Projektträger Jülich
Forschungszentrum Jülich

Bundesministerium
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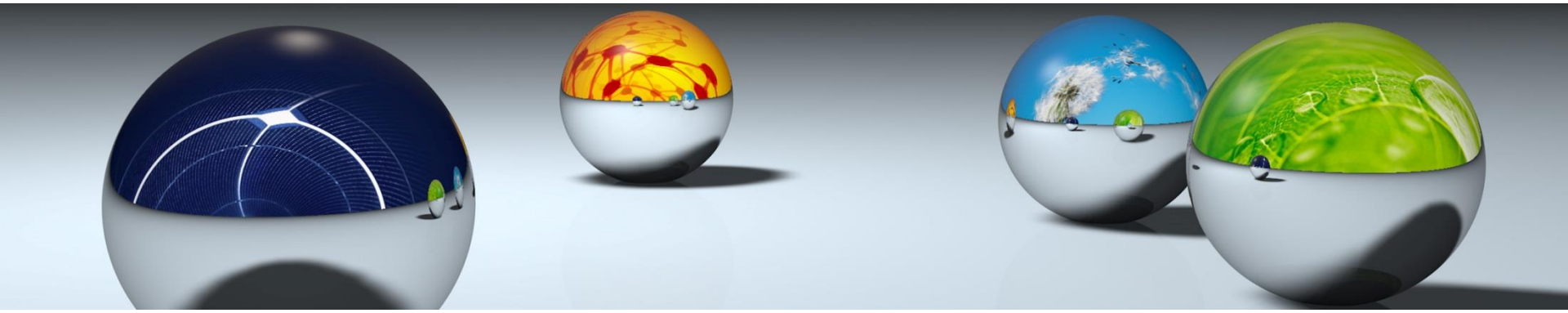


Implementation Plan of the PV Temporary Working Group

Christoph Hünnekes, Wim Sinke, Fabio Belloni

Content

- The SET Plan
- Declaration of Intent (DoI)
- TWP PV
- Implementation Plan (IP)
- Next Steps

What's the SET Plan?

- Key innovation pillar of the Energy Union
- Comprehensive energy R&I agenda to accelerate innovation and the energy transition
- Better alignment of European and National R&I programmes thus making better use of existing resources
- Integrated approach: going beyond technology silos
- Setting priorities: focus on specific targets
-

But

- The SET Plan is not a funding instrument

Energy Union and SET Plan priorities

Energy Union R&I and competitiveness pillar	SET Plan 10 Key Actions	SET Plan Declarations of Intent / Working Groups
Nº 1 in renewables	**Develop highly performant renewables**	• **PV** • Offshore wind • CSP • Ocean • Deep geothermal
	Reduce cost of key renewable technologies	
Smart EU energy system with consumers at the centre	Create new technologies and services for energy consumers	• Energy consumers • Smart cities and communities
	Increase the integration, security and flexibility of energy systems	• Integrated and flexible energy systems
Efficient energy systems	Increase energy efficiency for buildings	• Energy efficiency in buildings • Heating and cooling in buildings
	Increase energy efficiency in industry	• Energy efficiency in industry
Sustainable transport	Become competitive in the battery sector for e-mobility and stationary storage	• Batteries for e-mobility and stationary storage
	Strengthen market take-up of renewable fuels and bioenergy	• Renewable fuels and bioenergy
Carbon capture storage / use	Step-up R&I activities and commercial viability of CCS/U	• Carbon capture storage / use
Nuclear safety	Increase nuclear safety	• Nuclear safety

Main SET Plan steps

DONE

SET Plan 10 Key Actions:
Communication Sept. 2015

DONE

Setting targets: Declarations of Intent

DONE

Set-up of temporary Working Groups:
R&I activities to reach the targets

IN PROGRESS

Implementation Plans (R&I activities, Flagships, and monitoring mechanisms)

Actions mainly at national level (Joint R&I Actions or by individual countries) and at **EU level only when there's a clear added value**

Declaration of Intent

Agreed Strategic Targets in photovoltaic (PV) solar energy

Overarching goals: re-build EU technological leadership in the sector by pursuing high-performance PV technologies and their integration in the EU energy system; bring down the levelised cost of electricity from PV rapidly and in a sustainable manner to allow competition in electricity markets all over Europe. This will be achieved by:

1. Major advances in efficiency of established technologies (c-Si and TFs) and new concepts:
   - **Increase PV module efficiency by at least 20% by 2020** compared to 2015 levels;
   - **Increase PV module efficiency by at least 35% by 2030** compared to 2015, including with the introduction of novel PV technologies;

2. Reduction of the cost of key technologies:
   - **Reduce system hardware costs by at least 20% by 2020** as compared to 2015;
   - **Reduce system hardware costs by at least 50% by 2030** compared to 2015 with the introduction of novel, potentially very-high-efficiency PV technologies manufactured at large scale;

Declaration of Intent

3. Further enhancement of quality, lifetime and sustainability and hence improving environmental performance:
   - **Maintain proven system energy output** per year at at least **80% of initial level** for **30 years by 2020** and for **35 years by 2025**;
   - **Minimize life-cycle environmental impact** along the whole value chain of PV electricity generation, and increase recyclability of system components (in particular: of modules);
   - Perform **focused research** and apply & progress **eco-design requirements** in preparation of implementing **measures supporting maximum energy yield** (kWh/kWp) and **lowest life-cycle environmental impact** (pts/kWh);

4. Enabling mass realisation of "(near) Zero Energy Buildings" by Building-Integrated PV (BIPV) through the establishment of structural collaborative innovation efforts between the PV sector and key sectors from the building industry:
   - **Develop BIPV elements**, which at least include thermal insulation and water protection, to entirely replace roofs or facades **and reduce their additional cost by 50% by 2020, and by 75% by 2030** compared to 2015 levels**, including with flexibility in the production process,** (table in *Annex I*);
   - **Recognise the importance of aesthetics** in the activities of the implementation of NZEB;

Declaration of Intent

5. Major advances in manufacturing and installation:
   - Make available **GW-scale manufacturing technologie**s that reach productivity and cost targets **consistent with the capital cost targets for PV systems** (re: Target 2);
   - Develop **PV module and system design concepts that enable fast and highly automated installation,** to reduce the installation costs of both ground-mounted arrays and PV building renovation solutions, **by 2020**.

Temporary Working Group

- Composition
  - 11 Member States representatives (Cypress, Belgium, Estonia, France, Germany, Italy, Netherlands, Norway, Spain, Turkey)
  - Representatives of the E.C.:
    - from DG RTD, DG ENER and JRC
  - Stakeholder from industry (10) and research (5)

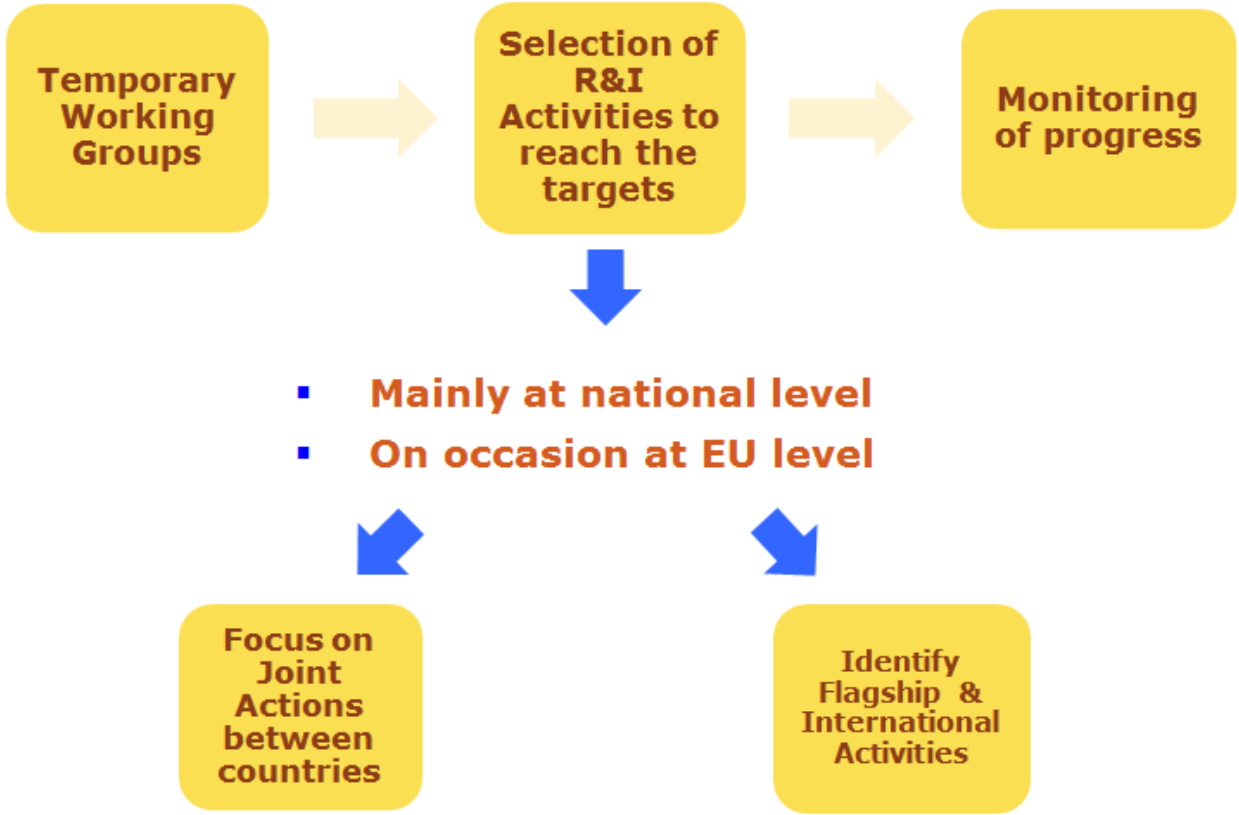
Temporary Working Group

- Role of SET Plan countries and stakeholders participating in the WG
  - Support the preparation of the Implementation Plan
    - Provide information on **ongoing R&I activities** (among which at least one Flagship)
    - Identify **new R&I activities** necessary to reach the targets
    - Highlighting concrete **non-technological barriers/enablers** experienced in their country
    - Seeking options for joint programming and funding in specific areas by groups of member states and private stakeholders
    - Sharing their experience, if any, in **monitoring** the targets

Temporary Working Group

- SET Plan countries not participating in the WG are kept informed about the progress
- Regular updates will be provided in SG meetings
- Implementation Plans must be discussed and endorsed by the SG

Implementation Plan



Implementation Plan

- Selection of R&I activities to be carried out
  - Crucial aspect of the Plan!
  - Maximum **10 R&I activities** to be selected
  - how to select the R&I activities:
    - bottom-up approach
    - first discussion at kick-off meeting,
    - DoI is starting point of discussion, furthermore the EU Integrated Roadmap, Solar ERA-Net guidelines, ITRPV Roadmap, …
- Identification of precise non-technological barriers/enablers

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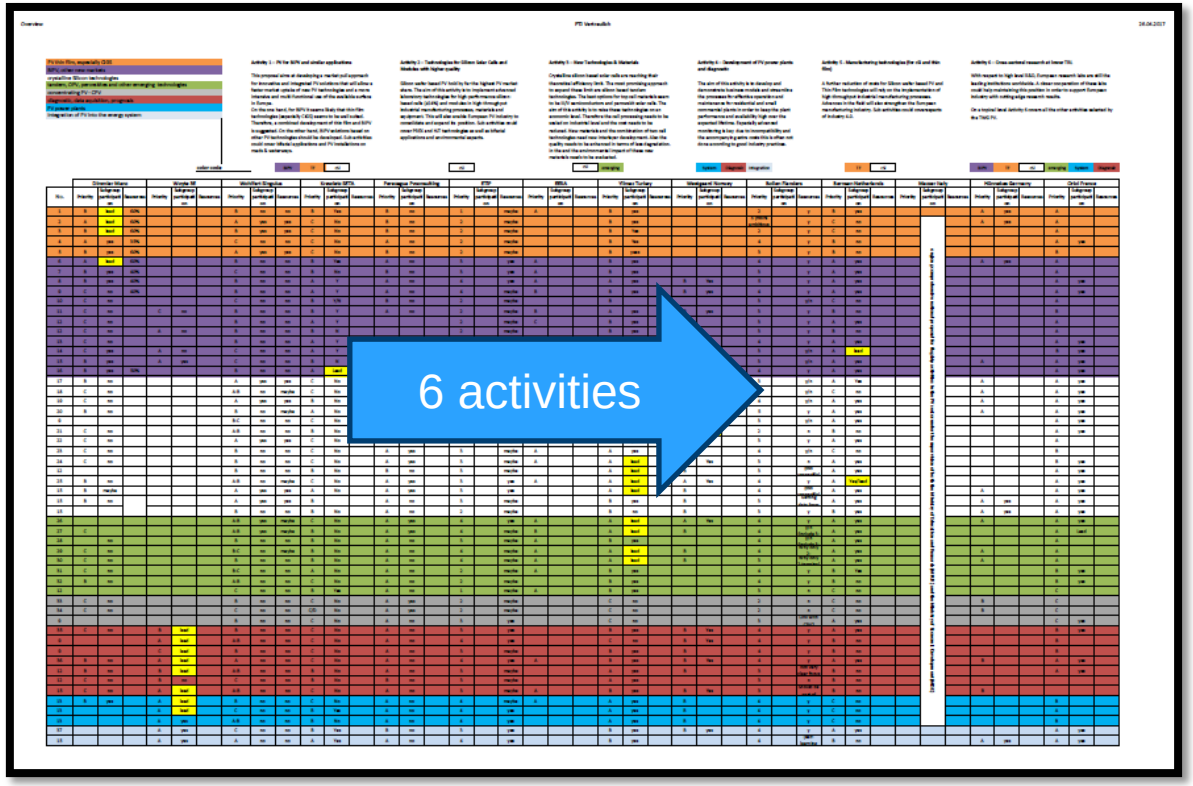
Implementation Plan

› Selection of R&I activities



Implementation Plan

› Selection of R&I activities

Activity	Description
PV for BIPV and similar applications	This proposal aims at developing a **market pull approach for innovative and integrated PV solutions** that will allow a faster market uptake of new PV technologies and a more intensive and multi-functional use of the available surface in Europe. On the one hand, for BIPV it seems likely that **thin film technologies (especially CIGS)** seems to be well suited. Therefore, a combined development of thin film and BIPV is suggested. On the other hand, BIPV solutions based on other PV technologies should be developed. Sub-activities could cover bifacial applications and PV installations on roads & waterways.

Implementation Plan

› Selection of R&I activities

Activity	Description
Technologies for Silicon Solar Cells and Modules with higher quality	Silicon wafer based PV hold by far the highest PV market share. The aim of this activity is to implement advanced laboratory technologies for **high-performance silicon-based cells (≥24%) and modules** in **high-throughput industrial manufacturing processes**, **materials** and **equipment**. This will also enable European PV industry to consolidate and expand its position. Sub-activities could cover PREX and HJT technologies as well as bifacial applications and **environmental aspects**.

Implementation Plan

› Selection of R&I activities

Activity	Description
New Technologies & Materials	Crystalline silicon based solar cells are reaching their theoretical efficiency limit. The most promising approach to expand these limit are **silicon based tandem technologies**. The best options for top cell materials seem to be III/V semiconductors and perowskit solar cells. The aim of this activity is to raise these technologies on an economic level. Therefore the cell processing needs to be **scaled on industrial level** and the cost needs to be reduced. New materials and the combination of two cell technologies need new interlayer development. Also the quality needs to be enhanced in terms of less degradation. In the end the **environmental impact** of these new materials needs to be evaluated.

Implementation Plan

› Selection of R&I activities

Activity	Description
Development of PV power plants and diagnostic	The aim of this activity is to **develop and demonstrate business models** and streamline the processes for effective **operation and maintenance for residential and small commercial plants** in order to keep the plant performance and availability high over the expected lifetime. Especially advanced monitoring is key, due to incompatibility and the accompanying extra costs this is often not done according to good industry practices.
Manufacturing technologies (for cSi and thin film)	A further reduction of costs for **Silicon wafer based PV** and **Thin Film technologies** will rely on the implementation of **high-throughput industrial manufacturing processes**. Advances in the field will also strengthen the European manufacturing industry. Sub-activities could cover aspects of **Industry 4.0**.

Implementation Plan

› Selection of R&I activities

Activity	Description
Cross-sectoral research at lower TRL	With respect to high level R&D, European research labs are still the leading institutions worldwide. A **closer cooperation** of these labs could help maintaining this position in order to **support European industry** with cutting edge research results. On a topical level activity 6 **covers all the other activities** selected by the TWG PV.

Implementation Plan

- Funding
  - **Main source**: National level (e.g. Governmental funding, stakeholders' funding, or a combination of both)
  - **When there's a clear EU added value**: by EU sources, provided that R&I activities are commensurate with relevant policies endorsed by the EU legislative bodies and with the mandate of the EC
  - **Joint R&I activities between SET Plan countries** (with or without EU funds) should be an important dimension of the Implementation Plans

According to the EC Implementation Plan template, the WG needs to specify who will implement **what**, with **which resources**, and **when**. This is a critical aspect.

Next Steps

- Set up subgroups on each activity which work on an detailed description of activities by End of June ´17 containing
  - targets
  - monitoring mechanism
  - total budget required
  - deliverables and timeline
  - Implementation instruments and indicative financing contribution

- July / August ´17: drafting of IP
- August / September ´17: revision of the draft within the TWG PV

- September ´17: draft IP provided for the SET-Plan secretariat

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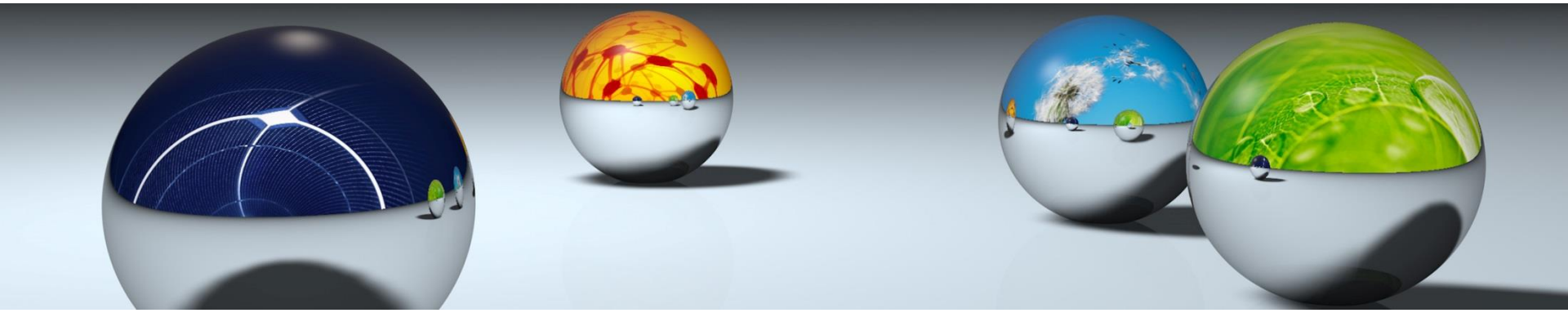

- Contacts
  - Chair Christoph Hünnekes (DE), ch.huennekes@fz-juelich.de
  - Co-Chair Wim Sinke (ETIP PV), sinke@ecn.nl
  - E.C. Fabio Belloni, fabio.belloni@ec.europa.eu