Implementation Plan 2013-2015

Discussion on priorities

EPIA
European Photovoltaic Industry Association

Notes for the discussion

- The overall scope of the **Solar Europe Industry Initiative** is to promote the advancement of the **PV technology** and increase its competitiveness *vs.* the fossil fuel technologies.

-It also serves the purpose of ensuring the **competitiveness of the EU industry at global level**.

-The IP is **technology agnostic**, it will therefore promote all PV technologies.

-The direct involvement of all stakeholders in the drafting of the Implementation Plan is vital: please contribute to today's discussion and to the next opportunities.

-The workshop follows a consultation phase in which the **Working Group 3** of the **EU TP PV** and the **Industry Advisory Committee** provided their written comments through the same questionnaire

-All the comments received during the consultation phase and the views gathered today will be reflected in the first draft of the new Implementation Plan.

-**Working Group 3** of the **EU TP PV** and the **Industry Advisory Committee** will be asked to provide their comments on the draft list of priorities that will follow the workshop.

Notes for the discussion

The 46 R&D priorities of the first Implementation Plan and relative comments were grouped in **5 main thematic areas:**

Pillar A: *Cost reduction*

1 - Advanced manufacturing processes for cells and modules

2 - Performance enhancement & lifetime extension

3 - Materials development & sustainability

Pillar B: *System integration*

1 - Enabling large scale deployment

2 - Building integration

Organisation of the slides:

- Priorities from the first IP are listed on the left column

-The points for discussion are listed on the right:

- Context and goal: objective of each set of priorities and in which context they will operate
- Overview of the main points emerged during the consultation phase
- Main principles for the drafting of specific priorities.

-**FP7:** this label indicates that the priority has already been financed through FP7 calls for proposals.

Goal of the workshop

Clarify the goal of each set of priorities

Identify clear trends

Provide further guidance for the drafting of detailed priorities

Main changes suggested on the overall structure

The Implementation Plan 2010 – 2012 featured **46 R&D priorities** divided in **3 pillars**

Pillar A: *Cost reduction: paving the way to 2020*

Pillar B: *System integration*

Pillar C*: Preparing for cost and penetration beyond 2020 levels*

"Pillar C: *Preparing for cost and penetration beyond 2020 levels"* has now been integrated in the other two pillars.

~~**Pillar C: Preparing for cost and penetration beyond 2020 levels**~~

1	Ultra low cost technologies
2	Very high efficiency approaches

→ Included in: **"Pillar A: *Cost reduction: paving the way to 2020"***

3	Integration concepts for very high levels of penetration

→ Included in: **"Pillar B: *System integration"***

Do you agree ?

A.1 - Advanced manufacturing processes for cells and modules

Priorities IP 2010-12	
1.1	**Wafer silicon technologies**
1.1.1	New, low-cost & low-energy silicon feedstock technologies
1.1.2	Silicon crystal growth techniques for high quality and re-use of crucibles
1.1.3 FP7	Advanced, low/zero-loss wafering techniques for efficient materials utilisation
1.1.4 FP7	High-throughput processes for manufacturing of advanced, high-efficiency cells and modules, including integrated (wafer/)cell & module approaches and process equipment (up to 17% multicrystalline and 20% monocrystalline, on module level)
1.1.5 FP7	From LAB to FAB: pilot-line demonstration of (2) high-efficiency, low-cost approaches

Suggestions

1. Context and main goal for Wafer silicon technologies

Since the drafting of the first IP PV markets and industry have undergone remarkable changes. An extremely competitive global environment has led to selling prices below expectations and large part of the production capacity installed in Asia.
In this context the goal of the IP is to increase competitiveness of the EU manufacturing segment and hence, to regain a share in global manufacturing. The overall scope of the IP remains though: achieve competitiveness against fossil fuel generation sources.

2. Trends or specific points emerged from the consultation phase

-Which should be the focus of this set of priorities? Cost reduction and/or quality of products?

-Automation and high efficiency products could make the difference for the EU industry

3. Suggestions

To take into account the context, a push for ambitious targets should be reflected in the specific priorities.

Pillar A: *Cost reduction: paving the way to 2020 and beyond*

Priorities IP 2010-12		Suggestions
1.2	**Thin-film technologies**	**Context and main goal for TF** Thin-film technologies have been experiencing difficulties in competing with wafer based technologies and their market share has decreased. **Trends or specific points emerged from the consultation phase** - All the TF technologies should achieve efficiencies ranging between 10-15% by 2015; there will not be a market for lower efficiencies TF products. - Focus on laser and novel light technologies. **Suggestions** Need to motivate usefulness/necessity of efficiency targets (10-15%) and viability of reaching them by 2015. Clarify position of technologies aimed at new applications (possibly at lower efficiencies) – see also next slide.
1.2.1	High-rate, large-area deposition processes, including process equipment and control methods (active and passive layers)	
1.2.2 **FP7**	Roll-to-roll cell & module manufacturing processes and equipment	
1.2.3 **FP7**	From LAB to FAB: pilot-line demonstration of (2) novel low-cost, high-efficiency technologies	
1.3	**Concentrator PV (CPV) technologies**	**Context and main goal for CPV** Similar to TF technologies, CPV has to consolidate its position within the PV market and increase its share. Specific technology advancements have to be tackled. **Trends or specific points emerged from the consultation phase** No specific comments were received on CPV so far. **Suggestions** BOS elements have a greater impact on yearly yields of CPV systems. R&D topics focused on this aspect should be added in the next IP.
1.3.1	Industrial manufacturing processes for high-efficiency concentrator cells, including process equipment and control methods	
1.3.2	Industrial manufacturing processes for concentrator optics, including process equipment	
1.3.3	High-throughput, high-precision assembly technology for CPV modules	
1.3.4 **FP7**	From LAB to FAB: pilot-line demonstration of industrial manufacturing (from cell to CPV module)	

Pillar A: *Cost reduction: paving the way to 2020 and beyond*

Priorities IP 2010-12	
1.4	**Cross-cutting**
1.4.1	Equipment and product standardisation
1.4.2	Low-cost framing and mounting, frameless structures
1.5	**Ultra low cost technologies**
1.5.1	Advanced pilot lines (2) for ultra-low cost (printable) PV technologies
1.5.2	Characterisation & testing, accelerated lifetime tests
1.6	**Very high efficiency approaches**
1.6.1 FP7	Proofs-of-concept (2) for very-high efficiency novel PV technologies
1.6.2	Modelling and characterisation

Suggestions

Context and main goal for "Cross-cutting", "Ultra low cost technologies" and "Very high efficiency approaches"

"Ultra low cost technologies" and "Very high efficiency approaches" originally included in Pillar C (Post 2020) have been included in this thematic area: **"Advanced manufacturing processes for cells and modules".** It is in this area that their benefits will be primarily exploited. This does not imply giving up on their longer terms goals.

Trends or specific points emerged from the consultation phase

- Ultra **low cost technologies** could be included in Advanced manufacturing processes for cells and modules

-In **Cross-cutting** add: new standards for characterisation

Suggestions for the 3 cross-cutting chapters.

-The chapter **low cost technologies** could be suppressed and its priorities included in other sections:

- 1.5.1 Advanced pilot lines (2) for ultra-low cost (printable) PV technologies moved under 1.2 **Thin-film technologies**

-1.5.2 Characterisation & testing, accelerated lifetime tests in **A.2 - Performance enhancement & lifetime extension**

- Add a new priority « **Technologies for new applications** »

Pillar A: *Cost reduction: paving the way to 2020 and beyond*

A.2 - Performance enhancement & lifetime extension

IP 2010-12		Suggestions
2.1	**Flat-plate PV technologies**	**Context and main goal for "Flat-plate PV technologies" and "Concentrator PV technologies"** R&D priorities under this chapter have as primary goal to increase the quality of products. **Trends or specific points emerged from the consultation phase** Performance enhancement can refer both to cost reductions and increased efficiencies. Overlaps in R&D developments between the two areas should be avoided. **Suggestions** - Keep in chapter A.2 only priorities linked to Sustainability and Reliability (2.1.1-2.1.2 & 2.2.2 – 2.2.3) - Merge chapter "**A.2 - Performance enhancement & lifetime extension"** and **"A.3 - Materials development & sustainability"** - Priorities dedicated to performance enhancements from chapter A.2 should be included in their technology dedicated chapters (under "A.1 - Advanced manufacturing processes for cells and modules"). - The chapter dedicated to **"Balance-of-System components** " improved performances and cost decrease should be included after "A.1 - Advanced manufacturing processes for cells and modules"
2.1.1	New low-cost, long-lifetime (typically 40 yrs) encapsulation materials and module designs	
2.1.2	Ageing models and outdoor performance	
2.1.3 FP7	Very-high efficiency cell designs and processes (>17% multicrystalline silicon, >20% monocrystalline silicon, >12% thin-film, on module level	
2.2	**Concentrator PV technologies**	
2.2.1 FP7	Cell designs (>3 junctions), optics and thermal management for ultra-high concentration ratios (typically 2500x)	
2.2.2	System designs and materials for >25 yrs lifetime	
2.2.3	Outdoor performance evaluation methods	

Pillar A: *Cost reduction: paving the way to 2020 and beyond*

IP 2010-12		Suggestions
2.3	**Balance-of-System components and systems**	**Context and main goal** With much achieved in costs and performances for modules, attention will shift to BOS components: priorities in this area could focus on lower costs, increased overall performances and additional functionalities at system level. Hardware improvements and new functionalities facilitating grid integration should be considered in the two separate pillars (A&B). **Trends or specific points emerged from the consultation phase** - In the previous Implementation Plan inverters have been overlooked. As they will play a key role in grid integration they deserve greater attention - Components and system layout for high voltage operation should be further developed **Suggestion** Dedicate a sub-chapter to inverters in the next IP split in components and functions
2.3.1	Low-cost mounting structures and electrical systems (wiring, connections, safety devices, etc.)	
2.3.2	Enhanced lifetime power electronics	
2.3.3	Low-cost, high-accuracy tracking systems	
2.3.4	Components for high-voltage (>1000 V) operation	

Pillar A: *Cost reduction: paving the way to 2020 and beyond*

A.3 - Materials development & sustainability

IP 2010-12		Suggestions
3.1	**Energy and materials**	**Context and main goal for "Energy and materials" and "End-of-life and recycling"** The goal is to develop materials to meet PV specific needs. The focus here should be on durability and sustainability (incl. availability). Cost and performance aspects can be included in "Cross cutting".
3.1.1 **FP7**	Exploration and development of new, low-energy processes and sustainable material alternatives	
3.1.2	Life-cycle assessment of new PV technologies; implementation of improvements	**Trends or specific points emerged from the consultation phase** - The principle of sustainability should be extended to the whole PV value chain, including manufacture, transportation and installation. - Recycling should be updated to reflect recent developments at EU level (recast of the WEEE directive)
3.2	**End-of-life and recycling**	
3.2.1	Design-for-recycling approaches for wafer silicon, thin-film and concentrator PV	**Suggestion** - Better definition of the goal of the chapter to allow interaction with other potential initiatives such as EMIRI (materials). - Recycling priorities update - "Product design and production aimed at facilitating dismantling and recovery of its components and materials"
3.2.2	Implementation of PV CYCLE system	

Pillar B: *System integration*

B.1 - Enabling Large scale deployment

IP 2010-12		Suggestions
1.1	**Grid interface**	**Context and main goal** There is general agreement that the "**Pillar B: System integration**" will play a greater role compared to the previous period. The pillar has received less funding during the first period of the SEII. The EU is on the frontline of Res integration and should ensure its leadership on the long period. Ancillary services, storage, innovative inverters functionalities (reactive power) will contribute to grid stabilization. Greater interaction with other initiatives such as the EEGI will enable further deployment of PV. The pillar should include hardware developments to deliver innovative services. **2. Trends or specific points emerged from the consultation phase** -Better understanding of PV needs for large scale deployment -More focus on inverters functionalities -> key for further deployment in established EU markets. -Development of small scale stand alone systems to introduce PV in developing markets. -PV participation in intensive Res electricity mix. -Interactions between RES and Smart Grid demonstration projects to gain experience. **3. Suggestions** - More detailed priorities -**"Integration concepts for very high levels of penetration"** from pillar C has been moved in this section -Coordination meeting the EEGI (European Electricity Grid Initiative)
1.1.1 **FP7**	**Power and energy management strategies and business models** for high degrees of PV penetration, including development and testing of the required hardware, field tests and demonstration	
1.1.2	Power and energy prediction models including validation, for use in combination with the previously mentioned topics	
1.1.3	The first phases of "Solar Cities" and "Solar Islands", aimed at demonstrating the many aspects of the feasibility of large-scale use of solar energy in urban and isolated environments (see also "Building integration")	
1.2	**Integration concepts for very high levels of penetration**	
1.2.1 **FP7**	Proof-of-concept for very high levels of PV penetration	

Pillar B: *System integration*

IP 2010-12		Suggestions
1.3	**Large scale PV power plants**	**1.Context and main goal for Large scale PV power plants** Replicability, dedicated products and improved installations procedures are the main beneficiaries of this set of priorities. Large scale installations, furthermore, still face difficulties in attracting investments; the proof of concept would facilitate their integration in utilities portfolios. **2. Trends or specific points emerged from the consultation phase** Rather than being a technology bottleneck, large scale installations are a financial challenge. They should not be considered as a standalone set of priorities. **3. Suggestions** Remove technology references under « Large scale PV power plants ». Keep one single priority for large scale field demonstration.
1.3.1	Realisation of large-scale CPV power plant (20MW) with tracking system	
1.3.2	Realisation of large-scale CIGS power plant (40MW)	
1.3.3	Realisation of large-scale tandem/triple junction TF silicon power plant (40MW)	
1.4	**Solar resources and monitoring**	**1.Context and main goal for "Solar resources and monitoring"** Improved forecasting methodologies will play a central role in large deployment of PV. **2. Trends or specific points emerged from the consultation phase** - All priorities linked to forecasting should have the highest level of priority in the next IP - "Models and unified protocols for PV system monitoring and control for automation of monitoring and fault detection, integration into SCADA and distribution management systems" - "Remote sensing (satellite) methods for determination of reference yield, ambient temperature and spectral parameters as a reference for PV system monitoring" **3. Suggestions** Focus on innovations and new functions enabling interface with the EEGI
1.4.1	European "PV Monitoring centre", aimed at gathering and disseminating a variety of monitoring data and information for benchmarking, including technology, industry, market and policy aspects	
1.4.2 **FP7**	Development of simulation and monitoring tools (early fault detection, *Modeling and simulation of ancillary services, etc.*).	

Pillar B: *System integration*

B.2 - Building integration

IP 2010-12	
2.2.1 **FP7**	Development of new multifunctional PV-based products
2.2.2	Research infrastructure, test facilities, and test procedures for building integrated PV (BIPV) products, in order to make innovations faster and easier
2.2.3	Optimisation of the energy output and value in a complex environment: shadowing, demand-side management options to get the best value of the PV production (in relation to the topics listed under "grid integration")
2.2.4	Further development and implementation of electrical safety requirements
2.2.5	The first phases of "Solar Cities" and "Solar Islands", aimed at demonstrating the many aspects of the feasibility of large-scale use of solar energy in urban and isolated environments (see also "Grid integration")

Suggestions

1.Context and main goal of this "thematic area"

BIPV products are struggling for competitiveness. New obligations in the construction sector will generate new opportunities. Until now BIPV has not been tackled enough as a separate area in order to develop its full potential.

2. Trends or specific points emerged from the consultation phase

-Priorities in this domain should be More specific. Industry should contribute in defining short/medium terms developments.

-Focus on BIPV products for commercial roof tops and large projects

-Integration with building energy efficiency techniques

3. Suggestions

Coordination with the Energy Efficiency Buildings European Initiative (E2B EI)

Attention to compliance of PV products with sector standards.

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