

# Optimising PV Research Infrastructures in Europe: Lessons learned from the SOPHIA Project

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## 1. Description

- Context and motivation
- Scope
- Consortium
- Objectives and activities

## 2. Main outcomes

- Transnational access activities
- Joint research activities
- Networking activities

## 3. Conclusions

Many PV research infrastructures exist all over Europe:

- Some are unique: BESSY3 (HZB, Berlin), super computer (FZ Jülich)
- Some are quite similar: PV module test facilities

This project was the first to promote on a large-scale an increased coordination in order to:

1. avoid unintended duplication
2. avoid unnecessary investment.
3. get more value out of the same budgets. « Working together to progress faster or to learn more » :
  - Benchmarking of characterisation methods,
  - Validation with a larger number of data to increase the confidence level

**Joining forces to offer better services for researchers  
from academia and industry**



- The project focuses on **8 topics** covering the whole value chain:
  - Silicon material
  - Thin films and TCOs
  - Organic PV
  - Modelling
  - CPV
  - BIPV
  - PV Module lifetime
  - PV module and system performance
  
- A link to the EERA PV Joint Programme is organised through:
  - Many common partners
  - Four topics are also addressed within EERA



Funding scheme : Integrating Activities

EU financial contribution : 9 M€

Duration : 48 months

Starting date : February 2011

- 17 research organisations, 3 associations for information exchange





- 17 research organisations, 3 associations for information exchange



**COORD**

**WPL**



**WPL**



**WPL**



**WPL**



**WPL**





Si material

## SoPhia RI: Your unique entry point to many European PV research facilities

● SoPhia RI is your gateway to the state of the art of PV technologies and applications. By combining scientific expertise with technological capabilities, Sophia RI provides you with innovative and efficient solutions to your challenges in the area of photovoltaics.

Free ccess to 48 Research Infrastructures : see "User access"

● **This website is under development.** We are doing our best to finalise all sections.

### Latest News

- > July 15–16th: First meeting of the IPVQA Forum
- > August 15th Organic PV meeting

### Next Events

- > 08.09.11  
Environment-Specific Module  
Durability Testing

### Technologies

- > Si Material
- > Organic PV
- > Thin Films

### Links



1. Access of European researchers to a portfolio of laboratories and test facilities,
2. Coordination of partners from academia and research institutes in order to address some specific challenges.

**Outstanding facilities  
(lab, characterisation  
tools)**

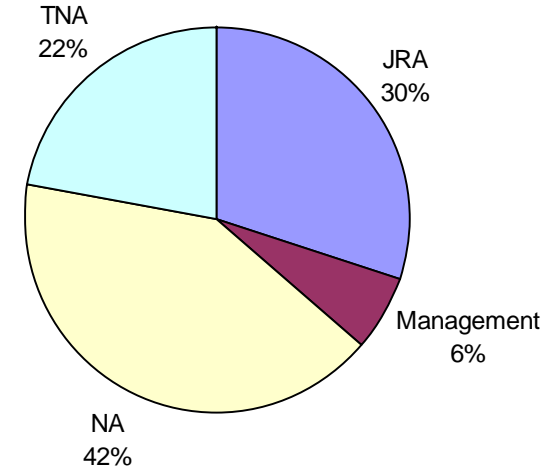
**Coordinated set of  
facilities (mainly  
characterisation and  
modelling)**

**Training**



- 1. Transnational Access Activities:**  
Free-of-charge transnational access for researchers, through a single entry point
- 2. Joint Research Activities:** Upgrade and improvement of the services of PV RIs
- 3. Networking Activities** for coordination and joint development of the RIs

**Grant per activity**



**A driver towards an increased coordination :**

**1. Listing existing Ris**  
Equipment, procedures

**2. Increasing coordination**  
Benchmarking, RoundRobin,  
improved procedures

**3. Developing joint strategy**

## 1. Description

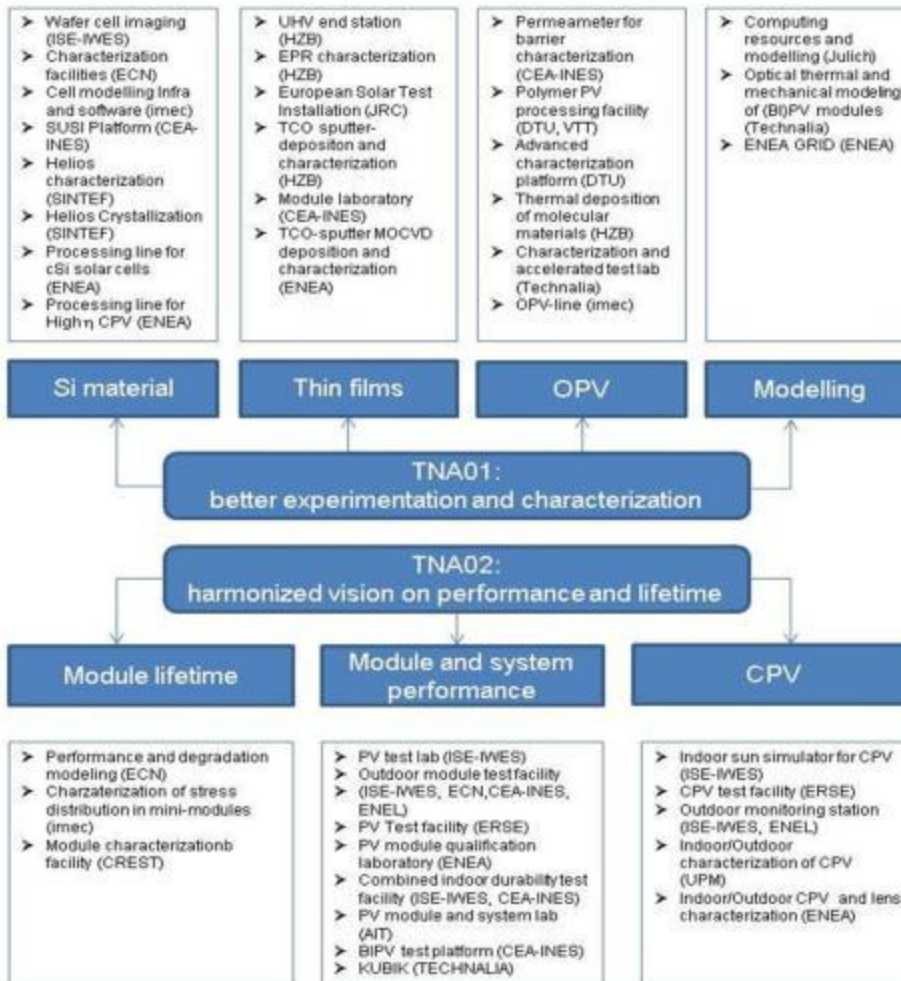
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## 3. Conclusions

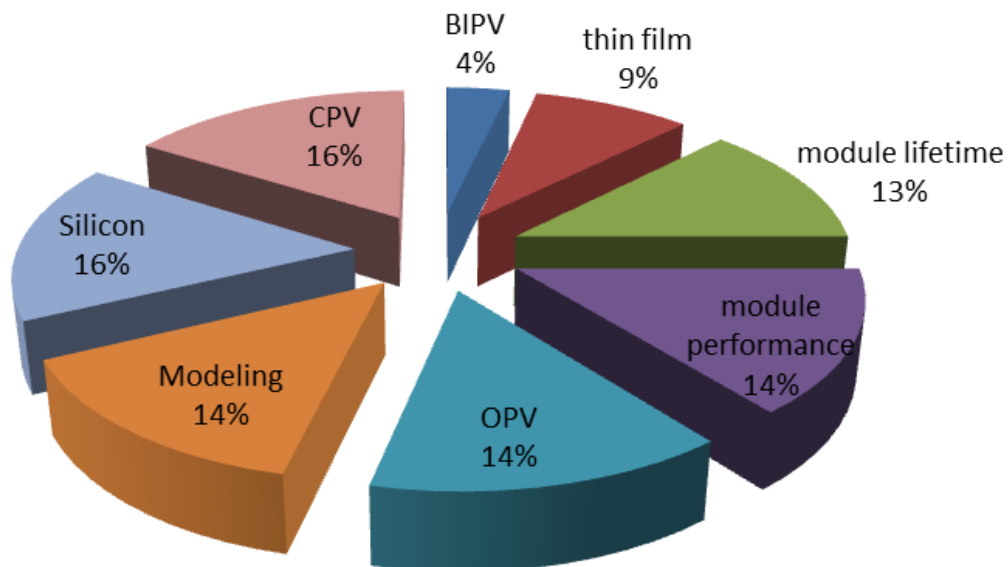
- Objective: provide free of charge and open access to 48 research infrastructures offering various services:
  - Prototyping
  - Better characterisation of materials and innovative technologies,
  - Performance characterisation and lifetime prediction of PV modules
  - Modelling



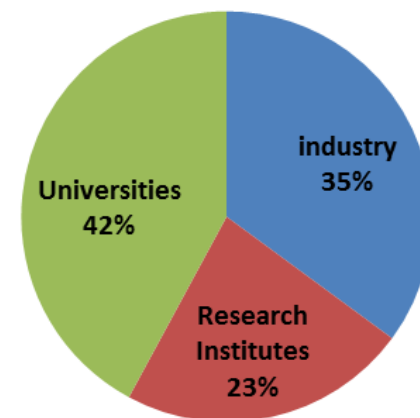
- **8 calls** for research proposals organised
  - Since January 2012
- **65 proposals** submitted in total, of which **50** were accepted

+

**Proposals' topics**



**Types of applicants**



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- Objectives: to improve and optimise the services provided by the research infrastructures.
- Work focused on four topics:
  1. Greater accuracy of rated power and energy output prediction of PV modules & systems
  2. Quicker lifetime prediction of PV modules through accelerated ageing tests and improved failure analysis procedures
  3. Improved Material characterisation procedures dedicated to:
    1. silicon material,
    2. thin films and TCOs,
    3. and organic solar cells
  4. Improvement and validation of software infrastructure for material, cell, module and system modelling

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### Objectives :

- Defining common objectives per each topic
- Benchmarking and developing common procedures for testing and characterising PV materials, modules and systems,
- Performing training and exchange activities for all European scientists (summer universities, exchanges)

### Results :

- 18 networking seminars and workshops
- 10 common databases
  - Sets of measurement data and test results:
  - Listing of test- and analysis capabilities: TNA infrastructures, TCO test facilities, PV systems and smartgrid test facilities, PV module test equipment, accelerated ageing test procedures, silicon imaging techniques
  - Overviews of modelling tools
- Test procedures and standards
  - Proposals of common testing procedures, and recommended best practices,
  - Contributions to IEC TC82 WG2 & WG7

- Staff exchange
- Training courses and summer schools
- E-learning platform: “SOPHi@Webinar”



- ❑ 21 webinars organised since March 2013
  - Around 2-3 events/month organized
- ❑ 570 participants in total (+ 60 in streaming)
  - Majority of non-SOPHiA members
- ❑ Information on all courses available on the Sophia “events” web page
  - <http://www.sophia-ri.eu/news-events/news/>
- ❑ Several pdf presentations of workshops and webinars (pdf, video) are available on-line on Sophia Events pages.

Six types of research infrastructures, all along the PV value chain

PV value chain

Material and equipment suppliers

Cell / Module manufacturers

System providers, installers

Integrated energy services, citizen

Investors

Research activities

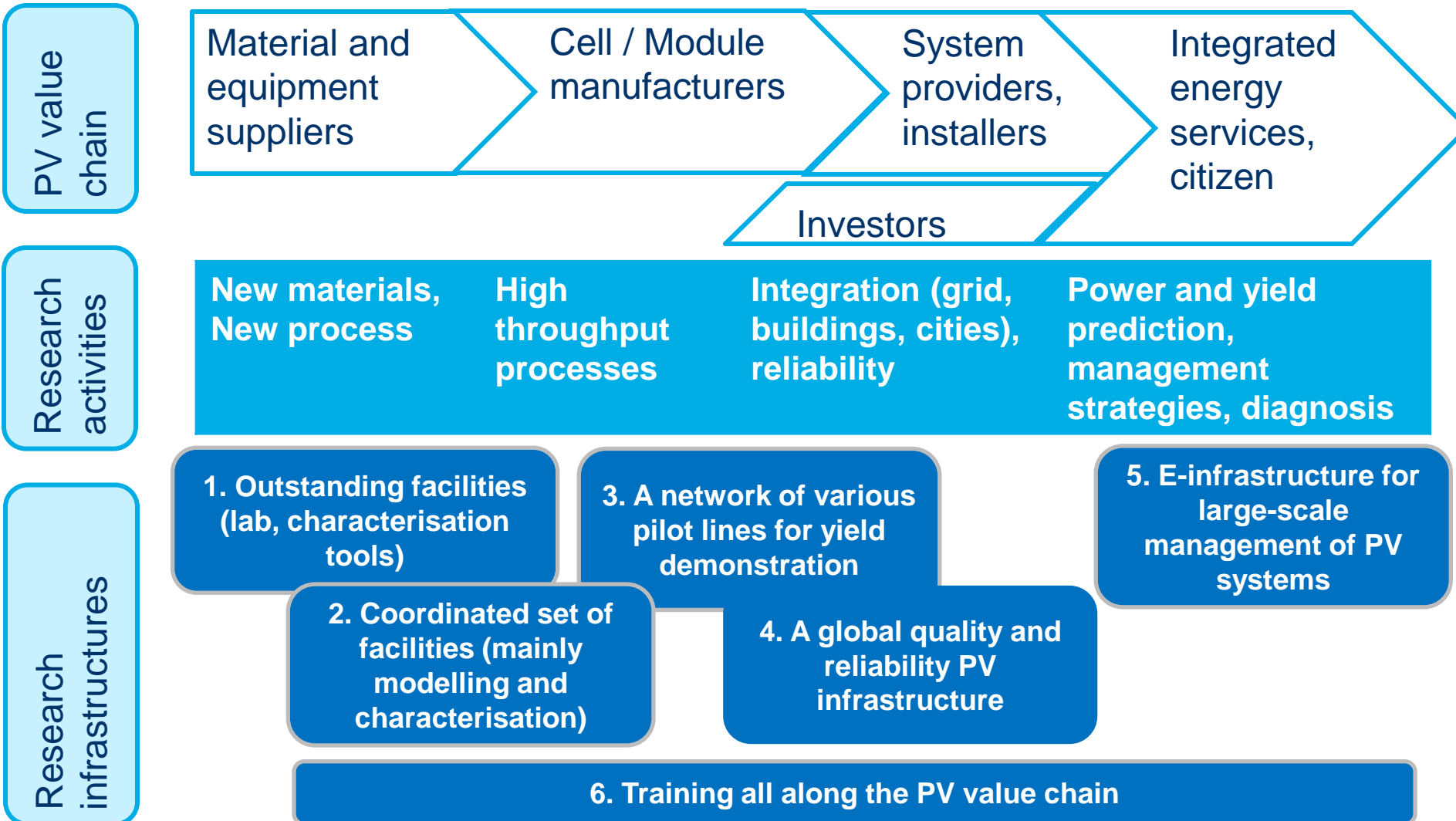
New materials, New process

High throughput processes

Integration (grid, buildings, cities), reliability

Power and yield prediction, management strategies, diagnosis

Six types of research infrastructures, all along the PV value chain





- This project provided the opportunity for a better coordination, following a three step approach :
    1. Listing RIs, by identifying current facilities, equipment and characterisation procedures
    2. Organising Round Robin tests and validating characterisation methods
    3. Developing joint strategies through elaboration of roadmaps
- 10 databases
- 5 Round Robins +  
1 large test plan
- 18 Workshops +  
webinars
- This first-of-its-kind project has gradually been gaining momentum (webinars, TNAs, ..), and it sets the basis for more in-depth collaboration
  - Many results to be disseminated:
    - 10 presentations at 29<sup>th</sup> EUPVSEC
    - 5 presentations at WCPEC 6
  - The “Research Infrastructure” concept has to be enlarged to cover the needs of all European researchers. It may also be extended to additional neighbouring countries

as part of the SOPHIA final event:

## **A Symposium on European PV Research Infrastructures**

- **January 22<sup>nd</sup>, 2015**
- **at CEA-INES  
in Chambéry (France)**

- What are the main achievements of the SOPHIA project ?
- How to keep European R&D at world-class level?
- What is the best way to support innovation in the PV industry?
- Should PV research infrastructure for quality & reliability be linked worldwide?
- Can Big Data bring big advantages in the area of solar PV system operation ?

