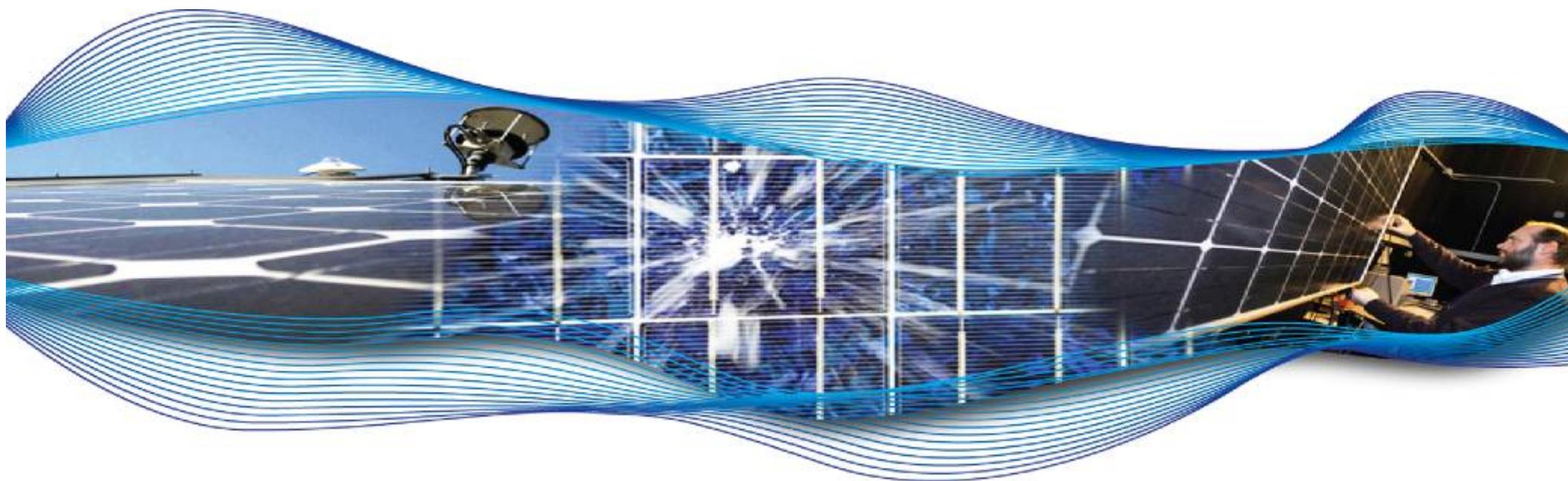


Photovoltaic Solar Electricity

Renewable Energy Unit Institute for Energy

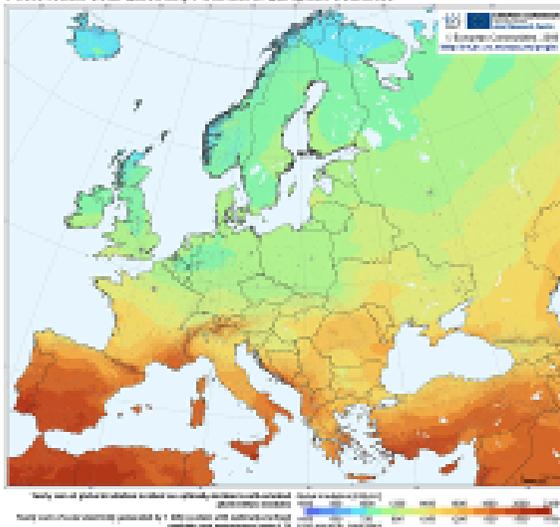


- *Do next generation photovoltaic technologies also have 30 years lifetime? Or more? ... and how do they end their life? ... after how much electricity produced?*
- *Does the buyer really get what he pays for? (performance verification)*
- *Where is PV best located? Does it pay to track the sun's movement and to concentrate power?*
- *Can we push the technology to its efficiency limits? (>60%)*
- *What kind of large-scale distribution do we need?*

- European reference lab for PV performance
- ISO 17025 accreditation, with full traceability to SI units and best-in-class uncertainty levels



Photovoltaic Solar Electricity Potential in European Countries



Facilities:

- 6 indoor solar simulators for performance evaluation of cells and modules
- 2 climatic chambers for lifetime testing
- Large outdoor test field, including tracking systems, building-integrated PV and meteo tower
- PV-GIS solar resource analysis tool

Commission

JRC

Annual Work Prog.

- R&D
- Testing and/or R&D performed under MoUs or Collaboration Agreements

Shared Cost R&D Projects (DG-RTD)

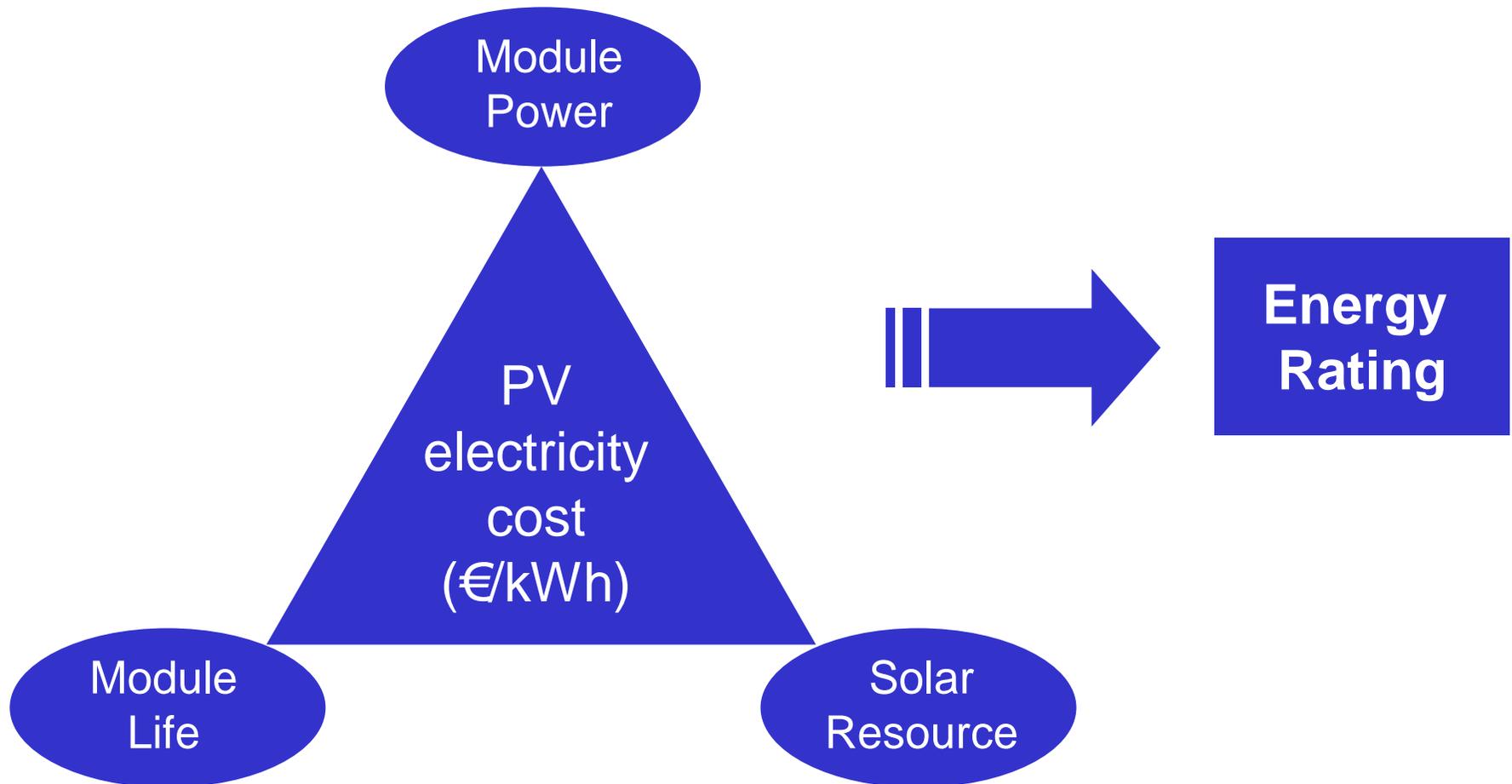
Other DGs

“Administrative arrangements” with policy DGs

External

Testing services (ESTI price list)

R&D contracts with third parties

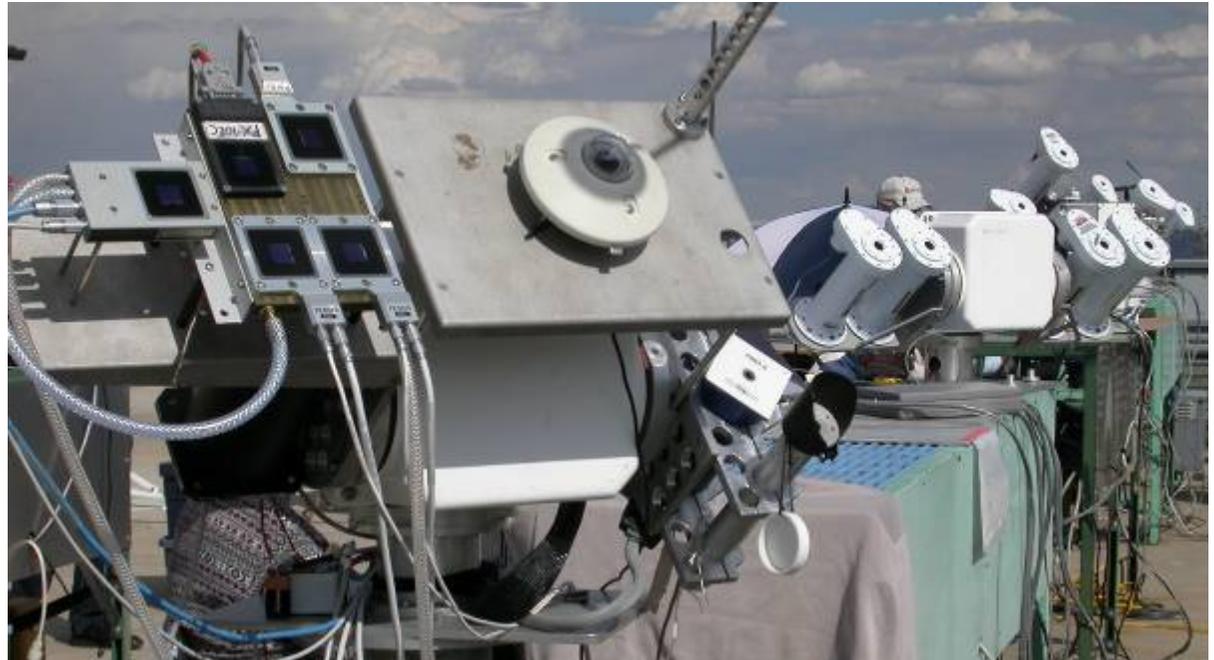


Market value of $\pm 1\%$
uncertainty:

2007: ± 240 Mio€

2010: ± 1050 Mio€

**) assuming worldwide production/capacity
figures and an average price of 3€/Wp*



**Consumers and industry rely on accurate
performance measurement**

- § calibration of reference devices under ISO 17025 accreditation
- § 2 major European intercomparisons
- § 2 new industrial collaborations
- § new capabilities for (tandem thin film modules and cells for concentrator PV systems)

2009- Calibration of reference devices		
Scope	No.	Client
MoUs, supporting traceability in the EU	45	AIT, CENER, ECN, ENEA, FhG-ISE
Commercial	44	BP Solar, Mitsubishi, Oerlikon, Tenesol, Wuerth Solar,
ESTI reference cells	27	Internal annual calibration

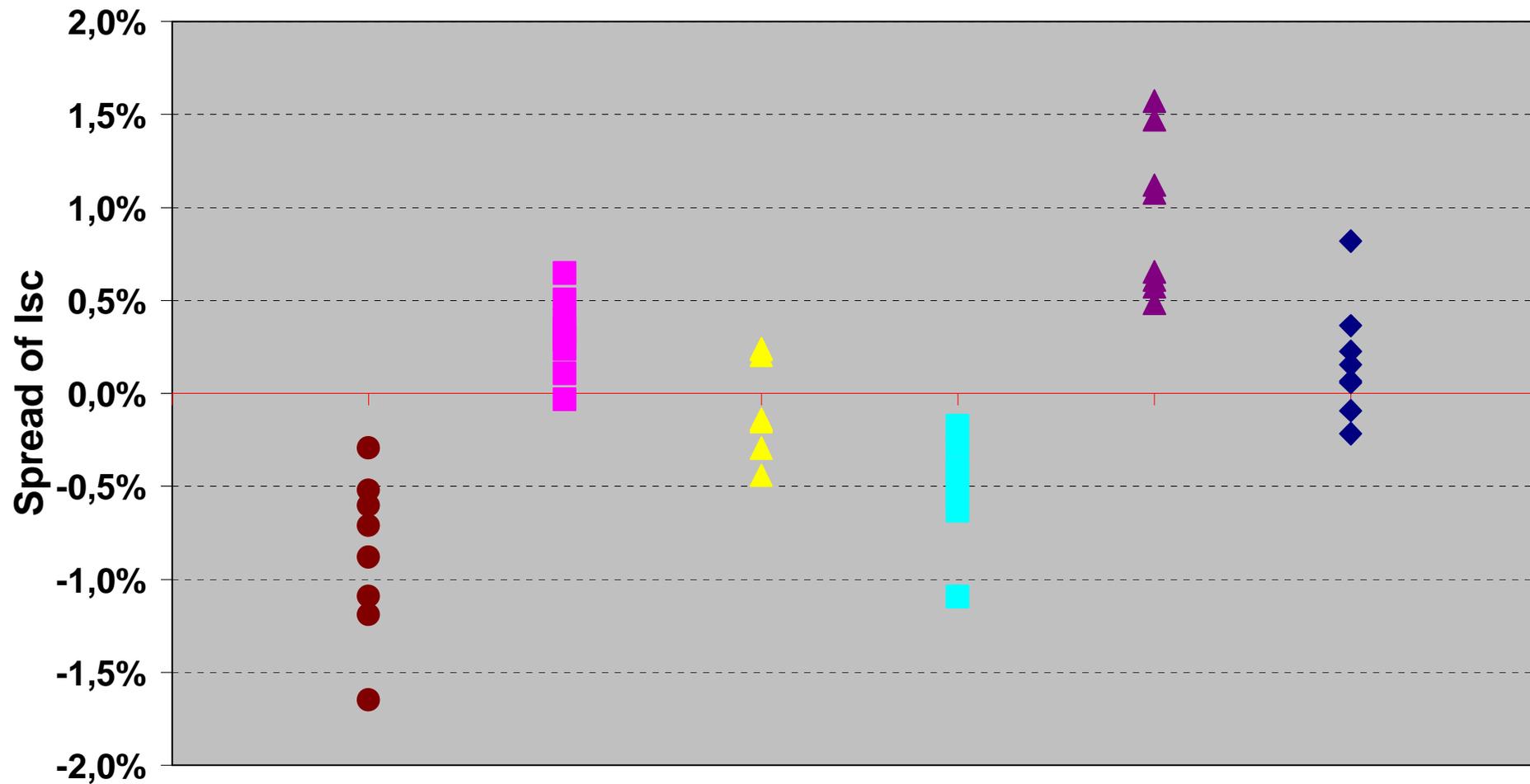


Recent Highlights:

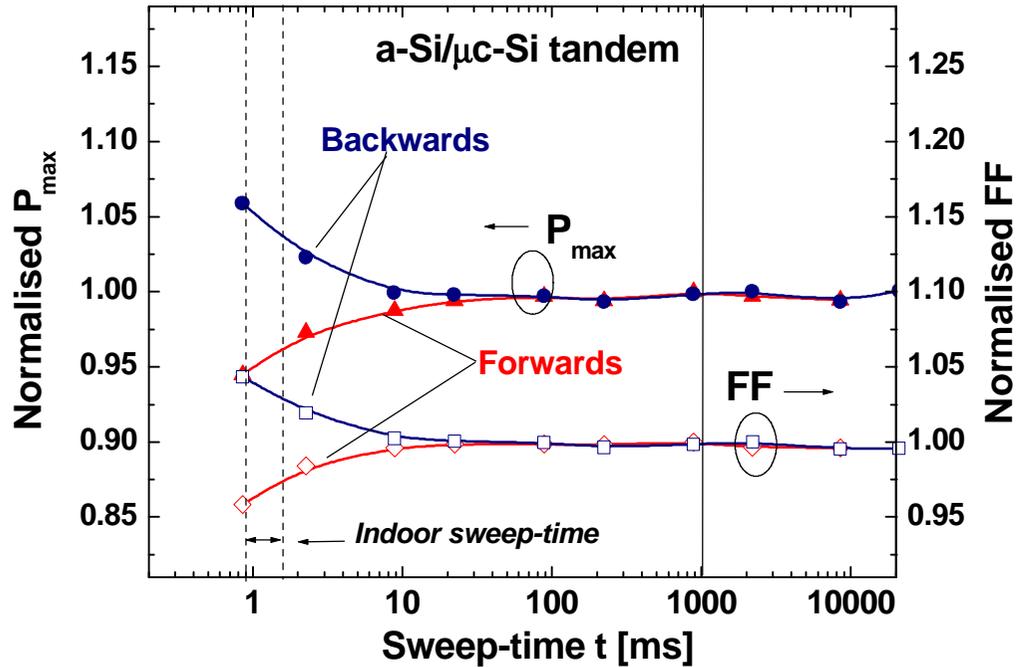
- ***Nov. 2009: calibration of the new world record crystalline silicon PV module with 17% efficiency from ECN/REC***
- ***Feb. 2010: first calibration certificate for tandem a/ μ aSi module, including spectral response correction***

Spread of reported Isc values @ STC

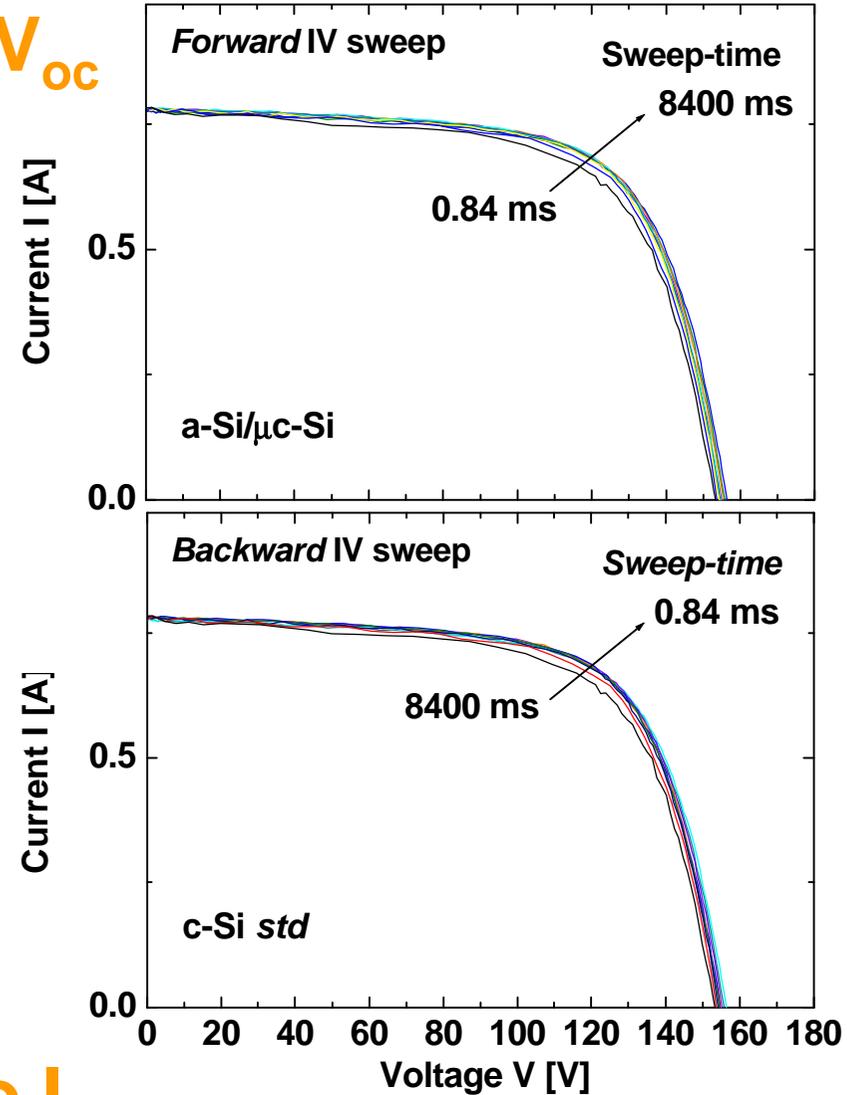
Deviation from module averages



a-Si/ μ c-Si



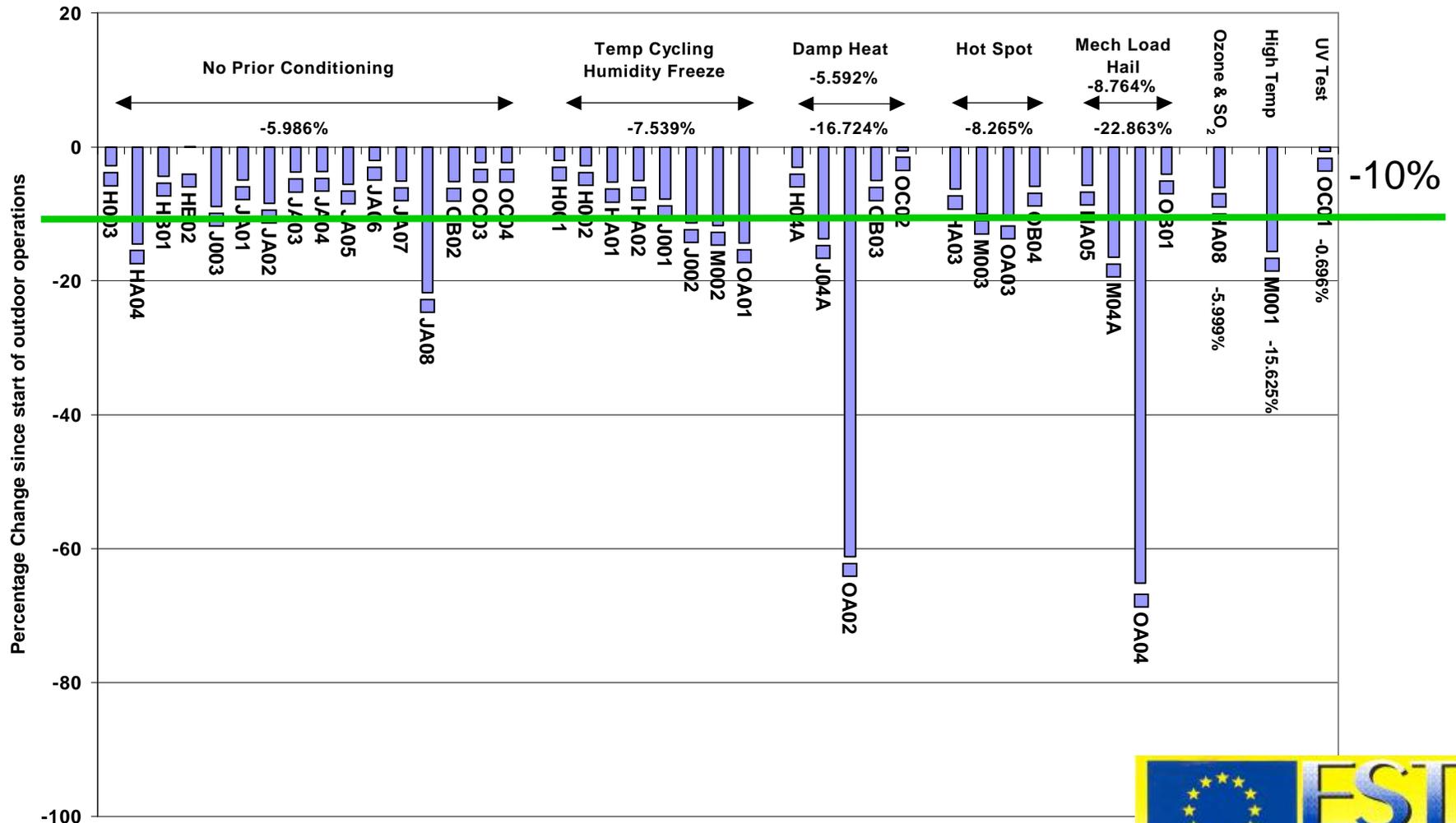
I_{sc} to V_{oc}



a-Si and micromorph large-area modules are susceptible to *sweep-time* effects below 10 ms.

V_{oc} to I_{sc}

after 22 yrs of operation: lifetime probably >30 years

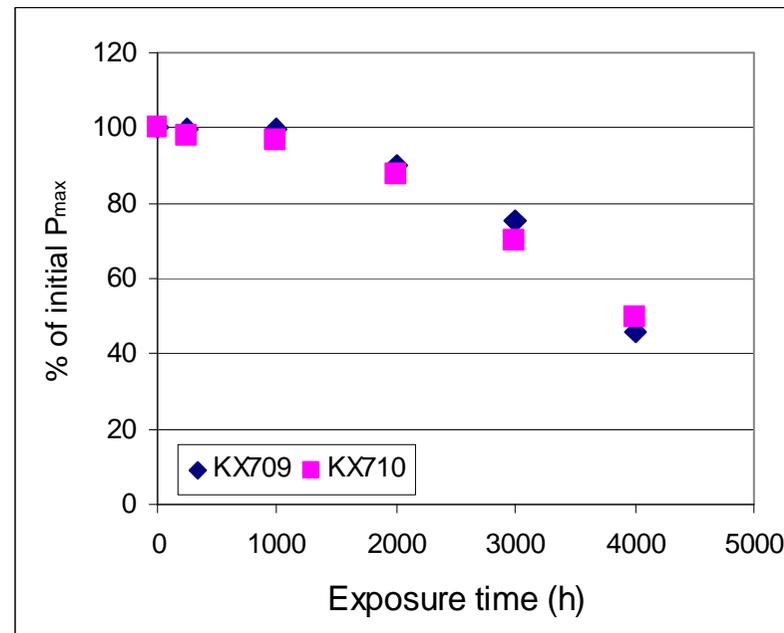


- Sequential damp heat exposure tests used to induce accelerated aging on thin-film modules.
- However not possible to equate loss of power to a number of years of outdoor exposure

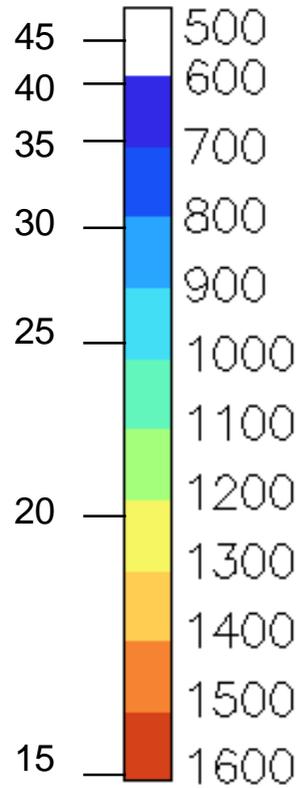
ESTI Code	Damp Heat (h)	Percentage of the initial value			
		V _{oc}	FF	P _{max}	I _{sc}
KX709	0	100	100	100	100
	250	100.7	98.5	99.4	100.2
	1000	100.3	98.8	99.4	100.2
	2000	98	91.5	90.1	100.5
	3000	96.9	78.9	75.3	98.5
	4000	95.1	50.1	45.6	95.6
KX710	0	100	100	100	100
	250	100.1	97.9	98	100
	1000	99.4	97.5	96.8	99.9
	2000	98.1	89.5	87.8	100
	3000	96.9	73.9	70	97.8
	4000	94.9	59.4	49.8	88.4

Relative light-soaked stabilized values for the CdTe modules

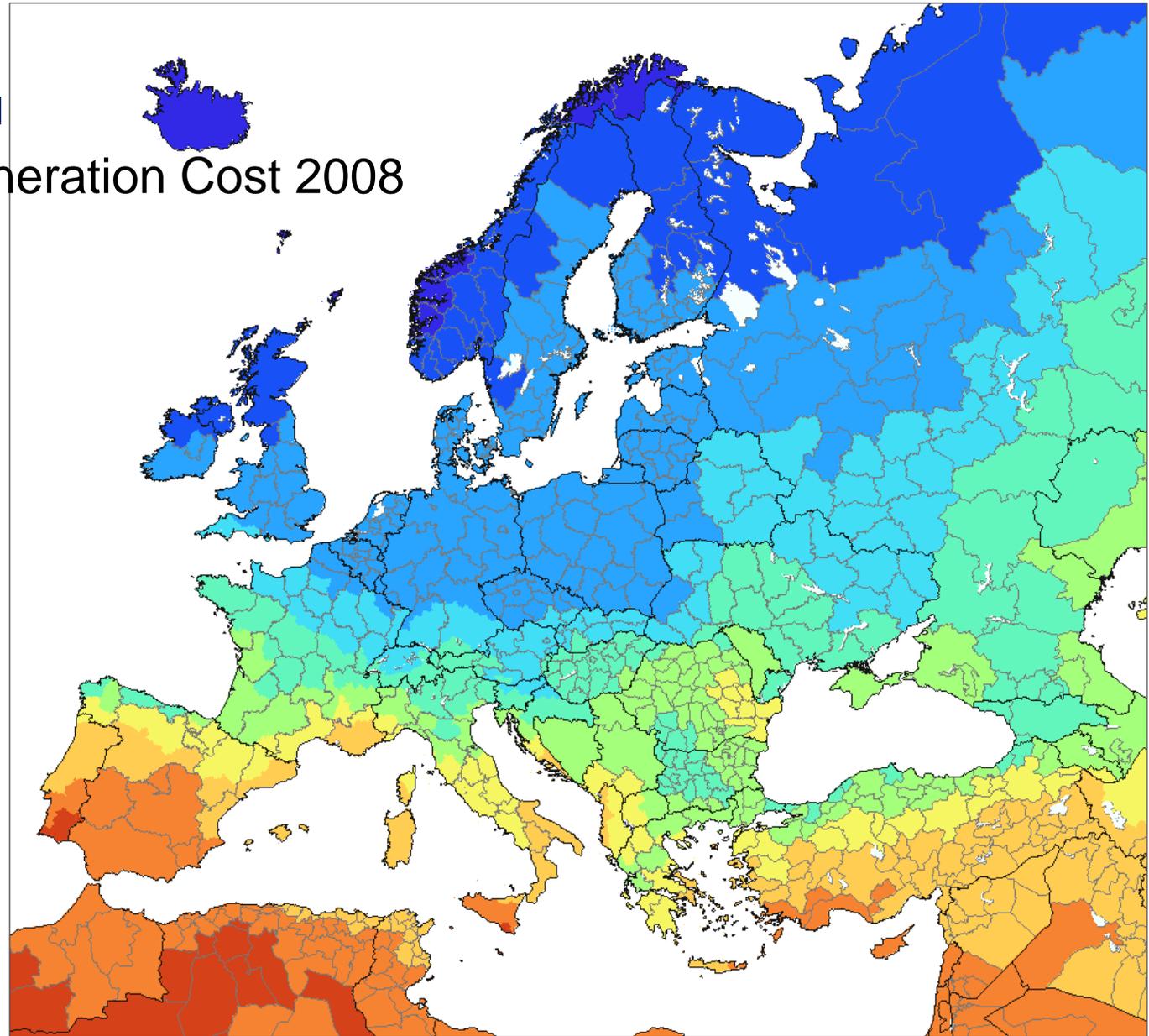
P_{max} vs Time



Regional PV-Generation Cost 2008



cent/kWh [kWh/kWp]



1 MW System Cost: 4 €/kWp, Interest: 2% above Inflation, optimum tilt angle, 20 yrs lifetime, PR 0.75




Joint
**25th European Photovoltaic Solar Energy
Conference and Exhibition 2010**
and
**5th World Conference
on Photovoltaic Energy Conversion**
Conference Chairman: Giovanni Federigo De Santi,
Director, Institute for Energy, Joint Research Centre, European Commission

Feria Valencia, Spain
Conference 06 - 10 September • Exhibition 06 - 09 September
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Engineering Conference

JRC chairs the conference scientific committee

European Industrial Initiatives

European Energy Research Alliance



Wind



Solar



Bioenergy



CCS



Electricity Grid



Fission





Objective: support European energy technology policy, **providing regular, up-to-date and sound knowledge on energy technologies** - a tool for decision making by the SET-PLAN Steering Group

SETIS is led by the Commission's JRC

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Thank you!

