

# PV in Baltic Eco-energy Cluster



DEPARTMENT OF PHYSICAL ASPECTS OF  
ECOENERGY

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# PV in Baltic Eco-energy Cluster



## BEEC Actions:

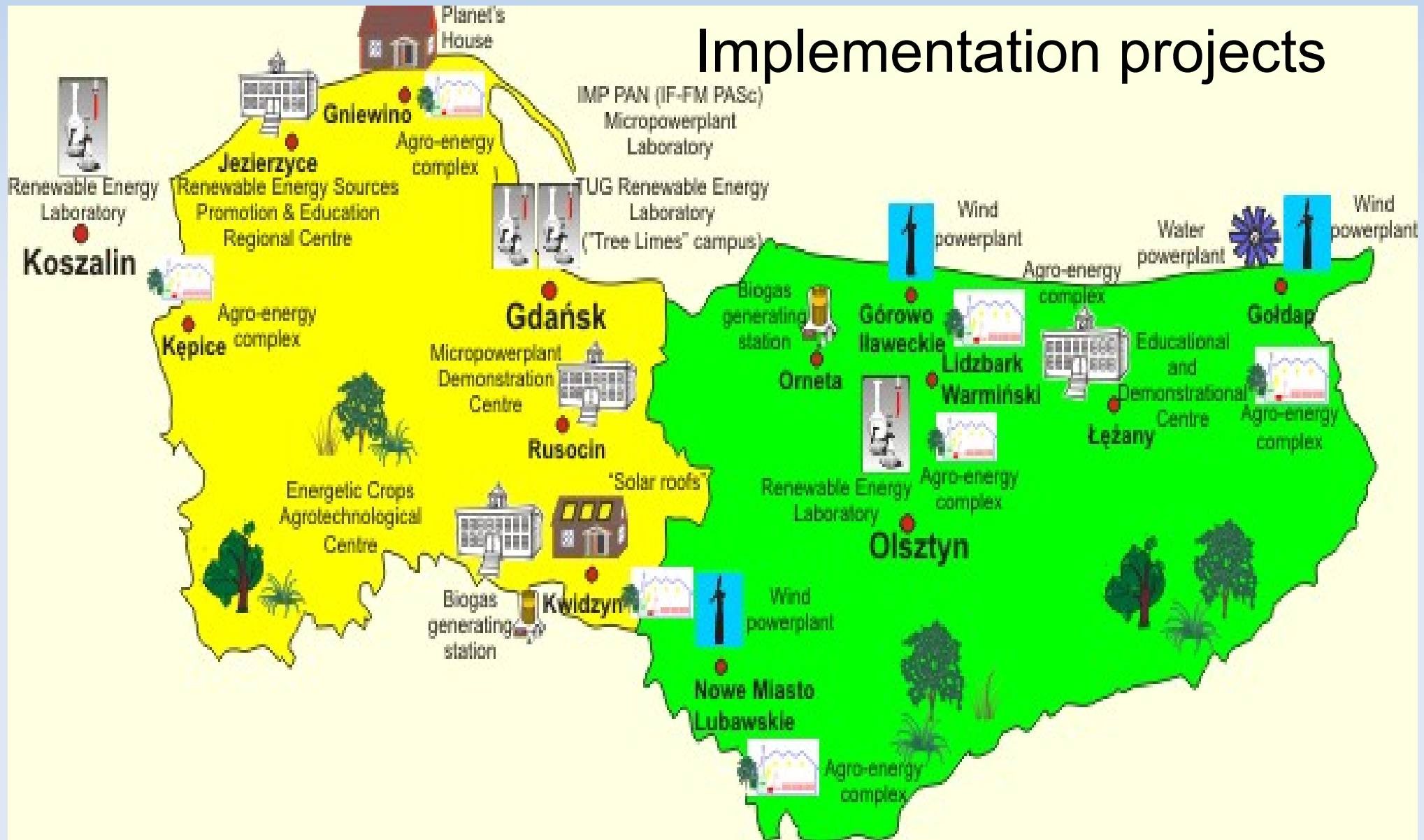
- reducing the proportion of fossil fuels as the primary energy sources,
- stimulating development of green energy
- assistance in starting production of facilities and systems for bio-energy industry,
- promoting and supporting energy saving technologies,
- developing ecological awareness, and professional activation of rural area residents.

# PV in Baltic Eco-energy Cluster

## Main thematic areas:

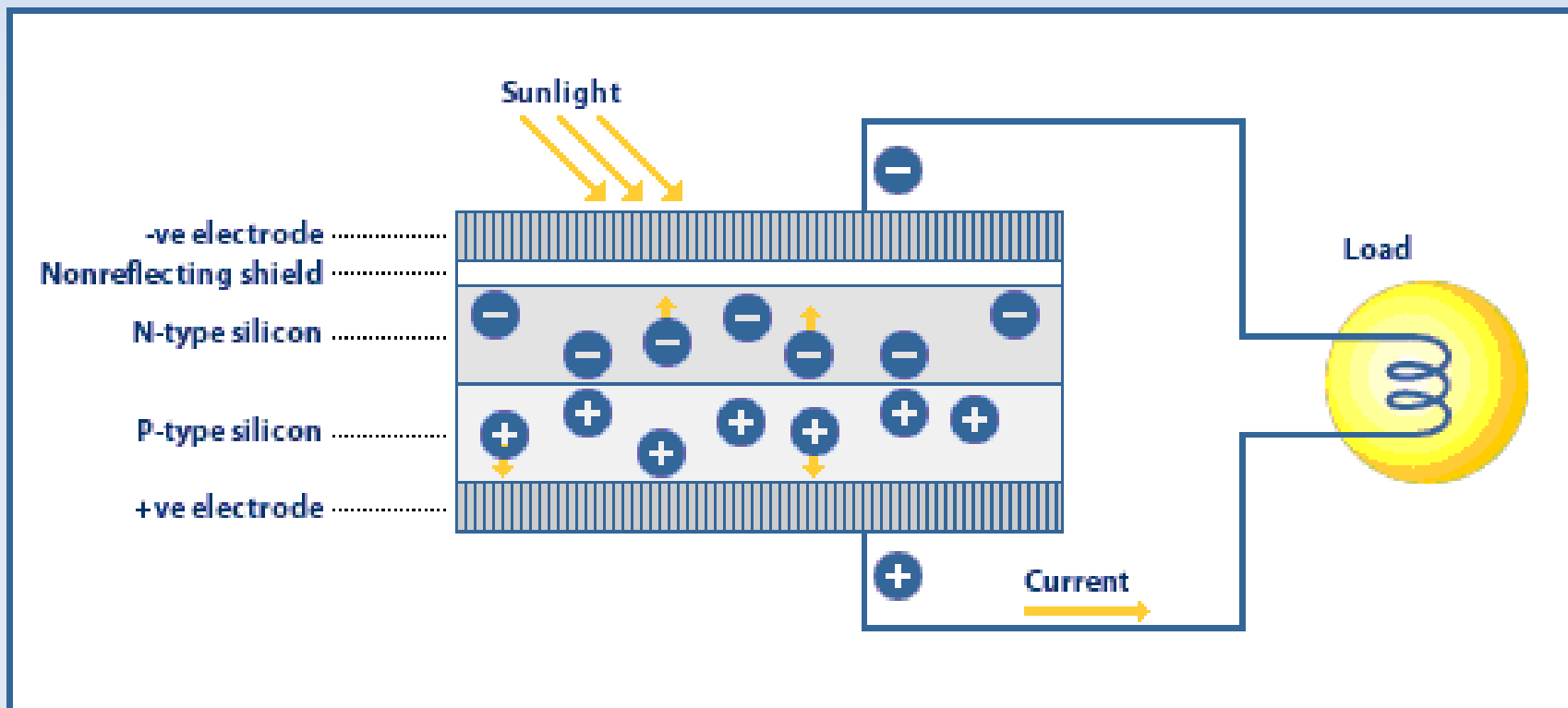
- Cogeneration of small and medium-scale thermal and electric energy
- Hydrogen technologies and fuel cells
- New materials
- Production and conversion of solid, liquid and gas biofuels
- Energetic plant production technologies
- Utilisation of water, wind, and solar energy
- Assistance in developing the agro energy industry
- Research laboratories, and demonstration and training centres

# PV in Baltic Eco-energy Cluster



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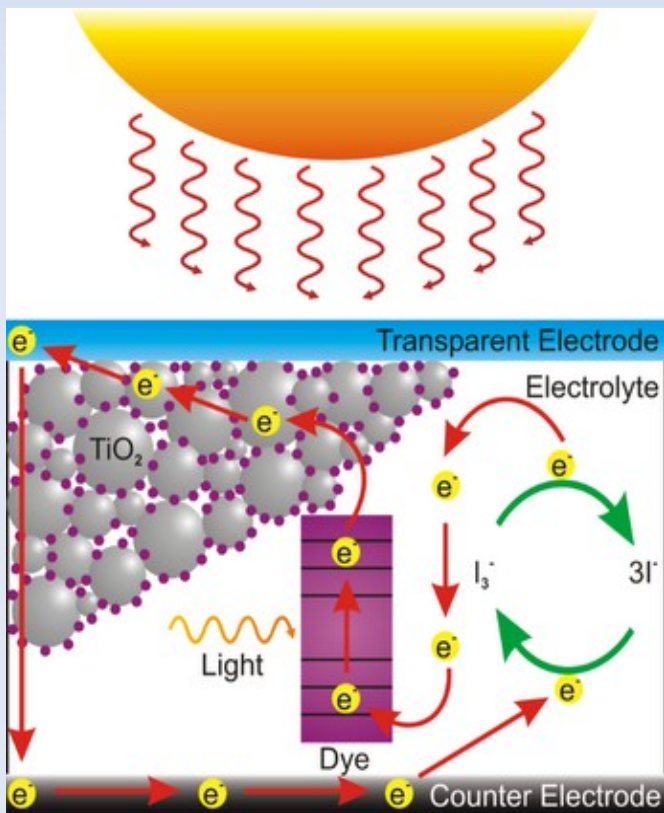
## How it works?



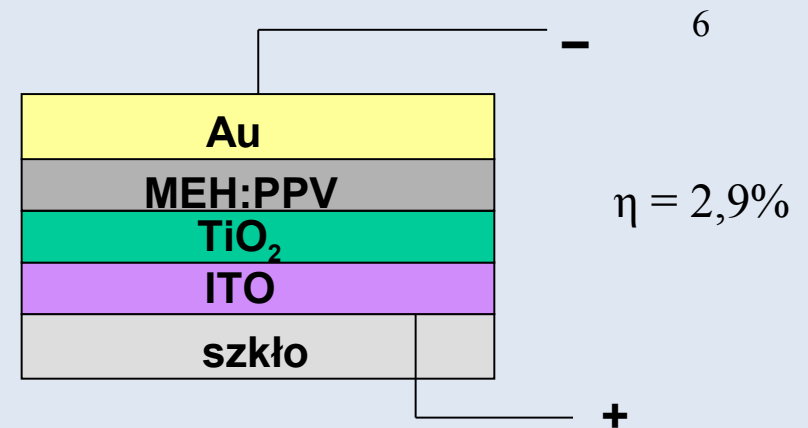
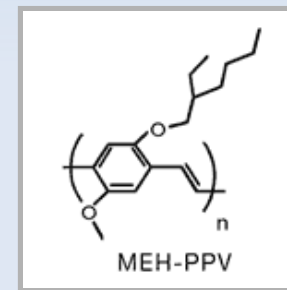
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Grätzel cell (DSSC - dye sensitized solar cell)

Grätzel, Nature 414 (2001) 338



p-n junction (TiO<sub>2</sub>-polymer)



A. J. Breeze, Phys. Rev. B 64 (2001) 125505

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Ablation process and nanofilms deposition based on zinc oxide used in solar-cells

## Tasks:

- Examination dependency of film properties on laser parameters
- Doping with metals
- Optimization of PLD ( Pulsed Laser Deposition) technique

# PV in Baltic Eco-energy Cluster

Cu(InGa)Se<sub>2</sub> thin film solar cells

## Tasks:

- Examination dependency of film properties on laser and ablation target parameters
- Examination of flexible substrates
- Composing numerical model of the PLA (Pulsed Laser Ablation)
- Optimization of PLD (Pulsed Laser Deposition) technique



# PV in Baltic Eco-energy Cluster

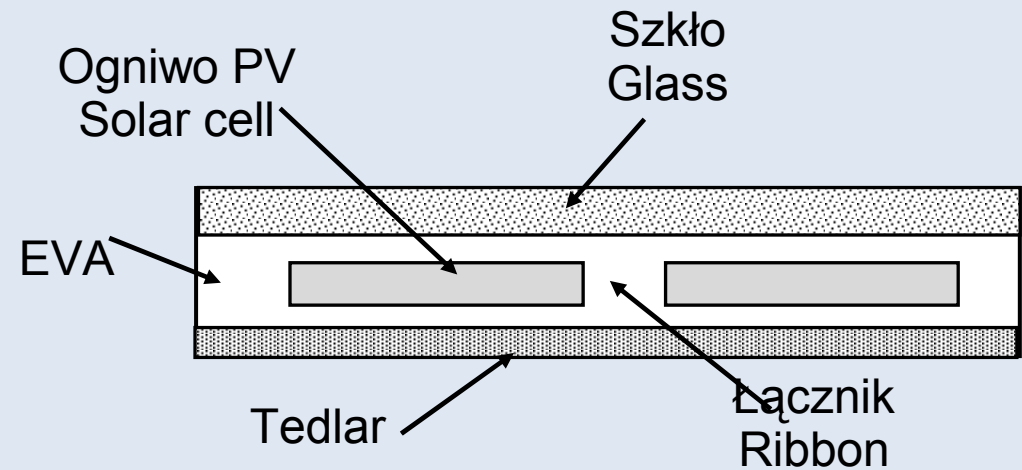
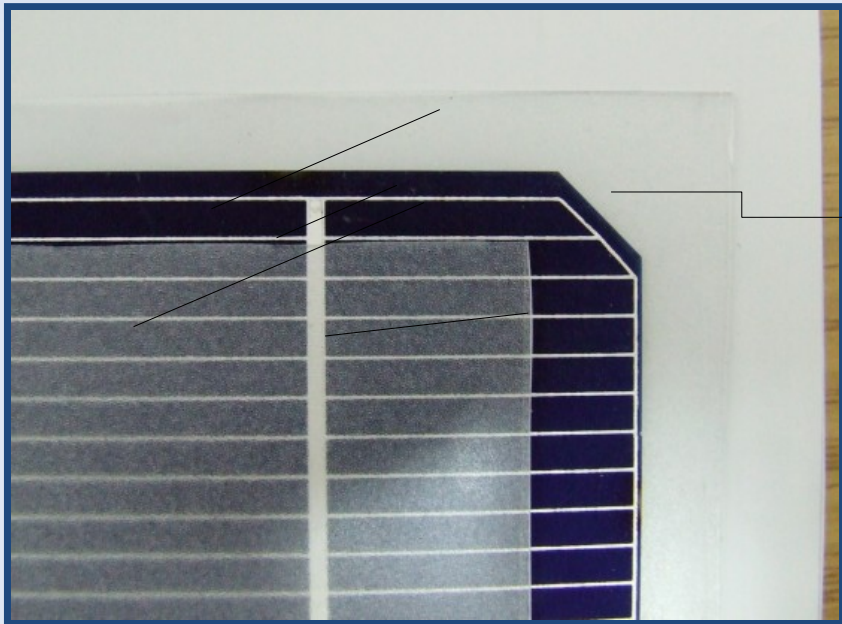
Cu(InGa)Se<sub>2</sub> thin film solar cells

## Results:

- Optimal conditions for obtaining nanofilms
- Development of different substrates
- Development of simulation methods
- Understanding role of admixture in optoelectronic behavior

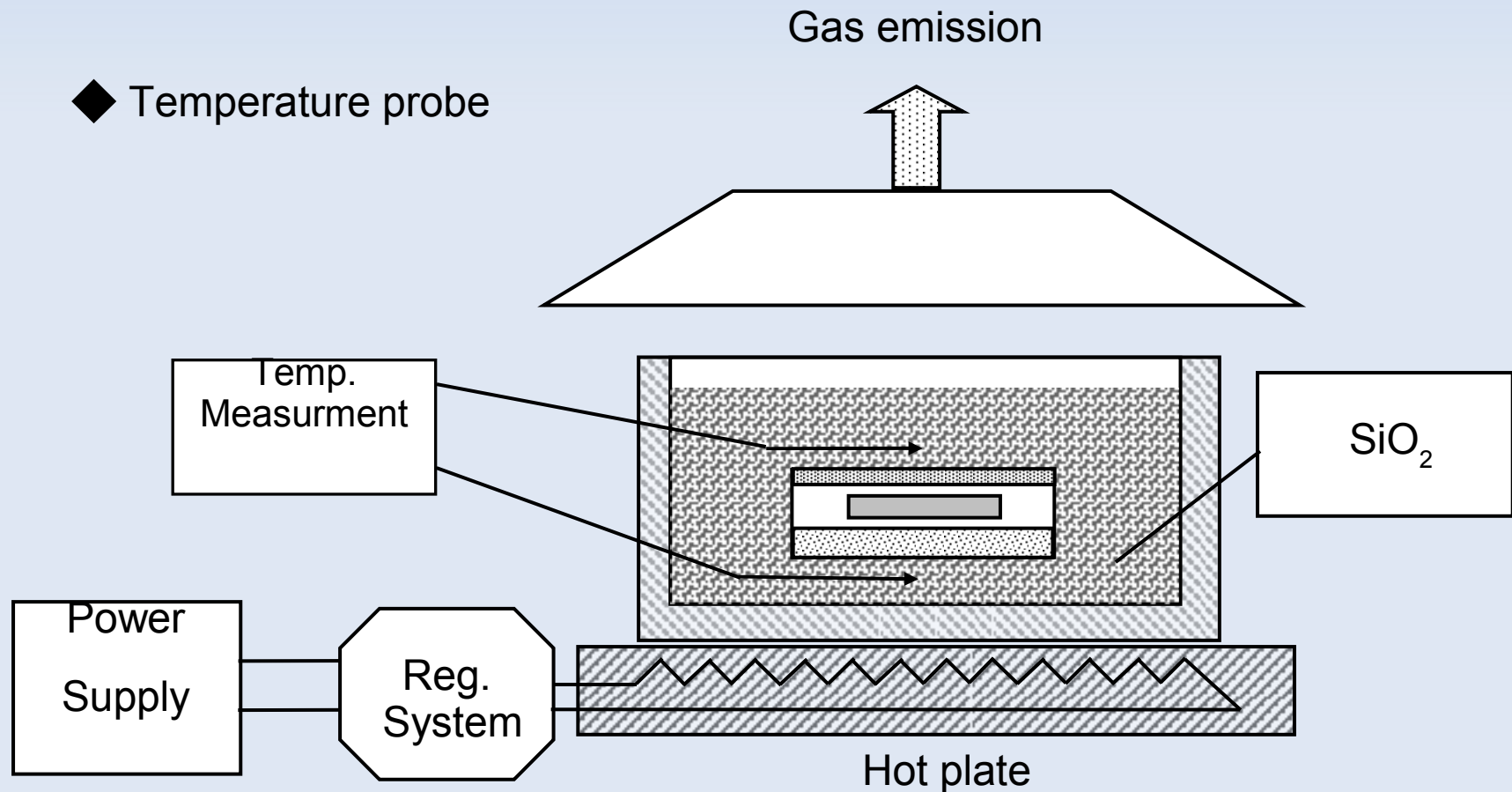
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## Recycling of PV modules – thermal treatment



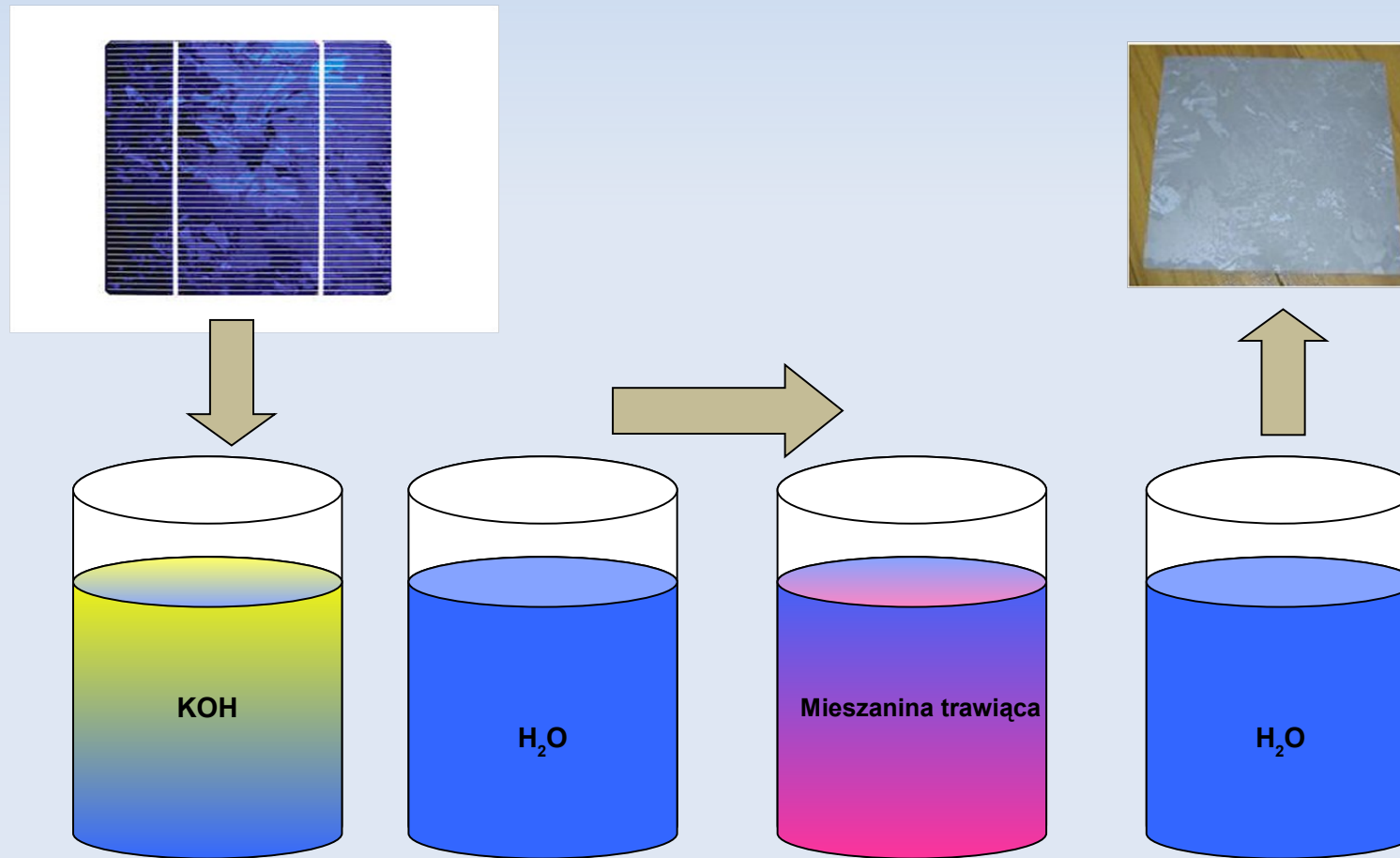
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## Recycling of PV modules – thermal treatment



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## Recycling of PV modules – chemical treatment

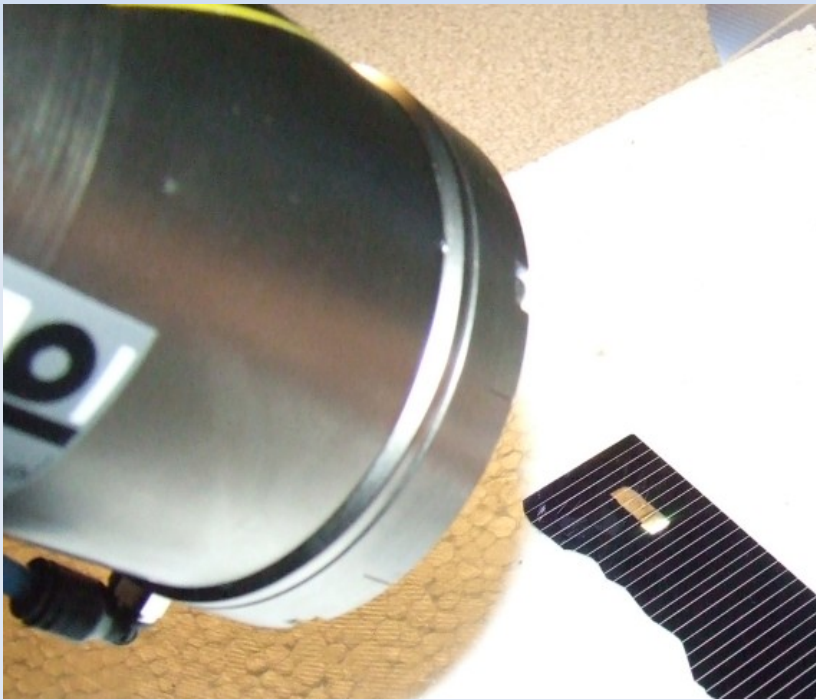


Recovery of the silicon base from the silicon PV cells

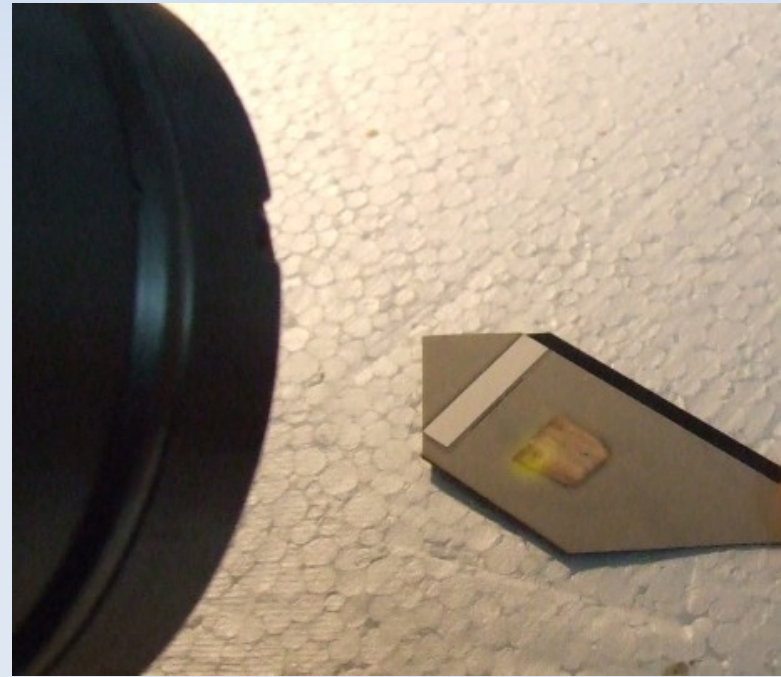
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Poleko Trade Fairs, Poznań 24.11.2009

## Recycling of PV modules – laser treatment



Removal of ARC layer

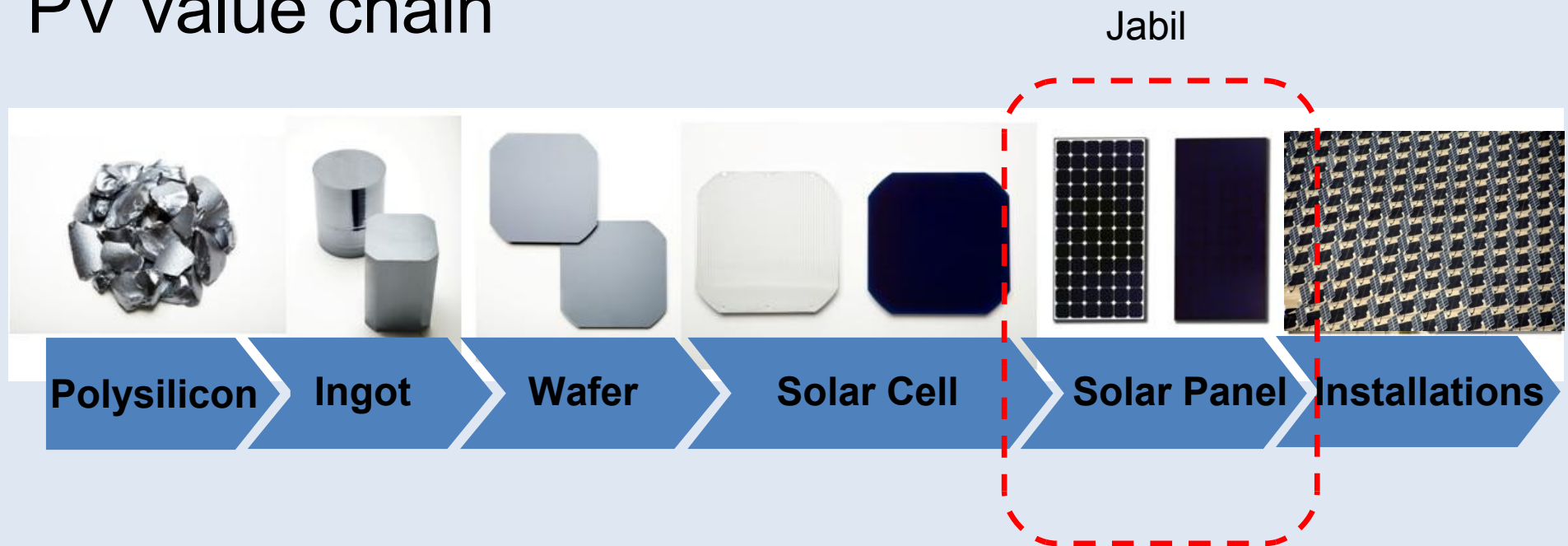


Removal of back contact

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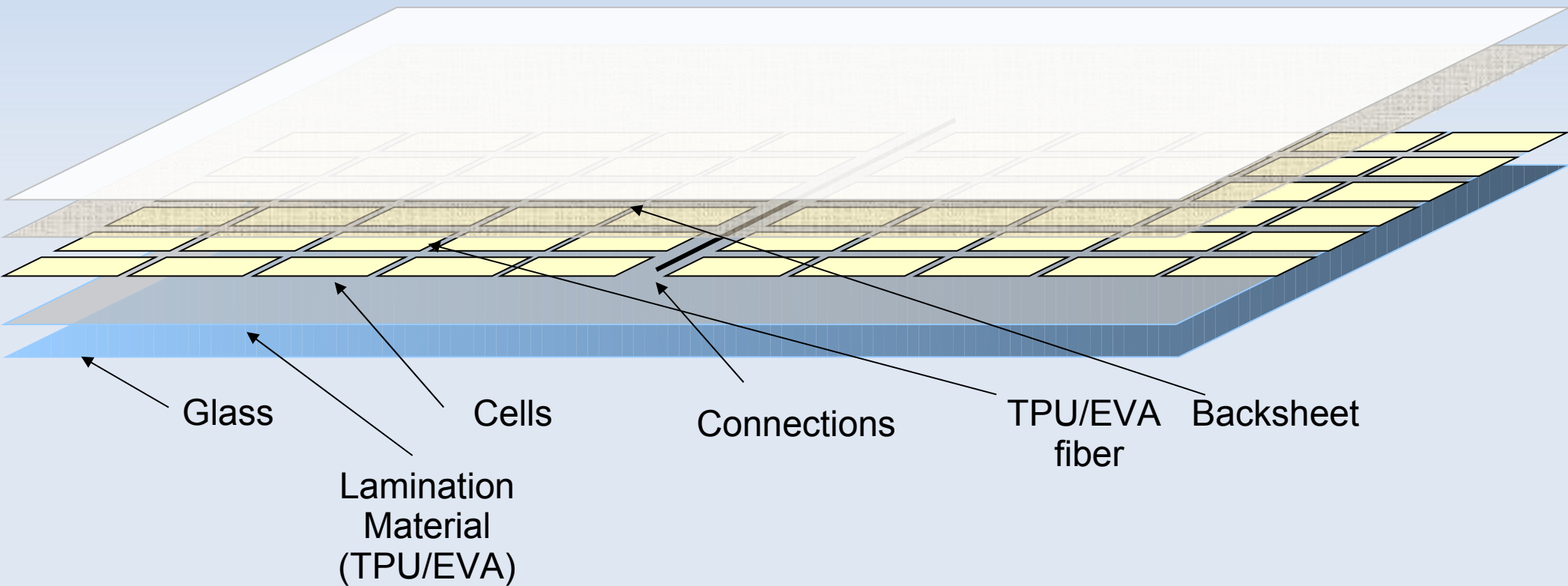
The logo for JABIL, featuring the word "JABIL" in a bold, blue, sans-serif font. A green arrow-like shape is integrated into the letter "A", pointing to the right.

## PV value chain



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## PV Panel Structure





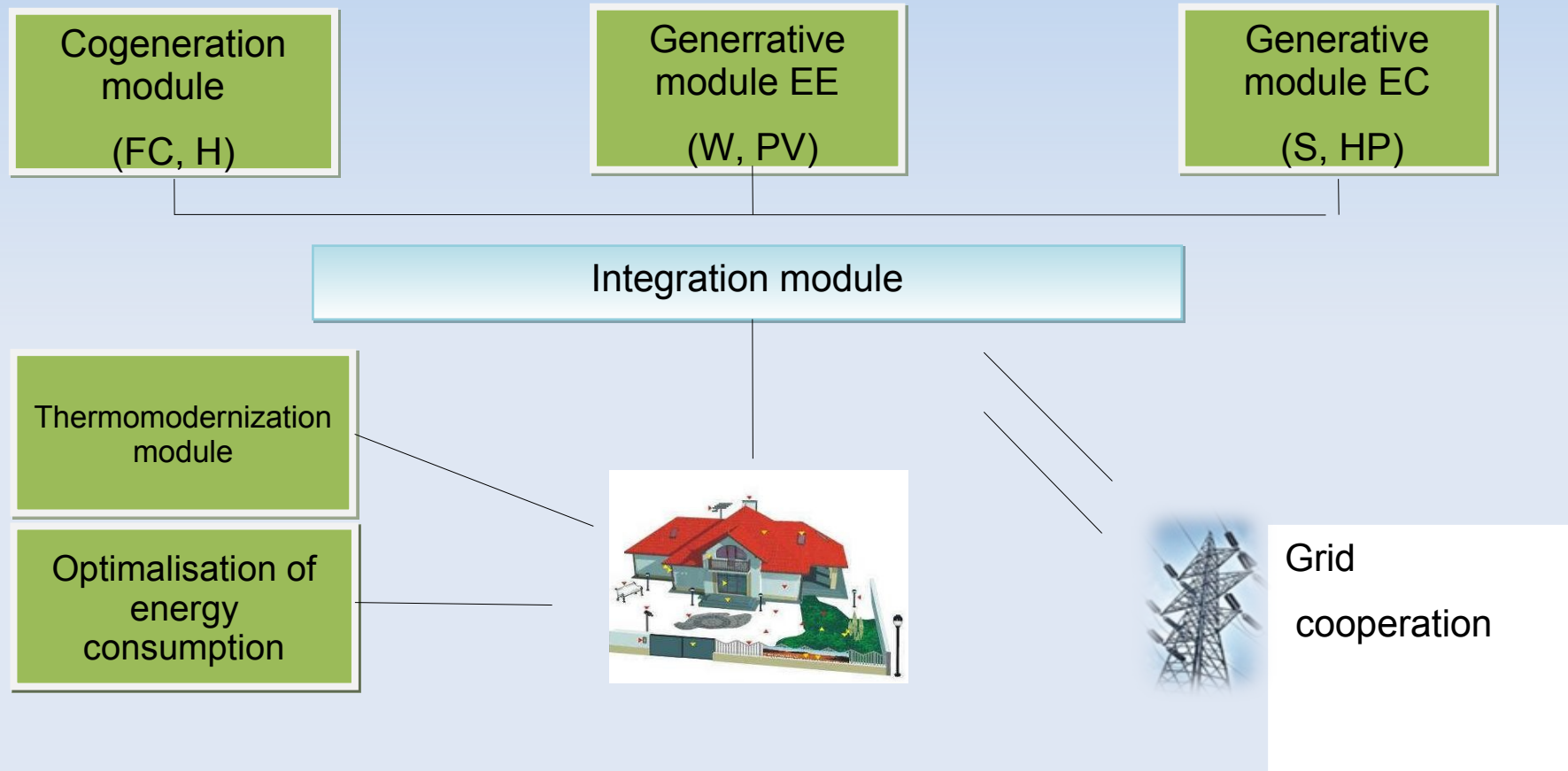
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**Product**  
**„ENERGETIC HOME”**



# PV in Baltic Eco-energy Cluster



## Legend:

FC- fuel cells

H- hybrid solution

W- wind turbines

PV- photovoltaic cells

S- sun collectors

HP – heat pumps

# PV in Baltic Eco-energy Cluster

The first in Europe passenger inland waterway vessel with solar panels and batteries as the basic propulsion power source (*constructed under classification society supervision*).



# PV in Baltic Eco-energy Cluster

## BASIC PARTICULARS OF THE FERRY:

- Length overall 13,46 m
- Breadth 3,07 m
- Draught 0,4 m / 0,46 m
- Solar power generator 4 950 W
- Maximum speed 12 km/h
- Motor's power (electric DC) 2 x 8 kW / 48 V
- Motor's current 20 A for speed 6 km / h  
190 A for speed 11 km /h
- Main batteries capacity 2 x 400 Ah / 48V
- Operational time 10 h navigation /day with  
a speed of 6 km/h



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