Trends in Research on Solar

Hugo de Moor
Avans University
Introduction on Avans

Status of Photovoltaics (PV)

Trends in PV

Applications on Buildings
Avans University of Applied Sciences

Avans  Lectorate Solar

- Application of Solar Foils
- Business Models for Solar

Close contacts with:
Solliance (Thin-Film) and SEAC (Buildings)  (TNO-IMEC-Uni’s)
Expertise on PV and Buildings since 1997

ECN Zonnedak 2010
Smart Energy Facade

Scheuten Solar Roof integration of standard modules
Custom made BIPV modules
Standards on PV and Buildings

Avans Integration of Solar Foils
Module Types

Crystalline Silicon

Thin-Film (CIGS, CdTe)

Multi
Mono

Glass-Glass
Foil

Hugo de Moor
Technology Mix

Wikipedia

Solar module = glass plate

Hugo de Moor
Trends in PV

Modules
2018 → 2022
Efficiency > 17% 20%
Module Cost <<
Cost = Module + BoS
≈ 1 €/Wp
0,10 €/kWh

Data: Bloomberg New Energy Finance en PV News

Hugo de Moor
Trends in PV

Inverters
- Micro Inverters: DC → AC
- Optimizers: DC → DC

\[ \Rightarrow \text{Independent modules} \]

Modules
- Optimizer IC

\[ \Rightarrow \text{Independent strings} \]

Tolerance for Shading

Hugo de Moor
Need for PV

Figure 2.10 Proxy shares of renewable energy in gross final energy consumption and targets (EU countries), 2013

- RE 2020 20%
- 2030 32%

Hugo de Moor
PV Installations

- Belgium (Flanders)
  Grid-connected PV-Installations

- UK Grid-connected PV-Installations

- France Grid-connected PV-Installations

New Elan is needed
- Support
- Applications

Hugo de Moor
Applications on Buildings

Roof

Facade

Parapet

Sun protection

Hugo de Moor
Yield of a 1 kWp System
South Oriented Gent

**Daily Irradiation**  Wh/m²/day

<table>
<thead>
<tr>
<th>Location</th>
<th>Horizontal</th>
<th>Optimal</th>
<th>Vertical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gent</td>
<td>2790</td>
<td>3420</td>
<td>2400</td>
</tr>
<tr>
<td>Amiens</td>
<td>3120</td>
<td>3580</td>
<td>2480</td>
</tr>
<tr>
<td>Portsmouth</td>
<td>3220</td>
<td>3800</td>
<td>2690</td>
</tr>
<tr>
<td>Heerhugowaard</td>
<td>3000</td>
<td>3510</td>
<td>2490</td>
</tr>
</tbody>
</table>

Gent Facade per m² (150 Wp) Yield 110 kW/Year  Cost 300 €? Value ??
SOLARISE

Urban Planning Orientation

Traditional

→

Stad van de Zon (Heerhugowaard)

Hugo de Moor

22-6-2018
Applications on Buildings

Production

Regular Roofs

Hugo de Moor
Applications on Buildings

Specials/design

Visible Exposure

Hugo de Moor
Applications on Buildings

Invisible (monitoring display)

Architectural Integration
Applications on Buildings

Special Modules

Yield < 10-30%

Reliability ?

Hugo de Moor
Thank you for your attention
SOLARISE

Solarix Studio

Hugo de Moor
EVERY SURFACE IS AN OPPORTUNITY.

Kameleon

Bronze