1 Publishable summary

Photovoltaics (PV) offer a promising solution for CO2 emission reductions and climate change combat.

However, before its wide spread on the market, **PV** needs to find **new approaches** to make solar cells **competitive** with respect to conventional electricity sources.

With a PV industry dominated by silicon, about 99 % of the world PV market share corresponds to crystalline or thin film silicon based technologies. This is mainly due to the combination of factors such as:

- the maturity of silicon PV technologies,
- the very well known optoelectronic properties of silicon material,
- the availability of silicon,
- the non toxicity of silicon,
- the low cost potential of silicon,
- the chemical stability of silicon,

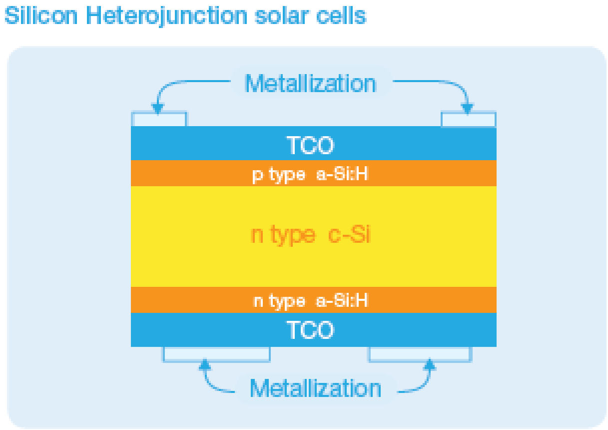
Crystalline silicon (c-Si) wafer-based technology has a real potential to achieve significant **cost reduction and therefore boost its competitiveness,** provided the **R&D effort** is made on the most critical issues:

- **Reduction of silicon material consumption** (e.g. using thinner wafers);
- **Increase of solar cell efficiency;**
- **Improved integration into modules;**

This can be achieved using simple, high-throughput mass-production compatible processes.

One very promising cell design to answer these needs is **silicon heterojunction solar cells**, of which the active part is basically produced by a low temperature growth of ultra-thin layers of silicon.

In this design, amorphous silicon (a-Si:H) constitutes both “emitter” and “base-contact” (while offering interesting surface passivating layers) onto both sides of a thin crystalline silicon wafer-base (c-Si).



Silicon Heterojunction solar cells

In-line with the Strategic Research Agenda (SRA) of the EU PV Technology Platform for a fast evolution of c-Si technology, HETSI gathers **world class European companies** and

institutes with experience in the fields of both crystalline Si and thin film silicon to answer this challenge.

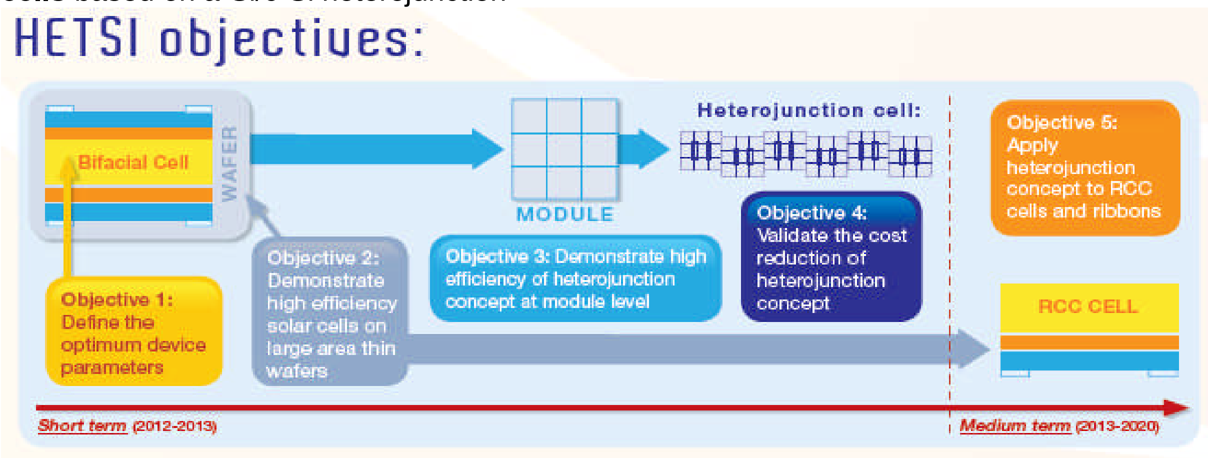
This synergy of world recognized partners is highly needed for EU market competitiveness in high efficiency modules to face international competition from the USA and Japan.

Therefore, HETSI addresses the **heterojunction concepts** (both bifacial and RCC cells) with short and medium term targets:

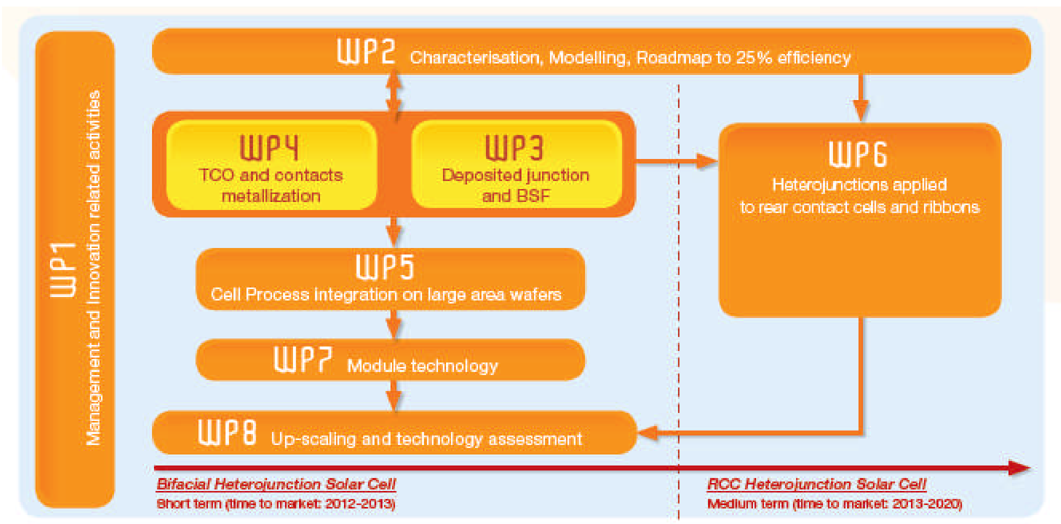
1) Short-term target is to demonstrate the **industrial feasibility** of **heterojunction solar cells** in **Europe**:

- with **50% cost reduction** compared to mainline production technology,
- based on ultra thin mono and multi silicon wafers
- application of heterojunction concept on n-type ribbons with high efficiency,
- with **very high efficiencies** : 21 % for mono and 18 % on multi at the cell level, 20 % at the module level for mono and 17 % at the module level for multi.

2) Medium term target is to demonstrate the concept of **ultra-high efficiency rear-contact cells** based on a-Si/c-Si heterojunction



HETSI methodology:



The HETSI public website is available at: www.hetsi.eu

hetsi

Combat climate change
with competitive photovoltaics

A European Project supported through the Seventh Framework Programme
for Research and Technological Development.

SEVENTH FRAMEWORK PROGRAMME

HETSI concept:

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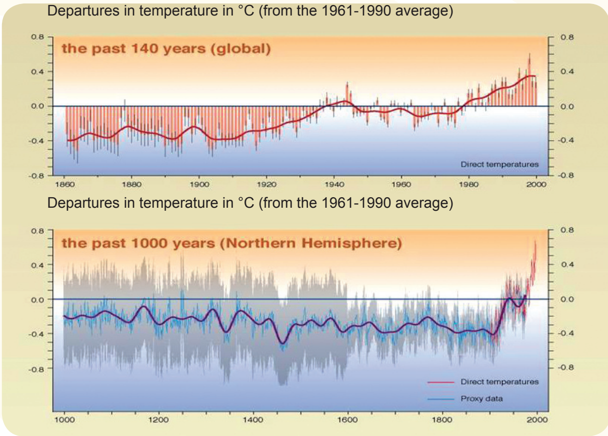
Variations of the Earth's surface temperature for...



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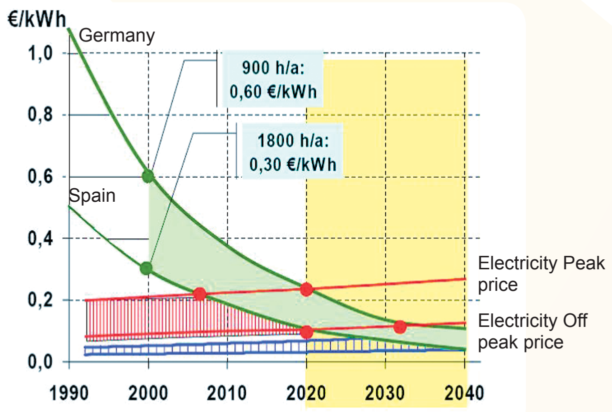

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One very promising cell design to answer these needs is **silicon heterojunction solar cells,** of which the emitter and back surface field are basically produced by a low temperature growth of ultra-thin layers of silicon.

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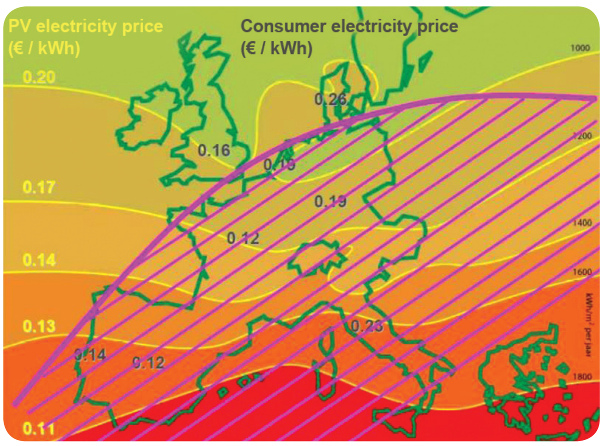
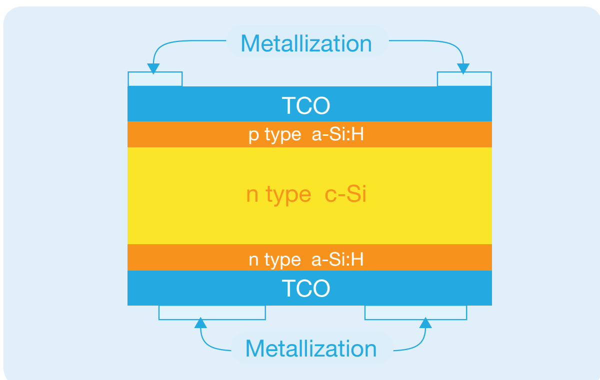
PV competitiveness depending on the localization in 2020:



Silicon Heterojunction solar cells



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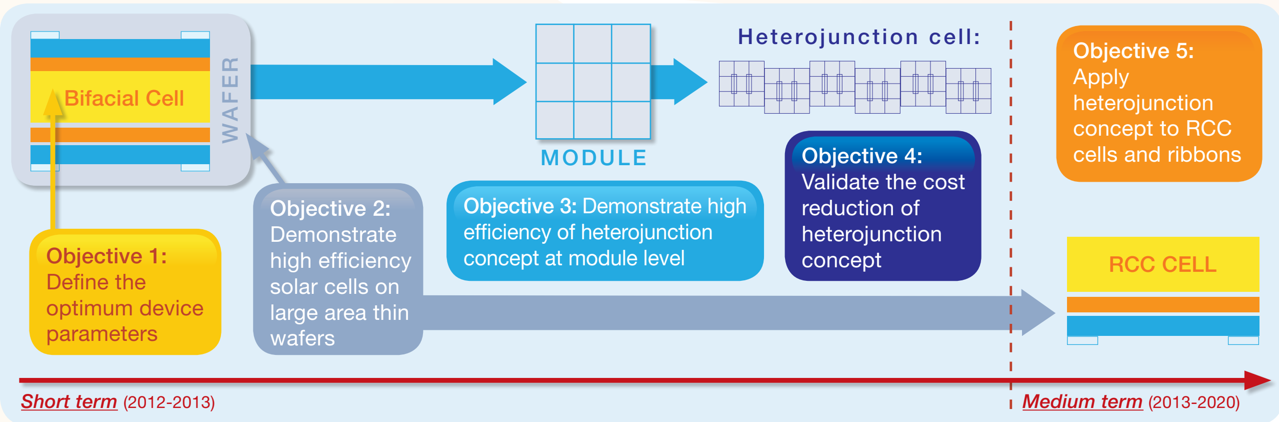
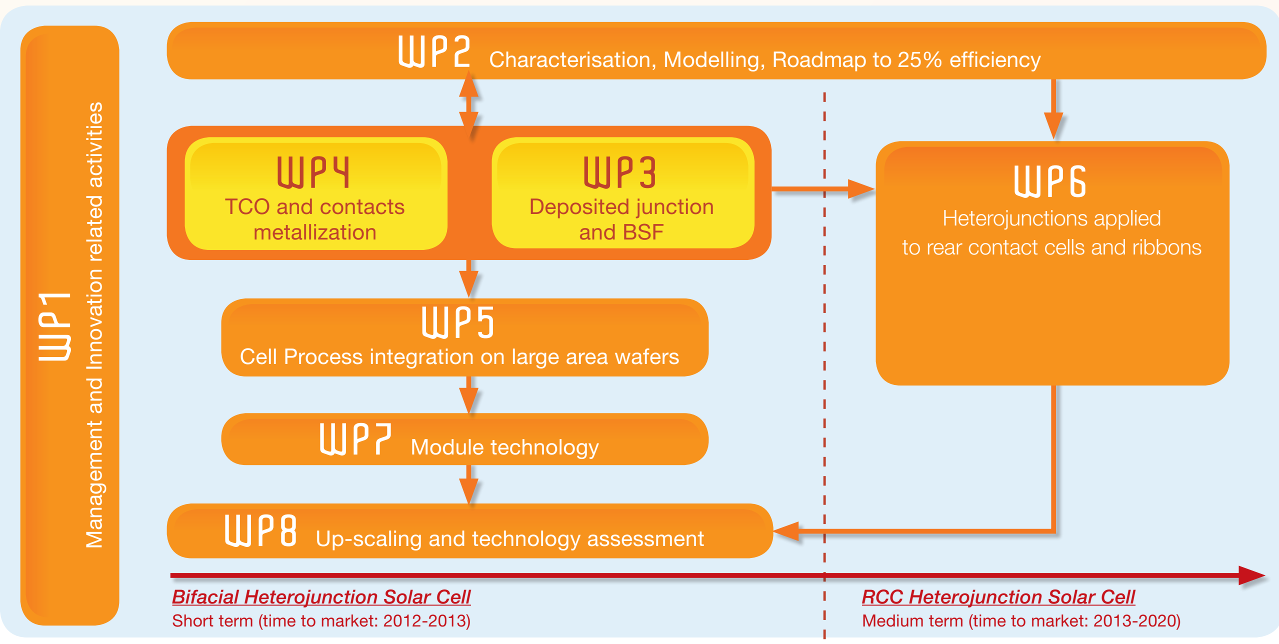
HETSI objectives:



HETSI methodology:



Consortium:

Partnership:

Research Centres:

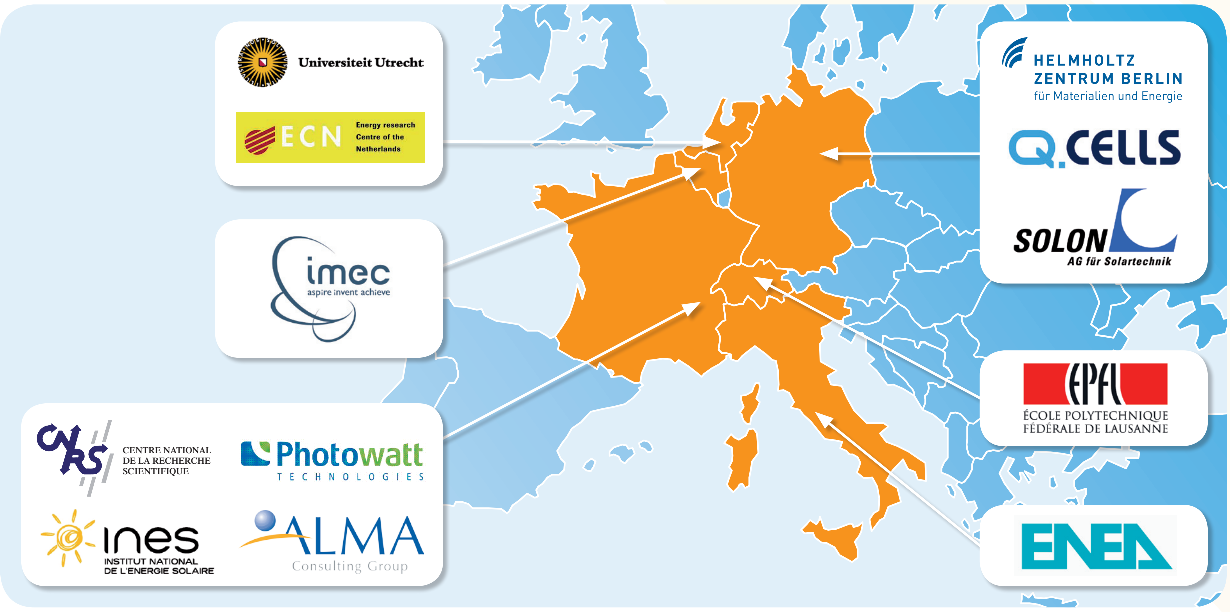
- Institut National de l'Energie Solaire (CEA-INES) WP1
- Centre National de la Recherche Scientifique (CNRS) WP2
- Energieonderzoek Centrum Nederland (ECN) WP7
- Ente per le Nuove Tecnologie, l'Energia e l'Ambiente (ENEA)
- Interuniversity Microelectronics Centre (IMEC) WP6
- Helmholtz-Zentrum Berlin für Materialien und Energie (HZB) WP3

Universities:

- Universiteit Utrecht (UU) WP4
- Institute of Microtechnology (IMT)*, Ecole Polytechnique Fédérale de Lausanne (EPFL) WP5

Companies:

- SOLON AG (SOLON)
- Photowatt (PW)
- Q-Cells AG (QC) WP8
- ALMA Consulting Group (ALMA)



Acknowledgements:

The HETSI project is supported by the 7th Research Framework Programme with a funding corresponding to 3 399 564 € (total budget 5 051 116 €).
The HETSI project addresses the thematic area ENERGY: Renewable Electricity Generation. The project started the 1st February 2008 for a duration of 36 months.

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