PVT an interesting option for the Nordic climates

Examples of installations with DualSun
in figures

- Created in 2010 by two engineers from one of France’s top engineering schools (Ecole Centrale Paris)

- A dynamic and international team supported by national and regional governments as well as numerous prestigious institutions

- > 1,100 installations around the world

- 15,000 m² of panels sold

- 573% growth over 3 years (Deloitte Fast 50 Prize)

- 4 international patents

- 2M€ in R&D investment

- 3,2M€ in equity capital raised
DualSun, meeting our daily energy needs

Electricity and hot water are part of our everyday needs. DualSun combines in one unique panel the solution to these two essential needs!

“One thing is certain: we will always need to produce domestic hot water (DHW) and the space on our buildings’ rooftops is not infinite…”

Martin Bouygues,
CEO of Bouygues
Client and solar star for DualSun
DUALSUN : 1st to certify a hybrid panel in the world

THE SPRING PANEL

35mm thin DualQuickfit

Lead the PVT market with competitive high performance, easy to install.

CEA study comparing PVT modules: DualSun panels have the best thermal performances (2018)
> 1,100 PVT installations around the world

Homes
- Superimposed

Mountain Refuges
- BIPVT - In façade
- For roof terrace

Apartment buildings

Hotels & campgrounds
- BIPVT - Into the roof

Swimming pools
- Canopy

Hospitals, schools, ...
- Superimposed
PVT+HP : DualSun in geothermal systems

PVT + HP geothermal system:
1 : DualSun PVT modules
2 : Geothermal probe
3 : Heat pump
4 : Heating distribution
5 : Controlling
6 : Air Conditioning
Positive energy renovation on a tertiary building (built in the 1970s!)  
40m² DualSun in a Geothermal system

Headquarters, KTR France, Dardilly (FR).

25PVT(40m²)
South : 0°
Slope : 10°

18 MWh\_th
+7 MWh\_el

26kW

21 MWh

5 m³

900 m² space floor

PolySun simulation

GREEN SOLUTIONS AWARDS 2018 - category: Sustainable Renovation (COP24)

PVT+HP coupling an interested solution also for Danemark

(Marseille, FR, 2013)
22PVT (36m²) +75m² black tubes
2x12kW heat pumps
No drilling (PVT as **direct cold source**)  

(Zoetermeer, NL, 2017)
8PVT+5PV
3kW
90m drill  

(Oslo, NW, 2019)
110PVT
2x64kW heat pumps
16 x 300m drill  

**FleXible user-CEntric**
**Energy poSitive houseS**

**H2020**
**ECESS**
(Helsinki, FIN, 2021, 226 PVT for 3x800m)

a positive energy building with BASSO.
## Economical balance

<table>
<thead>
<tr>
<th></th>
<th>KTR, Lyon (FR)</th>
<th>Zoetermeer (NL)</th>
<th>Marseille (Fr)</th>
<th>Oslo (NW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment (*)</td>
<td>70 000€</td>
<td>25 000€</td>
<td>136 000€</td>
<td>1 200 000€</td>
</tr>
<tr>
<td>PVT PV part</td>
<td>6.25kWp</td>
<td>3.64kWp</td>
<td>5.2kWp</td>
<td>34.1kWp</td>
</tr>
<tr>
<td></td>
<td>8,500€</td>
<td>6,000€</td>
<td>15,300€</td>
<td>40,000€</td>
</tr>
<tr>
<td>PVT ST part</td>
<td>40m²</td>
<td>13m²</td>
<td>110m²</td>
<td>180m²</td>
</tr>
<tr>
<td></td>
<td>8,000€</td>
<td>3,800€</td>
<td>11,800€</td>
<td>30,000€</td>
</tr>
<tr>
<td>HP (+drill./storage)</td>
<td>26kW+4x150m</td>
<td>3kW+90m</td>
<td>24kW+4m³</td>
<td>130kW+15x300m</td>
</tr>
<tr>
<td></td>
<td>53,500€</td>
<td>15,300€</td>
<td>108,700€</td>
<td>1,130,000€</td>
</tr>
<tr>
<td>Elec. Cons. kWh/yr</td>
<td>3 560</td>
<td>1900</td>
<td>32 700</td>
<td>tbc</td>
</tr>
<tr>
<td>PV Energy kWh/yr</td>
<td>7 000</td>
<td>3 700</td>
<td>7 450</td>
<td>31 000 (tbc)</td>
</tr>
<tr>
<td>Th Energy kWh/yr</td>
<td>SF5.9</td>
<td>17 450</td>
<td>SF3.8</td>
<td>SF~4</td>
</tr>
<tr>
<td></td>
<td>5 300</td>
<td>103 300</td>
<td>75 000</td>
<td></td>
</tr>
<tr>
<td>Cost of PV over 20y undiscounted</td>
<td>6,1c€/kWh</td>
<td>8,1c€/kWh</td>
<td>10,2c€/kWh (2013)</td>
<td>6,4c€/kWh</td>
</tr>
<tr>
<td>Overcost on Th</td>
<td>13%</td>
<td>20%</td>
<td>10%</td>
<td>3%</td>
</tr>
</tbody>
</table>

(*) no subsidies taken into account

The photovoltaic is profitable, and compensate (a part of) the electrical consumption of the heat pump. The thermal part of PVT is a small overcost to regenerate or avoid the drilling.
PVT for domestic hot water (PVT preheating + additional heating)

External additional heating
(for example gas heater)

Internal additional heating
(for example wood heater)
PVT to pre-heat DHW for homes (Lyon, 2017)

6PVT for a 4 people house

External additional heating: Heat Pump

Average temperatures:
- Cold water
- After solar pre-heating

Up to +25°C with PVT solar pre-heating

Year: 2018 Measurements

A lot of dual self-consumer with DualSun around the world

Alleins, FR
Santiago, CL
Ocean Reef, AU
Valais, CH
Grasse, FR

H2020: installation in Riga (Latvia) for domestic hot water pre-heating (next year 2020)