

Didactic construction photovoltaic solar panels

Expertise unit: Industrial technology
Professional bachelor electromechanics

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1. Target

- To inform students, colleagues, other people
- For exercises for students Electromechanics
- To produce electricity and save money!

1,000 kWh = 450 euro GSC

(GSC = green energy certificates in 2009)

- Comparison of 5 important types
- Not: compare different producers
- Not: compare different convertors



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2. Starting point

- Roof on top of the aula's
- Visible from the Science Garden
- 5 identical convertors SMA1200
- 5 x the same power (+/- 1200 Wp)
- 5 different types:
 - * Monocrystalline photovoltaic solar panels
 - * Polycrystalline panels
 - * Amorphous panels
 - * Tube panels "sunhunter"
 - * Solar mats



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3. Terminology

* Power – Watt-peak Wp

Watt-peak (Wp) is the nominal power of a photovoltaic solar energy device under laboratory illumination conditions:

- Light perpendicular to the solar panels
- The light intensity is 1,000 watt/m²,
- Normalised spectrum of the light
- Temperature of the cells at 25°C

* Profit – kilowatt-hour kWh

Electrical unit of energy quantity

In Belgium a solar panel of 200 Wp produces about 170 kWh a year.

A system of 10 kWp (total sun power on our campus) realizes 8.500 kWh in 1 year, which corresponds to the need of 2 families

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4. The different types

1. Monocrystalline photovoltaic solar panels

- Generally the best production (per mm² cel)
- More expensive than polycrystalline panels
- Demands direct sun light

CDM:

Sharp

8 panels of 180 Wp

Fixed with weight (concrete tiles)



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4. The different types

2. Polycrystalline photovoltaic solar panels

- Generally most used
- Mostly best product (cost/profit)
- Demands direct sun light

CDM:

Bisol (cells made in Belgium)

6 panels van 230 Wp

Fixed with weight (concrete tiles)



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4. The different types

3. Amorphous photovoltaic solar panels

- Generally bad result (per mm² cel)
- Cheapest
- Less used in Flanders, more in warm countries
- Good function without direct light
- Resists high temperatures
- Less sensitive for partial shadow

CDM:

Kaneka

14 panels of 105 Wp

Fixed with weight (concrete tiles)



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4. The different types

4. Tube panels - Sunhunter

- Amorphous cells
- Reflection by the white underground “doubles” the production
- Very light construction
- Easy to assemble
- Only for flat roofs
- New product, results are questionable

CDM:

- CIS sunhunter 173 Solyndra
- 8 panels of 173 Wp

Without fixation!



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4. The different types

5. Solar mats (thin film, laminate solar mats)

- Low profit (per mm² cel)
- cheap
- Very light
- “Easy” assembly
- Pay attention! It is not sealing
- Only for flat roofs
- Nearly invisible

CDM:

Solar

10 strokes of 144 Wp

Fixing with the right glue



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4. The different types

6. Tracker

- Follows the sun light
- Expensive to install
- Permission of the city is required
- With polycrystalline solar panels
- Moves a lot
- Great result

CDM:

Solar

3300 Wp



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5. Summary

			P 1 (W)	Dimensions	number	Ptotal Wp	Mai kWh	Juin kWh	july kWh
1	monocrystalline	Sharp NU 180	180	1318x994	8	1440	149	180	158
2	polycrystalline	Bisol 227-233 W	227	1649x991	6	1362	131	163	135
3	amorphous plates	Kaneka U-EA 105	105	1210x1008	12	1260	132	169	136
4	Tube panels	CIS sunhunter 173 Solyndra	173	1820x1080	8	1384	62	56	47
5	Solar mats	derbisolar	144	5486 x 400	10	1440	connect	153	126
6	Tracker	polycristalline				3300	455	608	485

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6. Future

- Didactic panel in the science garden
- Scale model with small panels like the great one
- Datalogging with a Beckhoff PLC and put the numbers on the internet?

Next projects:

- * Measuring the wind velocity on the campus – feasibility of a wind turbine (the results aren't very good at the moment)
- * Covering the whole roof of the main building with photovoltaic solar panels
50 - 150 kWp