Purchase Agreements (PPAs), energy service agreements and community investment funds
- **Reverse auction** managed by the public authority
  - **Step 1** registration of interested households
  - **Step 2** supplier shortlisting and tender process to procure an installation company to service the registered households.
    - ✓ monitoring systems
    - ✓ extended guarantee for each system
    - ✓ price reduction of 35% on market rates (4.000 installs)

# Risk mitigation and reduction in LCC/LCOE

Project life cycle cost analysis: IEA PVPS programme, the European Photovoltaic Technology Platform, Solar Bankability and PV Finance

- Optimisation of the potential to generate solar power,
- Minimisation of the risks to loss of income from and,
- Minimisation of the LCOE\* along the life cycle of a project.

$$LCOE = \frac{CAPEX + \sum_{t=1}^n [OPEX(t) / (1 + WACC_{Nom})^t]}{\sum_{t=1}^n [Utilisation_0 \cdot (1 - Degradation)^t / (1 + WACC_{Real})^t]}$$

\* LCOE: Levelised Cost of Electricity (€/kWh)

# Results of Solar Bankability project

Eight priority mitigation measures identified based on their Cost Priority Number (CPN) and potential impact on LCOE:

## Preventative

1. Quality testing of modules and inverters
2. Design review + construction monitoring
3. Energy Performance Contractor (EPC) qualification

## Corrective

4. Basic monitoring of system alarms and notifications
5. Advance monitoring systems for early fault detection/diagnosis
6. Advanced inspection to detect defects
7. Visual inspection to detect visible changes
8. Spare part management

# Summary findings of the evaluation

Evaluation criteria	Finding	Summary
<b>Step 1: Contribution to objectives</b>	Positive	<ul style="list-style-type: none"> <li>Support <b>greater deployment</b> and <b>yield optimisation</b></li> <li>Reduce or <b>manage environmental impacts along the life cycle</b> of solar PV systems and components</li> <li>Contribute towards <b>achievement of grid parity</b> for the LCOE of solar electricity</li> </ul>
<b>Step 2: Determine the added value of GPP to existing policy instruments</b>	Positive	Potential to play a strong role in promoting <b>better systems and components</b> – with a focus on quality, hazardous substances and circular design - but also through <b>novel procurement routes</b>
<b>Step 3: Determine if GPP is the most effective instrument to achieve the objectives</b>	Positive	Public sector has a substantial stock of buildings and land on which solar PV could potentially be installed: <ul style="list-style-type: none"> <li>the potential influence on the design and specification of components is <b>direct</b> in most cases</li> <li>reverse auctions or the procurement of electricity <b>extend this influence</b> to third party, citizen installations</li> </ul>
<b>Step 4: Determine the best form of GPP implementation</b>	Proposal	A combined focus on <b>product</b> (e.g. quality), <b>works</b> (e.g. protocols) and <b>services</b> (e.g. maintenance) is proposed.

# Should the scope be different for EU GPP?

## Possible considerations:

- Focus primarily on the **procurement of PV systems**, but with criteria on module and inverter performance
- Possible expansion to cover **novel procurement routes** in order to facilitate greater PV system deployment?
  - ✓ Roof auctions and community investment funds
  - ✓ Reverse auctions for residential systems



# GPP criteria by project phases and risk mitigation

Project phase		Risk mitigation	Potential type of GPP criteria
1. Preventative	1.1 Selection/testing	Module and inverter <b>factory quality and performance testing</b>	<ul style="list-style-type: none"> <li>• <b>Selection Criteria</b> for factory quality (e.g. IEC 62941, EN 62788)</li> <li>• <b>Technical Specifications</b> for modules and inverters (e.g. EN 61215, EN 62093)</li> <li>• <b>Award criteria</b> based on declared module degradation rate</li> </ul>
	1.2 Design and yield estimation	<p>Quality of <b>design yield estimate</b> and associated modelling data and assumptions</p> <p>Quality of <b>electrical engineering design</b> to mismatch and other losses</p>	<ul style="list-style-type: none"> <li>• <b>Selection Criteria</b> for the field experience of the design team/EPC contractor</li> <li>• <b>Award criteria</b> based on an estimate of the Performance Ratio (with reference to IEC 61724)</li> <li>• <b>Award criteria</b> based on energy payback time (dependent on climate/location)</li> </ul>

# GPP criteria by project phases and risk mitigation

Project phase		Risk mitigation	Potential type of GPP criteria
1. Preventative	1.3 Transportation to site	<b>Protocols to minimise damage</b> of modules through mishandling	<ul style="list-style-type: none"> <li>• <b>Selection Criteria</b> evidencing the use of such protocols</li> <li>• <b>Technical Specification</b> requiring specific actions within a protocol</li> </ul>
	1.4 Installation/construction	<p><b>EPC qualification</b> for competencies of field workers</p> <p><b>Advanced monitoring systems</b> for early detection and diagnosis of faults</p> <p><b>Procedures to minimise damage</b> of modules through mishandling</p>	<ul style="list-style-type: none"> <li>• <b>Selection Criteria</b> for the field experience of the design team/EPC contractor</li> <li>• <b>Technical Specification</b> for the monitoring systems</li> <li>• <b>Technical Specification</b> requiring specific actions within a protocol</li> </ul>

# GPP criteria by project phases and risk mitigation

Project phase		Risk mitigation	Potential type of GPP criteria
2. Corrective	2.1 Operation & maintenance	<p><b>Basic monitoring routines</b> to detect failures and deviations</p> <p><b>Advanced monitoring routines</b> including visual inspection and IR/electroluminescence sensing</p> <p><b>Spare part management</b> to minimise costs of downtime and increase likelihood of fulfilling design life.</p>	<ul style="list-style-type: none"> <li>• <b>Technical Specification/Award Criteria</b> for the granularity of monitoring system (e.g. IEC 61724-1)</li> <li>• <b>Technical Specification</b> based on planning to respond to inverter manufacturers recommended repair cycle</li> </ul>
	2.2 Decommissioning	Definition of <b>dismantling procedures</b> and <b>end of life routes</b>	<ul style="list-style-type: none"> <li>• <b>Technical Specification/Award Criteria</b> requiring specific actions within a protocol and/or provision of specific EoL services</li> </ul>

**Thanks for your attention**

**Discussion with Q&A**

# Next steps

## EU Ecolabel and GPP criteria

- Comments on the background study for Ecolabel and GPP can be received through BATIS **until 17<sup>th</sup> May 2019**

## Stakeholders meeting June 2019, Brussels

- Task 6 and Task 7 of Preparatory study
- EU Ecolabel and GPP session

Please use **BATIS** to submit your comments  
<http://eippcb.jrc.ec.europa.eu/batis/login.jsp>

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