



# Photovoltaic Power Systems Programme (PVPS)

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PVPS



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## Outline

- The IEA Photovoltaic Power Systems Programme (PVPS)
- Belgian involvement
  - Task 1: Exchange and dissemination of information on photovoltaic power systems
  - Task 13: Performance and Reliability of Photovoltaic Systems
  - Task 14: High Penetration of PV Systems in Electricity Grids

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## The IEA PVPS Mission

To enhance the international collaboration efforts through which photovoltaic solar energy becomes a significant renewable energy option in the near future

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## IEA PVPS Objectives

- stimulate cost reduction of PV power systems
- increase awareness of PV's potential and value
- removal of technical and non-technical barriers for PV power systems in OECD countries
- enhance co-operation with non-OECD countries

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## IEA PVPS Ongoing Tasks

Task 1: Exchange and dissemination of information on photovoltaic power systems

Task 8: Very large scale photovoltaic power generation systems in remote areas

Task 9: Deploying PV Services for regional development

Task 11: PV hybrid systems within mini-grids

Task 12: PV environmental health and safety

Task 13: Performance and Reliability of Photovoltaic Systems

Task 14: High Penetration of PV Systems in Electricity Grids

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## Belgian Participation

Task 1: Exchange and dissemination of information on photovoltaic power systems (APERe)

Task 13: Performance and Reliability of Photovoltaic Systems (3E)

Task 14: High Penetration of PV Systems in Electricity Grids (3E)

*Observer since March 2011*

*Signature of Implementing Agreement medio 2012*

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## Funding

- Service public de Wallonie – Département de l'énergie et du bâtiment durable
- Brussels Hoofdstedelijk Gewest / Région de Bruxelles-Capitale – IBGE/BIM
- Vlaams Gewest – Vlaams Energieagentschap

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## Task 1: Exchange and dissemination of information on photovoltaic power systems

Trends in photovoltaic applications in selected IEA countries, 17<sup>th</sup> ed., 1992 – 2011 coming soon

Newsletter PVPower Update

PVPS website [www.iea-pvps.org](http://www.iea-pvps.org)

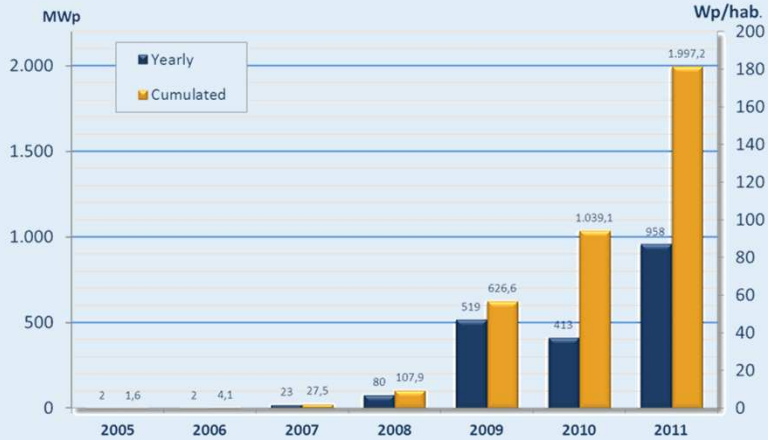
Dedicated workshops



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# PV Market Growth for Belgium



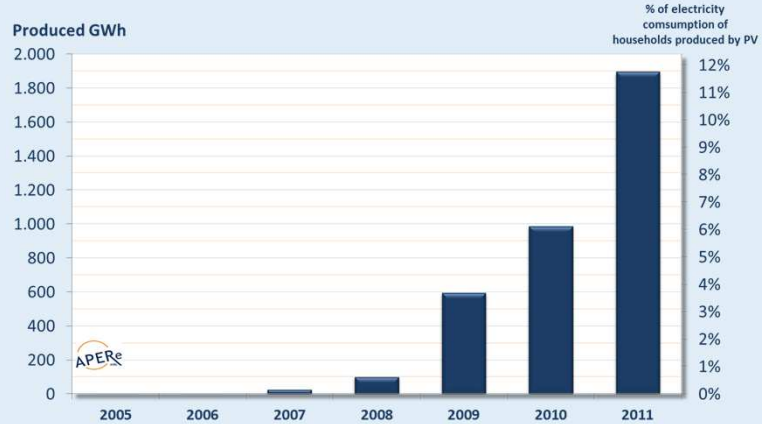
**2,058 GwP installed in April 2012**

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# PV Power Generation

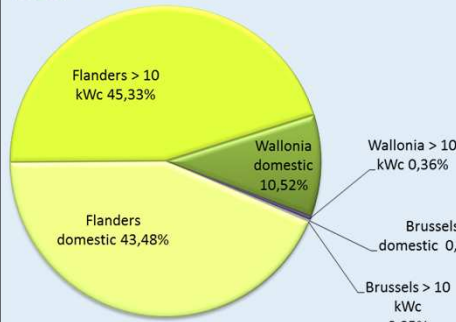
± 900 kWh/KWp  
1,8 TWh produced which is almost 12% of the electric households consumption



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## Market Segments



### Installed capacity

- 46 % of Large scale projects
- 54 % residential roof tops

### Amount of PV systems

- 232.406 installations
- 5% households has a PV system
- 98% of small scale systems (> 10 kWp)

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## Task 13: Performance and reliability of PV systems (2010 – 2014)

Subtask 1: Statistical System Performance Analysis

Subtask 2: Analytical PV System Assessment

Subtask 3: PV Module Characterisation and Performance Assessment

Subtask 4: Dissemination



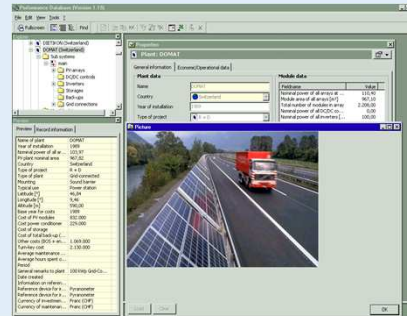
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## Subtask 1: Statistical System Performance Analysis

- Performance database for public access
- Monthly monitoring and performance data from well-monitored PV systems world wide
- Task 13 is looking for data from well-monitored PV systems.  
Please contact [Mauricio.Richter@3E.eu](mailto:Mauricio.Richter@3E.eu)

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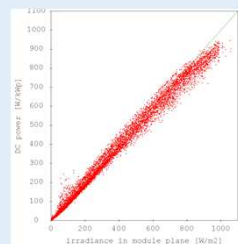
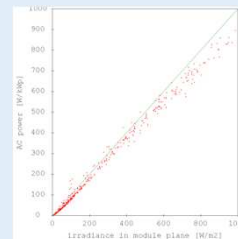


## Subtask 2: Analytical PV System Assessment

### Belgian involvement

**Activity 2.1:**  
Understanding PV System Operation  
Through Modelling

**Activity 2.2:**  
Understanding Effects Related to New  
Technologies



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## Subtask 2: Analytical PV System Assessment

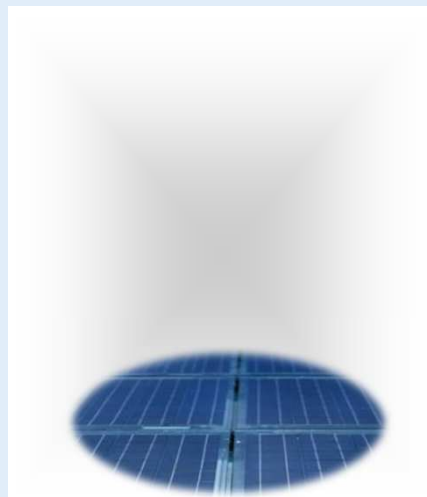
### Exemplary Result from 3E – Irradiance Sensor Comparison

- Cheap silicon sensors are often strongly biased and cannot serve for performance verification
- Pyranometer measurements are sufficiently precise
- Satellite data can serve but are intrinsically less precise than pyranometers

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## Task 14: High-Penetration of PV Systems in Electricity Grids (2010 – 2014)



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## Overall Goal of Task 14

- Promote the use of grid connected PV as an important source in electric power systems also on a high penetration level where additional efforts may be necessary to integrate the dispersed generators in an optimum manner.
- Develop and verify mainly technical requirements for PV and electric power systems to allow for high penetrations of PV systems interconnected with the grid
- Discuss the active role of PV systems related to energy management and system control of electricity grids

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## Technical Issues Tackled

- Aspects related to the fluctuating nature of PV in relation to electricity demand
- Grid interaction and penetration related aspects related to local distribution grids and
- Central PV generation scenarios.
- Inverters with multifunctional characteristics as smart interface between the source and the electricity network.
- Modeling and simulation techniques to evaluate the aforementioned technical issues.

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## Task 14 Work Plan

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- **Cross Cutting Subtask: Information Gathering, Analysis and Outreach**  
Collect and share state of the art information amongst the various tasks as well and collate information for the general public.
- **Subtask 1: PV generation in correlation to energy demand**  
Show and determine how with better prediction tools and optimized local energy management, PV penetration can be improved in grid.
- **Subtask 2: High penetration PV in local distribution grids**  
Identify and interpret the role of PV in distribution grids and includes an impact analyses of high PV penetration in distribution grids
- **Subtask 3: High penetration solutions for central PV generation scenarios**  
PV integration into power systems from the total power system view point, based on the forecasting, power system operation and power system augmentation
- **Subtask 4: Smart inverter technology for high penetration of PV**  
Inverter technology, technical requirements and standards, and system integration aspects for H-P PV



## Task 14 Results

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- PV forecasting state-of-the-art report ongoing
- Contribution to international case studies from Belgium (EU project MetaPV)
- Task 14 Utility Workshop scheduled for May 2013 in Belgium



## Conclusions

- IEA PVPS Participation since March 2011
- Financed by the three Belgian regions
- Task representation by APERe and 3E
- Tasks
  - Exchange and dissemination of information
  - Performance and Reliability
  - High Penetration in Electricity Grids

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