Eco-Design and Energy Labeling for Photovoltaic Modules, Inverters and Systems – Enabling a Sustainable Value Chain in the EU?

ETIP PV, SolarPower Europe, PVthin, European Solar Manufacturing Council, IECRE

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Put into context, this article deals with the recommendations presented in the Expert Input Paper that are the result of a Joint Mission Group of Solar Industry Experts and Researchers, building on the findings of the European Commission Preparatory Study for Eco-Design, Energy Labelling, Green Public Procurement and Ecolabelling. The findings of the Expert Input Paper aim to support the criteria development process within the framework of compulsory policy instruments further evaluated in the supporting study.

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Introduction

The number of renewable energy power plant installations worldwide has increased exponentially over the last 20+ years. The PV market has evolved from one of relatively small-scale applications to a mainstream electricity source with a trend towards large utility scale PV power plants, while residential, commercial and industrial applications continue to represent a major share of installed capacity as well. While having experienced this incredibly dynamic growth over the last 20 years, the solar sector currently represents only approx. 3-4% of worldwide annual electricity production (depending on the source of the data). As the PV sector becomes increasingly visible as a viable electricity generation source aiming for the next order of magnitude - representing 20% in the electricity mix and beyond at some point in the future - it is now a good time to discuss the reliability, predictability, and performance of PV power plants and as a consequence, the improvement potential for sustainability and government initiatives related thereto.

Building on this train of thought, this article will provide a short introduction of concerns related to the sustainability of PV power plant performance, and hence, sustainability; predominantly related to technical performance. Following, the EU Commissions' sustainability initiatives as well as the status of the consultation input by industry will be discussed.

There are various technical reasons why a PV power plant can underperform or completely fail. A review of the downwards cost trend of turnkey PV power plants over the last 20 years is very impressive. However, whether some stakeholders involved in the PV power plant value chain exercise poor quality practices because of distressed financials is another question. Regardless of the motivation, within the realm of the energy transition, there is an increasing concern about whether the PV "value proposition" lives up to the promise of providing a sustainable means of generating electricity. This means that the reputation of PV may eventually be at stake.

Some evidence on the viability of this concern is given by an insurance claim case study in which the root causes for more than 3.600 insurance claim cases has been conducted, all of which occurred in the Northern hemisphere at latitudes North of 35°. The following outlines an excerpt of a significantly more detailed study[1].

The insurance claim records date from the time between January 2012 and June 2017 so that a history of 5.5 years of insurance claim cases was covered in the study. The spread of damages where compensation to asset owners was paid is significant with a peak value of more than 110% relative to investment (>1,100 EUR per 1,000 EUR investment). Looking at the relationship of damage to nameplate power, the maximum damage was 3,250 EUR/kWp installed capacity. Note that both maximum numbers originate from different claim cases. Not surprisingly, no linear correlation could be drawn for either relationship, neither for the damage amount versus investment nor for the damage amount versus the installed capacity. The decline in frequency of claimed damages over the amount of loss follows a nearly logarithmic relationship: Damage cases with high amounts of loss are rare whereas minor damage cases occur more frequently. Figure 1 shows the frequency of damage claim cases on a logarithmic scale as a distribution of the amount of loss data in €/kWp for those claim cases for which the amount of loss has been covered.

[1] Consortium project PVScan – Evaluation research of quality assurance and assessments of PV modules in solar power plants – work package 5 titled "current insurance products and detection of relevant data" (original language: German)

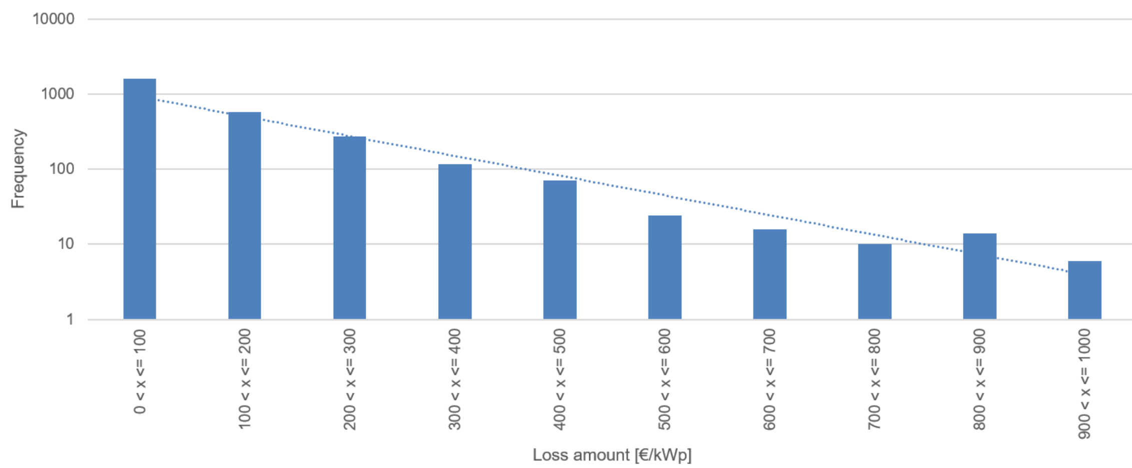

Figure 1: Distribution of amount of loss classification

One of the findings of a "deep-dive" analysis reveals that the average amounts of loss incidents over the service life of a PV power plant increases significantly for internal defects, see

Figure 2. shows the average amount of damage resulting from so called "internal defects". Internal defects are defects resulting from bad manufacturing or installation practices, hence, result from the internal integrity – or health – of the PV power plant. Besides the insight of a "to be expected" increase in amounts of damage over lifetime, another important finding is that average amounts of damage can be quite significant and higher than expected prior to the study. The standard deviation of the average amount of damage varies between 14.8% and 32.5%, the average amount of loss significantly increases with service lifetime of a PV power plant. It is important to note that many internal defects subject to the assessment have not been insured.

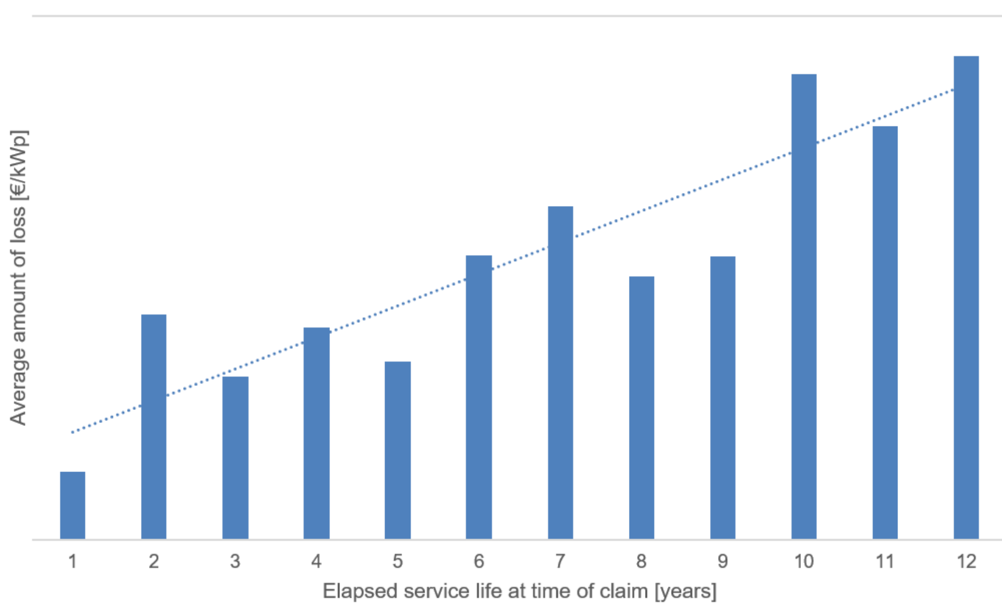

Figure 2: Average amount of loss as a function of service life (internal defects)

More insights of the insurance claim case study and questions related to investment risk mitigation have been discussed in the past[2].

The results naturally trigger an additional aspect of how to look at sustainability. Besides using "eco-friendly" (ideally recycled) materials and components, producing good quality products and systems throughout the value chain that are designed and constructed for longevity is very important aspect of sustainability. Further important aspects relate to the "carbon footprint" producing and decommissioning a PV power plant versus the actual energy yield of a PV power plant. Reparability and end-of-life recyclability of components are also important aspects to be factored into the sustainability "equation".

The factors discussed above are only a small excerpt of many – some obvious – triggers of why sustainability has eventually become a paramount goal for governments as well as for investors. As stated in the EU Green Deal Communication[3], the just transition to climate neutrality and a sustainable future is the overarching objective of all EU policies and actions. The decarbonisation of the energy sector, investments into environmentally friendly technologies and helping industry innovate are essential elements of this transition. The proposed European Climate Law[4] and the Green Deal Key Actions[5] build on the Clean Energy Package's Renewable Energy Directive (RED II)[6] targets for the mass deployment of solar, wind, hydro and other forms of sustainable energy conversion technologies. Solar photovoltaics could play the leading role in this transition: it is quickly becoming the most economic form of electricity generation worldwide, and consequently the IEA has declared PV to be the "new king of electricity" in its World Energy Outlook 2020.[7] The pathway to terawatts of solar being deployed required a number of dedicated policy and standardisation activities to ensure that the photovoltaic (PV) value chain grows in a manner that is resource efficient, environmentally safe and protective of human health. The PV industry today is working effectively towards decoupling economic growth from negative environmental impacts and resource consumption.

Over the last five years, the PV industry has pro-actively engaged with regulators, policy makers and wider stakeholder groups, to quantify the environmental performance of PV technologies and demonstrate the tangible advantages of the different PV technologies available. In the EU, the PV industry participated in the Product Environmental Footprint (PEF) Pilot Phase[8],and developed sectoral Product Environmental Footprint Category Rules (PEFCR) for Photovoltaic Modules used in photovoltaic power systems for electricity generation.[9] This validated the environmental performance of PV technologies in the EU, and helped better inform decisions on what EU sustainable product policies would be most appropriate for this category of products. The PEF pilot phase, the development of the PEFCR as well as the related pilot and screening

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[2] EPJ Photovoltaics 10, 7 (2019): Solar investment risk mitigation – are we all on the same page?

[3] Communication from the Commission: The European Green Deal; COM(2019) 640 final

[4] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law); COM(2020) 80 final

[5] Annex to the Communication on the European Green Deal Roadmap - Key actions; COM(2019) 640 final

[6] DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources (recast)

[7] IEA World Energy Outlook 2020, https://www.iea.org/reports/world-energy-outlook-2020

[8] Product Environmental Footprint (PEF) Pilot Phase, https://ec.europa.eu/environment/eussd/smgp/ef_pilots.htm

[9] PEFCR PV electricity v. 1.1; https://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_PV_electricity_v1.1.pdf

studies, clearly identified the environmental hotspots in the life cycle of PV systems, aiding in the development of voluntary industry standards to address these hotspots at a global level[10,11].

Building on the results of the PEF pilot phase, the European Commission added photovoltaic panels and inverters to the work program for Eco-Design in 2016[12] and extended the Preparatory Study[13] carried out from 2017 to 2019 to also assess whether sustainable product policy instruments such as the EU Energy Label, Ecolabel and Green Public Procurement would be appropriate for the PV industry, see Figure 3.

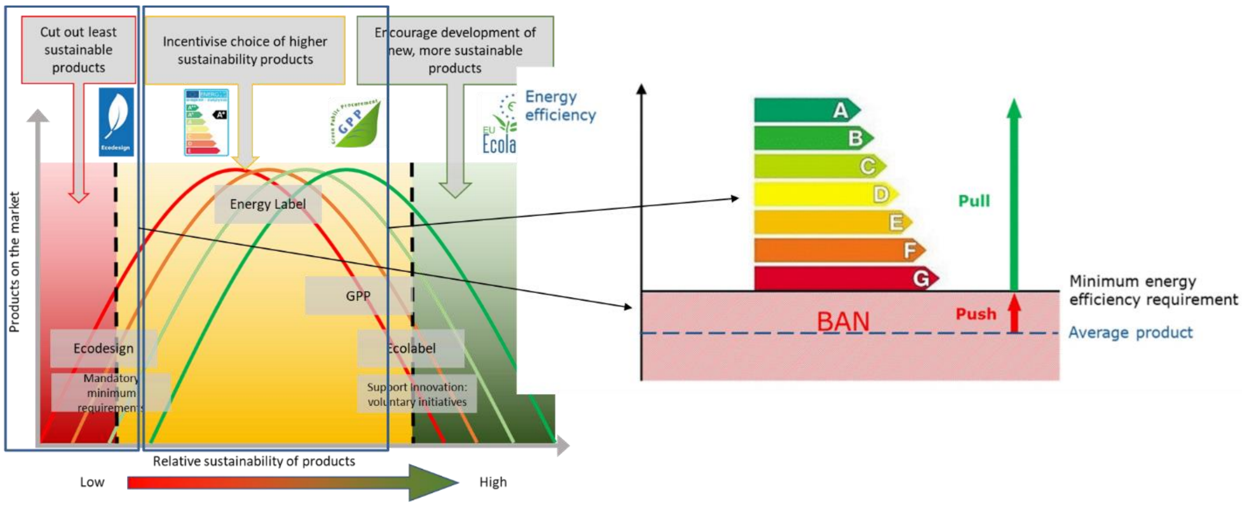

Figure 3: Overview of policy instruments considered by the EU Commission

The Commission's policy scenario evaluation concluded that the best way to further regulate PV modules was via a combination of mandatory and voluntary policy instruments. This scenario evaluation considered mandatory instruments such as Eco-Design measures for photovoltaic modules and inverters, augmented by the use of the Energy Label for residential PV systems, and voluntary instruments such as Green Public Procurement Criteria. The latter aspects will be developed between 2020 and 2023 to focus on a number of sustainability, quality, durability, circularity and performance criteria[14].

In order to inform the development of these criteria, representatives of the photovoltaic value chain came together to set up a Joint Mission Group under the umbrella of the European Technology Innovation Platform Photovoltaics (ETIP PV) - in cooperation with SolarPower

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10 Wade, Andreas, Philippe Stolz, Rolf Frischknecht, Garvin Heath, und Parikhit Sinha. „The Product Environmental Footprint (PEF) of photovoltaic modules-Lessons learned from the environmental footprint pilot phase on the way to a single market for green products in the European Union". *Progress in Photovoltaics: Research and Applications*, 2017. https://doi.org/10.1002/pip.2956.

11 Wade, Andreas, Parikhit Sinha, Karen Drozdiak, Dustin Mulvaney, und Jessica Slomka. „Ecodesign, Ecolabelling and Green Procurement Policies – enabling more Sustainable Photovoltaics?" In *WCPEC-7, Proceedings of the 7th World Conference on Photovoltaic Energy Conversion*. Hawaii, USA: IEEE, 2018.

12 Ecodesign Working Plan 2016 – 2019, COM(2016) 773 final

13 JRC, Solar Photovoltaic modules, inverters and systems preparatory study; https://susproc.jrc.ec.europa.eu/solar_photovoltaics/

14 Preparatory study for solar photovoltaic modules, inverters and systems – Final report; Dodd, N., Espinosa, N., Van Tichelen, P., Soares, A., JRC B.5 unit, VITO, 2020

Europe, PVThin, the European Solar Manufacturing Council, and IECRE - to review the results of the preparatory study and provide recommendations for the next regulatory discussions.

As outlined below (Figure 4), between June 2020 and January 2021, the Joint Mission Group (JMG) followed a structured approach to provide a comprehensive review and set of recommendations to support the discussions on the compulsory policy instruments of Eco-Design and the Energy Label – complemented by a dedicated investigation of the cross-cutting and more general sustainability criteria.

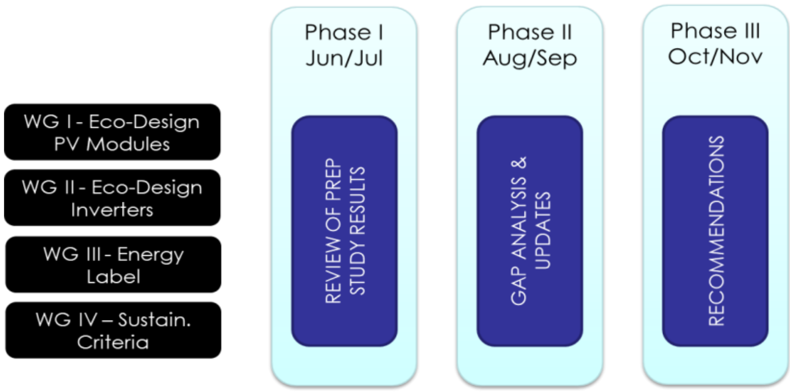

Figure 4: Joint Mission Group approach (2019)

The Expert Input Paper comments on the policy recommendations set out in the final report[15] and extends those to reflect on identified gaps and required updates from the perspective of the solar industry & solar research community. The first part of that report is structured as direct feedback to the policy recommendations. The second part of the report provides additional recommendations from the expert group to achieve the policy objectives.

A final comment in the introduction is to recommend periodic reviews of the directives every 2 years.

Summary of Recommendations for Policy Makers

Photovoltaics is a proven technology capable of making a substantial contribution to a sustainable global energy system. Its widespread use in all geographic regions, versatility in application and modularity in scale enables a socially acceptable energy transition by offering distributed electricity generation, employment and new business opportunities. [16]

The Joint Mission Group welcomes the policy recommendation on the introduction of eco-design requirements for photovoltaic modules and inverters in the EU. These future requirements should be based on standards, which determine the service life, energy yield and degradation – which are the most important parameters influencing the sustainable performance of these components. Given the longevity of the components and the fast evolution of new products & technology concepts, reference values established through accelerated life cycle testing and lifetime yield

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[15] Ibid.

[16] See also: Photovoltaic Solar Energy: Big and Beyond – Sustainable Energy to Limit Global Warming to 1.5 Degrees – Vision and Claims of the European Technology and Innovation Platform for Photovoltaics (ETIP PV), 2020

prediction should provide minimum requirements for performance guarantees, replacement and reparability within the eco-design regulations.

An Energy Label recommendation for residential scale photovoltaic systems is more challenging. Such a system runs a risk of being complex because of the number of important variables and consequently, of confusing and disincentivising the electricity prosumer – when every kilowatt peak of solar electricity generation capacity installed provides significant environmental and societal benefits in achieving the green transition of the EU Economy. An Energy Label should not disincentivise development of specific applications, but rather ensure transparency of environmental and quality performance of the system components deployed to allow conscious and informed choices.

The Joint Mission Group has provided detailed feedback on the issues it has identified and provided recommendations for addressing these issues. In many cases, these recommendations have been adopted.

Additional recommendations

As well as commenting on the specific proposals, additional recommendations pertaining Eco-Design requirements for PV modules and inverters, as well as considerations and calculations on a potential Energy Label for residential photovoltaic systems were provided.

In addition, a holistic approach for sustainability evaluation in the form of an Environmental Impact Index (EII) is proposed and referenced to applicable standards and methodologies. This Environmental Impact Index would satisfy the information requirements established in the policy recommendations and would help to trigger consumer interest as well as market pull for more sustainable products. Ultimately, further discussions of the EEI framework - also possibly including quality and reliability requirements - could lead to the definition of multi-dimensional green public procurement requirements for PV electricity (and components) in the EU, satisfying the objectives of the EU Green Deal & Green Recovery ambitions.

Eco-Design for Photovoltaic Modules

The key variables in determining the life-time total energy yield of a PV module are its service life and its degradation rate. The eco-design proposal assumes a 30 year lifetime for all module technologies and a degradation rate determined by a procedure and common for all modules regardless of the technology. This is considered by industry experts to be unreliable and time-consuming. The JMG assessed 3 alternatives to this approach and recommends a performance guarantee for module degradation and service life will be complied by the module manufacturers. If the modules fail to achieve this performance the manufacturers have to replace the modules in the event of reduced performance. The manufacturer will therefore carefully set the guaranteed degradation and lifetime and carry out appropriate tests. An important addition to the alternative approach is the establishment of minimum guarantee requirements that are comprehensively defined in the eco-design directive.

Eco-Design for Photovoltaic Inverters

The environmental impact of photovoltaic inverters is largely determined by its expected lifetime. Significant improvement of this factor could be achieved by focussing on the inverter’s reparability. This should not be met by defining minimum warranty requirements, as this could lead to negative incentives such as replacing the inverter during the warranty time, which could increase the overall footprint.

In order to promote inverter reparability, the Eco-Design measures should ensure the availability of spare parts and that the inverter is constructed to allow for access to and replacement of identified parts, and that spare parts are available over a long period of time after purchase. Spare parts should be replaceable with the use of commonly available tools and without permanent damage to the inverter. In order to enhance the repair market, manufacturers would have to ensure the availability of repair and maintenance information for professional repairers.

Energy Label for residential-scale systems

The policy recommendation on the introduction of an energy label suggests a label for the entire solar photovoltaic system deployed on residential rooftops. Here, a small number of system performance factors such as the energy yield of the module, the efficiency of the inverter, the orientation of the module and the location are taken into account. Given the overarching policy objective to improve the sustainability performance of the different system components, the proposed methodology for the determination of the energy performance falls short on its ability to provide component level differentiation.

An informed electricity prosumer in the European Union should have comprehensive and holistic sustainability performance data available for the photovoltaic modules and inverters upon purchasing those components. The lifecycle environmental impact of these system components is well understood, and lifecycle hotspots have been identified and can be effectively addressed by creating market pull for more sustainable products. The introduction of an independently validated combined Energy & Environmental Impact Index, embedded in a quality conformity assurance framework is seen as the most effective means to enable this transparency and to induce the continuous improvement in sustainability performance of these product groups.

It is important that unbundled renewable energy certificates are excluded in the supply chain of electricity for module production and rather the country's electricity mix has to be used to prevent double counting or misallocation of lifecycle impacts. In addition, consideration should be given to whether ESG (environment, social and governance) criteria should be taken into account for the assessment of manufacturing and the manufacturer in order to promote an ecological, social and transparent way of doing business in the EU.

To inform the future discussions on the development of a calculation methodology for residential scale photovoltaic systems, the Joint Mission Group performed and presented a number of benchmark calculations for reference systems, using the specified PV System Calculator as well as commercial energy yield prediction and assessment tools.

Holistic evaluation of sustainability performance - Environmental Impact Index (EII)

The environmental impact of a PV power plant requires a system perspective. Naturally, the environmental impact of each component is an indispensable compliance criterion; however, it is ultimately the entire system that needs to comply just as well with sustainability criteria.

Assessing the environmental impact of any product or system is a complex task. An environmental impact index is a possible means to translate the complexity of an environmental assessment into an abbreviated form. The effect of such an index would be to condense the various influencing factors of industrial or other human activity on the environment in a summarizing, comprehensive index in a way so that impacts from alternative actions can be compared and add to product or system evaluation. Figure 5 illustrates the elements of the proposed EII concept.

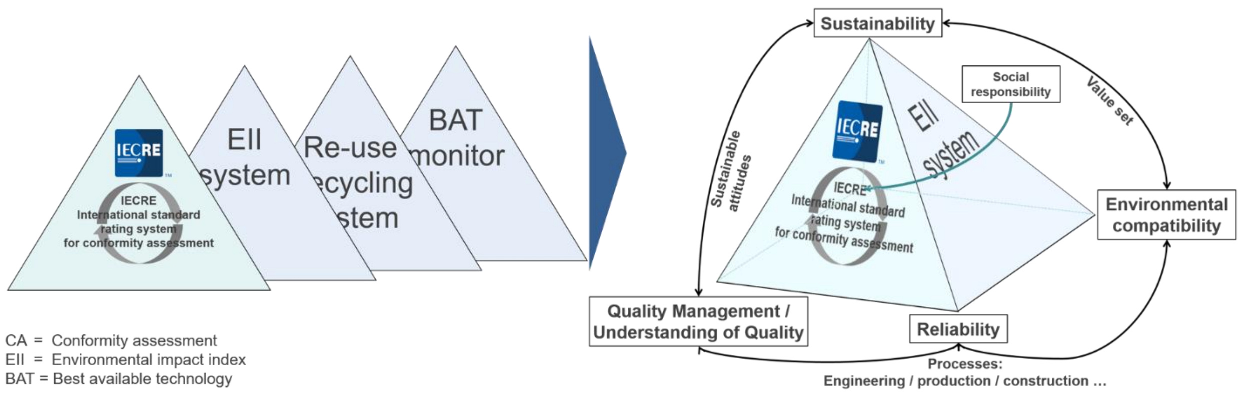

Figure 5: Elements of the Environmental Impact Index (EII)

Yet subject to further development, Figure 6 and Figure 7 outline the state of discussion on details related to the proposed concept, scale, and evaluation criteria of an EII scheme for modules, while Figure 8 outlines the corresponding details for inverters. The potential evaluation criteria are still subject to further discussion. The right hand side of Figure 6 and Figure 8 depict a possible visualization of the resulting EII.

Criteria / Policy Tool Implementation	Lifecycle GWP / Embodied Carbon Footprint	Life Cycle GER / Energy Payback Time (EPBT)	Hazardous Substances	Recycled Content	Recyclability and Repairability	Quality (IECRE, TEXXECURE)
Proposed Scale	A – G	A – G	A – G	A – G	A – G	A – G
Information Requirement under ED* / EL**	ED, EL	ED, EL	ED	ED	ED	ED
Minimum Requirement Eco-Design (ED) Energy Label (EL)	D***	D***	D***	D***	D***	D***
Visibility on extended Energy Label (EL)	YES	YES	N/A	N/A	N/A	N/A
GPP Award Criteria	B	B	B	B	B	B

* It is assumed that Eco-Design compliance is demonstrated through self declaration / CE marking
** It is assumed that Energy Label claims are validated through independent 3rd parties and through dedicated product group standards based on horizontal standards
*** To be further established and agreed upon

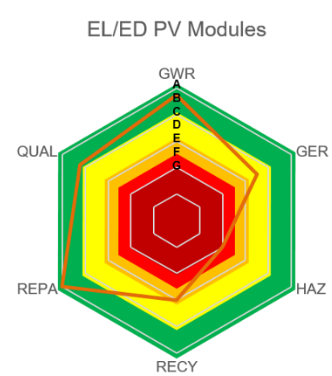

Figure 6: Details of the EII concept and visualization for modules

Rating	GWP		GER		HAZ	RECY	REPA	QUAL
	Min	Max	Min	Max				IECRE (TEXXECURE) Rating
A		250	tbd	tbd	B + NSF 457 5.2.4	B + > 10% post-consumer recycled content	B + tbd	AAA
B	250	300	tbd	tbd	C + NSF 457 5.2.3	C + > 10% recycled semiconductor	C + Glass	AA
C	300	350	tbd	tbd	D + NSF 457 5.1.5 + 5.1.6	D + > 10% recycled paste, contact materials (incl. TCO)	D + Cells	A
D	350	400	tbd	tbd	E + NSF 457 5.1.4	E + > 25% recycled frame material	E + Backsheet / Solder joints	BBB
E	400	475	tbd	tbd	F + NSF 457 5.1.3	F + > 10 % recycled backsheet/encapsulant	F + Frame	BB
F	475	550	tbd	tbd	G + NSF 457 5.2.1 + 5.2.2	G + > 10% recycled glass	G + Bypass Diode (if applicable)	B
G	550		tbd	tbd	NSF457 - 5.1.1 + 5.1.2 / Decl Subst List - IEC 62474 / REACH SVHCs	Declaration of recycled content	Junction Box	C, D

Figure 7: Possible evaluation criteria for the EII for modules

Criteria / Policy Tool Implementation	Lifecycle GWP / Embodied Carbon Footprint	Life Cycle GER / Energy Payback Time (EPBT)	Management of Substances	Recycled Content	Design for recycling	Sustainable supply chain	Lifetime and repairability	Quality (IECRE, TEXXECURE)
Proposed Scale	A – G	A – G	A – G	A – G	A – G	A – G	A – G	A – G
Information Requirement under ED* / EL**	ED, EL	ED, EL	ED	ED	ED	ED	ED	ED
Minimum Requirement Eco-Design (ED) Energy Label (EL)	D***	D***	D***	D***	D***	D***	D***	D***
Visibility on extended Energy Label (EL)	YES	YES	N/A	N/A	N/A	N/A	N/A	N/A
GPP Award Criteria	B	B	B	B	B	B	B	B

* It is assumed that Eco-Design compliance is demonstrated through self declaration / CE marking
** It is assumed that Energy Label claims are validated through independent 3rd parties and through dedicated product group standards based on horizontal standards
*** To be further established and agreed upon

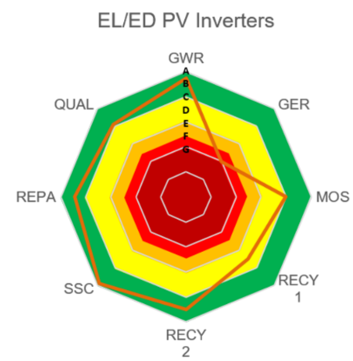

Figure 8: Details of the EII concept and visualization for inverters

The development of such an index could be undertaken in close cooperation between the standardization body called for by the EU Commission and an industrial expert group that can be managed by a neutral (non-profit) entity and the results incorporated into assessments for GPP and Eco Label.

Recommendation to include CSR (Corporate Social Responsibility) criteria

Considering the EU strategy on promoting CSR and encouraging businesses to adhere to international guidelines[17], several initiatives have been launched starting from the EC communication 2011[18], to the directive 2014/95/EU[19] and the study commissioned by EU

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[17] Corporate Social Responsibility – Recommendations to the European Commission By the subgroup on « CSR » of the Multi-Stakeholders Platform on the Implementation of the SDGs in the EU https://ec.europa.eu/info/sites/info/files/recommendations-subgroup-corporate-social-responsibility_en.pdf

[18] Directive 2014/95/EU amending directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0681:FIN:EN:PDF

[19] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0095&from=EN

parliament 2020[20] . CSR and RBC (*Responsible Business Conduct*) have been clearly identified as the core concepts to manage the negative impacts on society and the environment by preventing and mitigating them including the global supply chain. The last study published in November 2020, covers the international law instruments on CSR from the UNGPs[21] (*United Nations Guiding Principles on business & human rights*), the ILO - MNE Declaration [22] (*International Labour Organization – Multinational Enterprises*) and the OECD guidelines and guidance[23] (*Organization for Economic Co-operation and Development*). The international instruments are considered as "minimum thresholds the companies can take into account in the context of CSR debate". As a strong support of the United Nations 2030 Agenda for sustainable Development and associated Sustainable Development Goals (SDGs), the European Commission "has taken a very active approach to CSR at EU level". The EU analysis in the context of the COVID crisis has raised that the implementation of CSR within companies implies extra costs, however, creates in parallel significant value creation in terms of innovation and benefits. Moreover, the European Commission has raised the clear demand of the citizens for sustainable business initiatives. Accelerating the incentives on CSR legislative approach, the European Commission has announced the revision process 2014/95/EU in 2020 to "strengthen the foundations for sustainable investment".
The development of sustainable finance, so called green financing models based on ESG (*Environmental, Social & Governance*) is expanding very rapidly and will necessarily impact the energy sector investment framework. Indeed, on the front line, and to answer the carbon neutrality target, renewable energy investments are expected to be one of the most important release of funds in the coming years. Many European oil companies such as BP (UK), Shell (UK/NL), Eni (Italy), Total (France), Respol (Spain), Equinor (Norway) have announced in 2020 that their objectives to significantly reduce their oil and gas activities. In the meanwhile announcing their intentions to invest massively in low-emission activities, including mostly renewable energies. This type of investment will necessarily be deployed in the context of green financing. The photovoltaic sector will have to meet sustainability criteria including social criteria that are required to access financing from the "sustainable" taxonomy and integrate the portfolios of major financial institutions.

Conclusions

The European Commission is progressing the development of three new directives to improve the energy transition, enabling energy security and resilience for critical energy technology in the

[20] Corporate social responsibility (CSR) and its implementation into EU Company law https://www.europarl.europa.eu/RegData/etudes/STUD/2020/658541/IPOL_STU(2020)658541_EN.pdf
[21] United Nations Guiding Principles on business & human rights https://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf
[22] Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy (MNE Declaration) - 5th Edition (2017) https://www.ilo.org/empent/areas/mne-declaration/lang--en/index.htm
[23] OECD – Guidelines for Multinational Entreprises http://www.oecd.org/daf/inv/mne/48004323.pdf & OECD - Due Diligence Guidance for RBC http://mneguidelines.oecd.org/OECD-Due-Diligence-Guidance-for-Responsible-Business-Conduct.pdf

European Union and to ensure the sustainability of PV components and systems as the alternative.

Two of these directives, Eco-design for residential PV power systems and Eco Label for PV modules and inverters will be mandatory requirements for products sold within the EU. The Green Public Procurement (GPP) requirements will be voluntary.

The industry based Joint Mission Group has been actively involved in considering and providing feedback and recommendations on the EC proposals for Eco-design and Eco Labels.

A number of recommendations that have so far not been included within the regulatory design and the reason why they are considered relevant are highlighted in this paper.

The industry and scientific expert community has demonstrated a common approach to this topic, which has paramount importance, and will continue to participate in the discussions.