EU vision on Photovoltaics
EU Renewable Energy Policy Framework

Winter School on Photonics for Energy
March 12-14, 2010
Romme, Sweden

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New & Renewable Energy Sources
State of play of Renewable Energy in the EU
- Energy Policy for Europe - Strategic Objectives
- Climate and Energy Package
- New RES Directive

SET - Plan and Industrial Initiatives

PV Support Programmes
- IEE II (2007-2013)
- RTD FP7 (2007-2013)
State of play of Renewable Energy in the EU
European Renewable Energy Policy and its Bases

- Renewable energy promotion since 1997 - White Book (12% by 2010)
- National and EU targets for RE electricity Dir. 2001/77/EC (EU: 21% by 2010)
- National and EU targets for RE in transport Dir. 2003/30/EC (EU: 5.75% by 2010)
- EU and national binding targets by 2020 for Renewables 2009/28/EC

✔ Growing concern about security and continuity of energy supplies
✔ Climate change
✔ EU competitiveness
Energy Policy for Europe
Strategic Objectives

- Sustainability: world leadership in halting climate change
- Security of supply: oil & gas supply concerns, price volatility
- Security and continuity of energy supplies
- Renewable Energy Sources and Energy Efficiency
- Competitiveness: world-leading innovative industrial sector

- Climate change

- Renewable Energy Sources
- Energy Efficiency

- Competitiveness
- Competitiveness

- Sustainable development
- Security of supply
Climate and Energy package

- European Parliament and Council agreed climate and energy measures on 17 Dec 2008

- Climate and Energy package aims, by 2020:
  - Reducing EU GHG emissions by 20%
  - Boosting share of Renewables to 20% of total consumption
  - Increasing energy efficiency by 20%

- Bottlenecks:
  - Administrative barriers
  - Grid constraints
  - Low support in certain MSs
  - Lack of information and knowledge
The Renewables Directive 2009/28/EC

1. Sets mandatory national targets for renewable energy shares, including 10% renewables share in transport (also RES-E), in 2020

2. Requires National Action Plans

3. Introduces the possibility of statistical transfers, joint projects and joint support schemes between Member States and of joint projects between Member States and 3rd countries to provide flexibility to Member States in reaching their targets

4. Requires reduction of administrative barriers to the growth of renewable energy, improvements in provision of information and training and improves renewables’ access to energy grids

5. Creates a sustainability regime for biofuels
### The Renewables Directive 2009/28/EC

- April 2009: All Member States confirm commitments.

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**General Secretariat of the Council**

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**Sitting date**

06/04/2009

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*Qualified majority is reached if at least 275 votes in favour are cast by at least 14 Council members.*

For information only

Member States’ targets:

- Based on 2005 starting point, recent progress and a balanced sharing of the effort, weighted by GDP/capita
National Action Plans (NREAPs)

- Setting out the pathway towards the 2020 national target for each Member State.
- Critical for:
  - the necessary stability / predictability for investors
  - the Commission's ability to effectively enforce the Directive and keep Member States on track
  - The Member States to have an adequate implementation strategy
  - transparency of RES developments in the EU
National Action Plans (NREAPs)

National plans to be submitted by Member States by 30 June 2010 setting out:

- national sectoral targets and trajectories adequate measures to achieve the overall target
- planned statistical transfers or joint projects
- support schemes for each type of renewable energy
- measures to remove administrative barriers
Member States shall:

- ensure that rules for authorisation, certification and licensing procedures for RES are streamlined, transparent, non-discriminatory, proportionate and necessary
- provide priority or guaranteed grid access and guarantee transmission and distribution of renewable electricity
- take the appropriate steps to develop infrastructure
- introduce appropriate measures in building regulations and codes to increase the use of renewable energy in buildings
European Strategic Energy Technology Plan (SET-Plan)
European Strategic Energy Technology Plan (SET-Plan)

- 2020 targets: the three 20%
- 2050 target: developed countries should cut their GHG emissions by 80% by 2050 - G8 in Aquila
- Today’s EU primary energy supply: 80% dependent on fossil fuels (coal, oil, gas, the main sources of CO2 emission)
- A critical challenge: from 80% dependency on fossil fuels to 80% reduction in GHG emissions in 40 years!
  - A reinvention of our energy system
  - A need to move to a low carbon economy – not easy, cheap or swift
  - Technology and the efficient use of the resources are essential for this transition
EU’s response : the SET Plan

- The SET-Plan, adopted in November 2007, is the technology pillar of the EU's energy and climate change policy
  - Objective is to accelerate the development of low carbon technologies leading to their market take-up
  - Vision of a Europe with world leadership in a diverse portfolio of clean, efficient and low carbon technology – as a motor for growth and jobs
SET-Plan measures

- Joint strategic planning:
  - Steering Group
  - Information system: SETIS

- Effective implementation:
  - European Industrial Initiatives
  - European Energy Research Alliance
  - Trans-European Energy Networks and Systems of the Future – transition planning

- Increase in resources: both financial and human
The SETIS is the online SET Plan Information System, launched by the Commission on 7 October 2009: [www.setis.ec.europa.eu](http://www.setis.ec.europa.eu).

The SETIS enables the monitoring of the SET Plan actions, the assessment of its impact on policy and the identification of corrective measures if needed.

- **The Capacity Map**: monitor R&D effort made by the industry and the public sector in EU on key low carbon technologies.
- **The Technology Map**: gather key information on the status and prospects of low carbon technologies.
Technology Roadmaps 2010-2020:

- Technological objectives → Concrete action plans → Estimated investments needed for the period 2010-2020 to achieve:
  - Up to 20% of the EU electricity produced by wind energy technologies by 2020.
  - **Up to 15% of the EU electricity will be generated by solar energy in 2020.**
  - By 2020, 50% of networks in Europe operate along “smart principle” effectively matching supply and demand.
  - 25 to 30 European cities will be at the forefront of the transition to a low carbon economy by 2020.
PV Technology Roadmap shows

- Investment over the next 10 years is crucial
- Without proper regulatory framework no success of the SEII possible
- Opportunity for industry
- Solar European Industrial Initiative is to transform the vision into reality

The technology roadmaps help to:
- Identify key challenges and bottlenecks
- The actions to tackle them
- The investment needed and
- The optimal level of intervention
PV Technology Roadmap

2010

Reducing PV electricity generation cost

RTD Programme focused on enhancing performance (materials/cells/modules)

Development of new advanced high-yield manufacturing processes

2012

Development of advanced multifunctional modules for BIPV

2015

Demonstration phase: 10 Solar Cities

Development of PV specific storage and distribution solutions

Development of new and advanced BoS with specific functionalities for stand-alone systems

2017

Demonstration phase: 10000 electric vehicles charged through solar installations

Increased conventional PV module and system conversion efficiency to >25%, CPV to >35%

Demonstration phase: New pilot production lines

Reduced PV system cost to <1.5€/Wp

2020

Demonstration phase: 5 centralised PV power plants

Integrating PV into the European Grid
Six new European Industrial Initiatives:

- European Wind Initiative
- Solar Europe Initiative (PV + SCP)
- Bio-energy Europe Initiative
- European Electricity Grid Initiative
- European CO2 capture, transport and storage initiative
- Sustainable fission initiative (Gen IV)

Illustrative examples:

- Fuel cells and hydrogen (JTI on-going)
Depending on the success of the SEII up to 15% (PV: 12%; CSP: 3%) of the EU electricity could be generated by solar energy in 2020.
Solar European Industrial Initiatives

PV Technology objectives:

- PV Systems to enhance the energy yield and reduce costs
  - To increase conversion efficiency, stability and lifetime.
  - To further develop and demonstrate advanced, high-yield, high-throughput manufacturing processes
  - To develop advanced concepts and new generation of PV systems

- Integration of PV-generated electricity
  - To develop innovative, economic and sustainable PV applications
  - To develop grid interfaces and storage technologies capable of optimising the PV contribution
Solar European Industrial Initiatives

PV Technology objectives:

SEII 1: Cost Reduction
- Improving manufacturability
- Materials development & sustainability
- Enhancing Performance

SEII 2: System Integration
- Advance grid integration
- Large-scale grid integration analysis
- Solar resources prediction & Monitoring
- Code, standards, regulation

Demonstration & Deployment projects
- Advance pilot lines
- Large integration of PV in urban areas (focus on BIPV)
- Large integration of active PV distributed power generation (focus on grid integration)
- Large-scale PV power generation (focus on large demonstration of new concepts and technologies)

Smart grids initiative
Energy Efficient Buildings initiative
Green Cars initiative

Education & training
Awareness
SEII-PV Implementation Plan
priority area (1)

- **Cost reduction: paving the way to 2020**
  - Advanced manufacturing processes for cells and modules
  - Performance enhancement and lifetime extension
  - Materials development & sustainability

- **Aims at:**
  - Performance/lifetime optimization
  - Cheaper device designs and processes
  - Affordable materials and equipment
SEII-PV Implementation Plan
priority area (2)

System integration: paving the way to 2020
- Large-scale deployment
  - Grid integration: “smart” system components
  - Building integration
- Large-scale PV power plants
- Solar resources, monitoring and simulation

Aims at:
- Developing and demonstrating intelligent “smart” system components
- Supporting a robust European “smart grid”
Preparing for cost and penetration beyond 2020 levels
- Ultra low cost technologies
- Very high efficiency approaches
- Integration concepts for very high levels of PV penetration

Aims at:
- Exploring the limits of photovoltaic conversion
- Developing and demonstrating new integration concepts
EU Energy Research Alliance

- EERA key objectives:
  - To conceive and implement joint programmes of research in support of the SET-Plan priorities.
  - To work towards a long term, durable integration of excellent but dispersed research capacities across the EU.
  - To develop links and sustained partnerships with industry.
  - To develop training, education and outreach activities.

- Signature of a Declaration of Intent by 10 leading institutes on the 27 October 2008 (CEA, CIEMAT, CRES, ECN, ENEA, INETI, Juelich, UK ERC, RISOE, VTT) facilitated by EC
EU Energy Research Alliance - PV

- EERA-PV focusses explicitly on research topics which provide input for accelerated development of PV technology
- The areas selected for initial joint programming in EERA-PV are:
  - silicon materials
  - (inorganic) thin film PV
  - organic PV
  - module technology
  - education and training and use of infrastructures
EU investment trends...

- R&D to non-nuclear SET-P priority technologies
- Other non-nuclear energy R&D
- Nuclear energy R&D

2007 (Gap filled)

- H2/FC: 30%
- PV: 33%
- Wind: 7%
- Transport biofuels: 6%
- Smartgrids: 9%
- CCS: 7%
- CSP: 3%
- Energy efficiency: 22%
- Fossil fuels (excl. CCS): 18%
- RES (excl. PV, CSP, wind, biofuels): 17%
- Other energy R&D: 11%
- Electric power conversion: 31%
- Energy system analysis: 15%
- Energy storage: 7%

Source data: IEA
Investment has to increase

- Need for a step change in investment

- From 3b€ to 8b€ per year (public and private)
  = an additional investment of 50b€
  over the next 10 years

- IEA World Energy Outlook 2009:
  additional 10.5 trillion $ over baseline up to 2030

- Translating into huge global market opportunity
Possible sources of public funding

- EU Emissions Trading System (ETS) – potential virtuous cycle of reinvesting auction revenues
- 300m EU Allowances from the New Entrants Reserve for demonstration projects (CCS and RES)
- EU programmes add value:
  - can take on high risk, high cost, long-term programmes
  - economies of scale and strong leverage effect
  - optimising the portfolio of funding projects

But, current resources are not on the scale needed!!!
New Entrants Reserve: 300m EU Allowances

COMMISSION DECISION of […] laying down criteria and measures for the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of CO2 as well as demonstration projects of innovative renewable energy technologies under the scheme for greenhouse gas emission allowance trading within the Community established by Directive 2003/87/EC of the European Parliament and of the Council.
NER300
Financial Resources

Today's value

B€

FP7 (EC) Energy

EEPR (CCS & Wind)

NER300
FP7 & NER300

Technology Development Cycle Coverage

Technology Size

Large

Medium

Small

fp7

NER 300

Valley of Death of Innovation

Research  Develop  Pilot  Demo  Commercial
NER300 Decision

- 2 Feb 2010 - Approved by Climate Change Committee
- May 2010 - Parliament scrutiny
- End of May 2010 - Formal Adoption by Commission

1st Call (200 M EUA)

- Early summer 2010 - Publication
- 31 Oct 2010 - Deadline for submission to MS
- 31 Dec 2010 - Deadline for submission to EIB
- 31 Dec 2011 - Deadline for Award Decision

2nd Call (100 M EUA)

- 31 Dec 2013 - Deadline for Award Decision
Large-scale concentrator photovoltaics power plants with nominal capacity 20 MW

Large scale multi-junction Si-thin-film photovoltaics power plants with nominal capacity 40 MW

Large scale CIGS-based photovoltaics power plants with nominal capacity 40 MW
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Working together

EIIS
EIT
Basic science
Industry
InCo
MSs
NER300 Demos
EERA
EIB
ESFRI

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Commission calls for:

- An increase in investment – public and private – for the development of low carbon technologies
- Support for the Technology Roadmaps as the basis for launching the Industrial Initiatives
- Focus Community programmes on the SET-Plan initiatives, including through joint programming
- Reinforcement of the financial instruments involving the EIB Group
- A new look at financial engineering for large projects and early market replication
PV Support Programmes
IEE-II Programme (2007-2013)

- IEE-II runs seven years, total budget EUR 720 million
  - reduce non-technological barriers to growth in sustainable energy markets
  - contribute to develop and implement EU policies and legal frameworks
  - help to establish RES technologies in mainstream markets and supply chains

- Four new IEE-II projects on PV started
  - PVs in BLOOM, fosters realization of PV plants (50 kW to 2 – 3 MW) in marginal lands (terrains that are no longer able to answer positively to investments or that have exhausted their primary and exclusive function)
  - PV-NMS-NET, supports PV markets development in new MS
  - PV LEGAL, produces database on market barriers to PV systems in EU
  - QUALICERT, concerns qualification of PV installers, required by RES Directive
FP7 (2007 – 2013), EUR 50,5 billion*

Cooperation; 32.413

JRC (non-nuclear); 1.751

Capacities; 4.097

People; 4.750

Ideas; 7.510

*Fusion, fission & JRC nuclear activities covered in separate Euratom treaty EUR 2.7 billion
EU FP Investment in PV, 2003-2009

FP Investments in PV, 2003-2009 (Euro million)

- Production equipment & processes
- Innovative installations & grid interconnections
- Building integration
- New concepts
- Concentration PV
- Thin-films
- Wafer-based Si

FP7 (07,08,09) vs FP6 total

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EU FP Investment in PV Call 2011

- 2011 calls will be published in July 2010
  - FP7- Energy – 2011
  - FP7- NMP – Energy – 2011
  - FP7- Energy – Japan – 2011
- NER300 call will be published in June 2010
Thank you for your attention!

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