



EU PVSEC – Innovative Distributed Applications for
PV, **Smart Buildings** and Electric Mobility



- 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, mainly BIPV Residential
 - ✓ **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



Région
Provence
Alpes
Côte d'Azur



ADEME



Agence de l'Environnement
et de la Maîtrise de l'Energie

Deloitte. | **In Extenso**

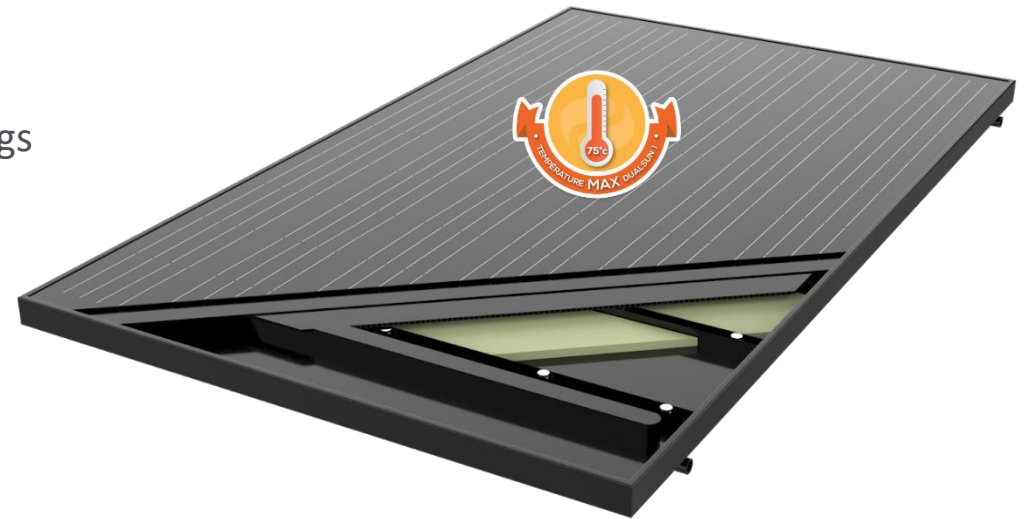
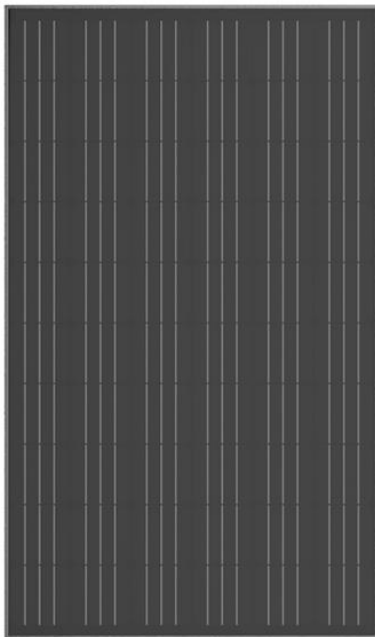




THE MULTI-ENERGY SOLAR PANEL

Spring[®]

The most efficient and thinnest PVT panel for smart buildings

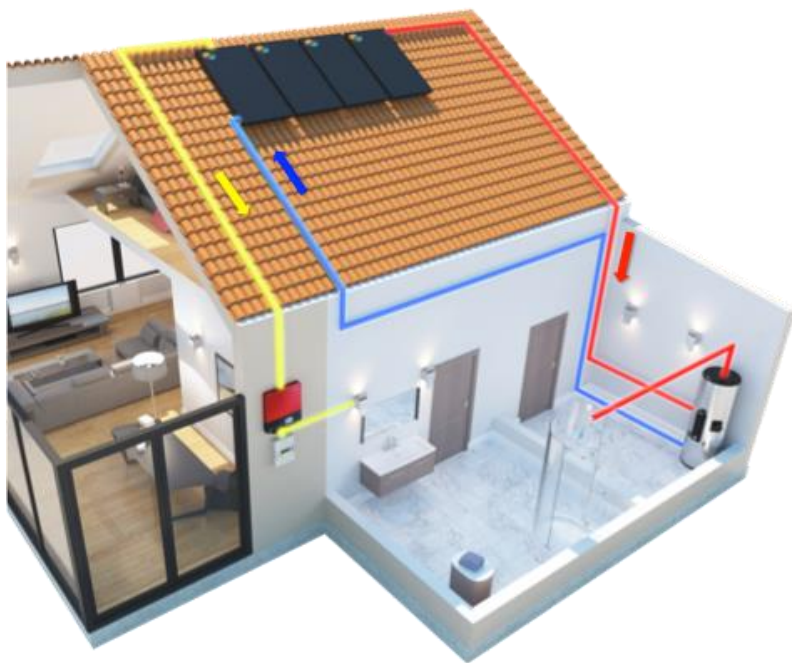


Power (Wp)	310
Panel area (m ²)	1,635
Width (mm)	35
Weight empty / full (kg)	22,8 / 27,8





DUALSUN APPLICATIONS FOR RESIDENTIAL SOLAR



Individual Housing
2kWp to 10kWp

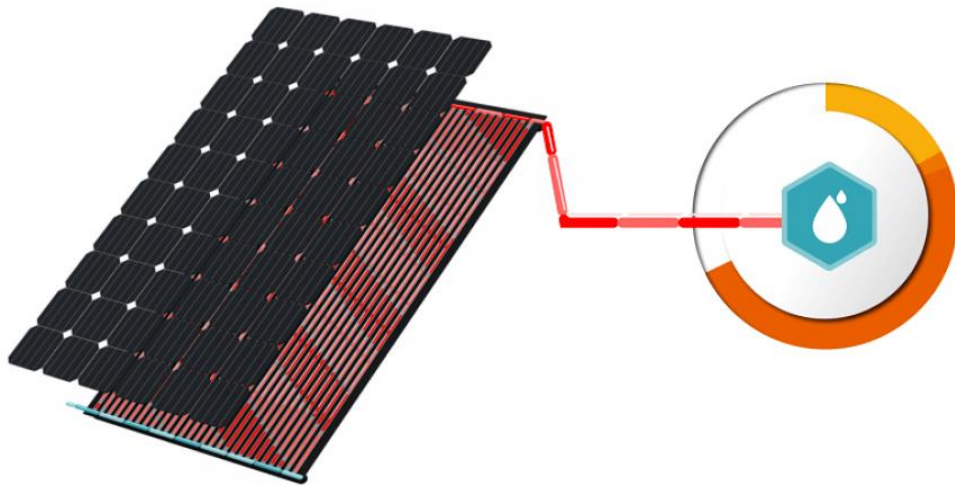


Collective Housing
10kWp to ~100kWp



DualHeat®

The backside of the DualSun Spring panel is composed of a **polypropylene heat exchanger** protected by **3 international patents**.



- The water that circulates through the exchanger is warmed by the heat dissipated from the photovoltaic cells and can reach temperatures up to 70°C.
- The heated water can then be used for different heating needs of the building : domestic hot water, pool heating, and even space heating with a combined system. The heated water can then be used for **different heating needs of the building**.

Spring is thus the successful union of two solar technologies :

- **photovoltaic solar** : with optimized production of photovoltaic electricity on the frontside
- **thermal solar** : with the generation of solar hot water on the backside by recycling the wasted heat of the photovoltaic cells

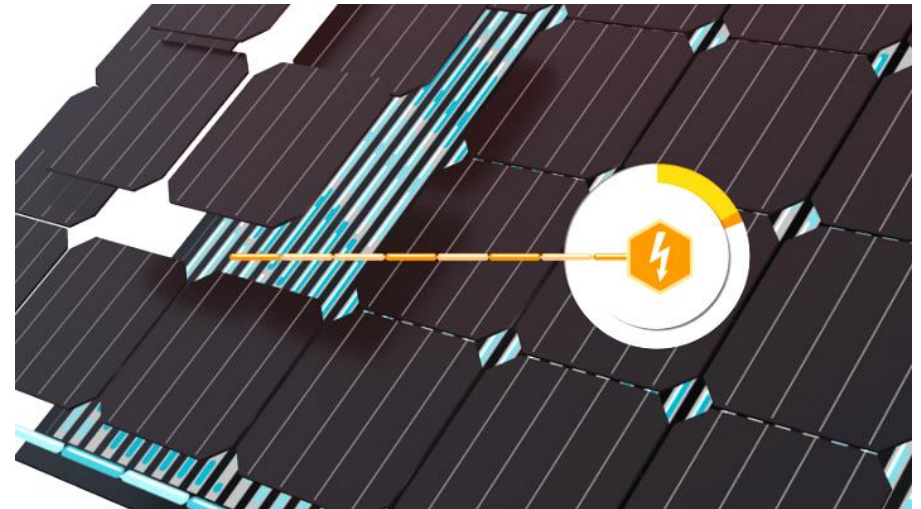




DualBoost®

A standard photovoltaic panel generates **80% heat and only 20% electricity**.

- This heat is not only wasted, but is adverse to the panel's photovoltaic efficiency which decreases as temperature increases
- Thanks to its **innovative heat exchanger** and the water circulating behind the photovoltaic cells, the DualSun Spring panel is constantly cooled which allows it to **generate more electricity** than a standard photovoltaic panel.



5% to 15 % more electricity due to the cooling of the photovoltaic cells:

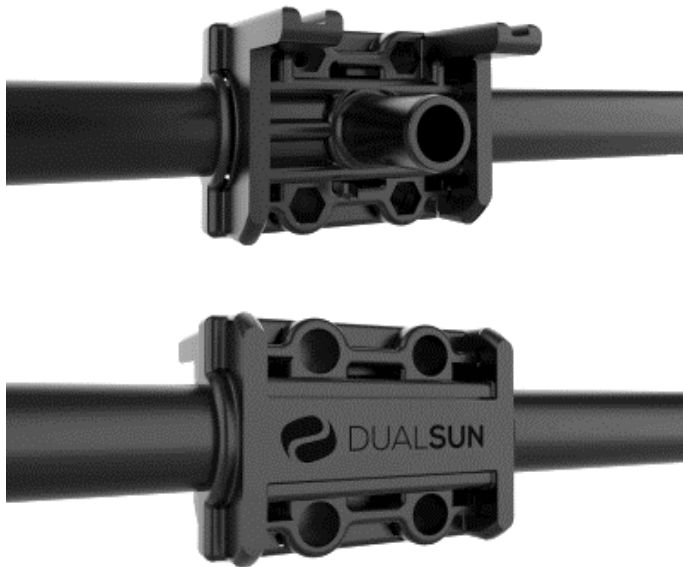


Standard photovoltaic panels generate a lot of heat and their efficiency decreases as temperature increases. The DualSun panel integrates a heat exchanger behind the photovoltaic module, and **the water running through this exchanger cools the photovoltaic cells and in effect, increases the PV efficiency.**



DualQuickfit®

In order to save time when installing its products, DualSun developed **hydraulic connectors specific to DualSun panels** : DualQuickFit connectors.



- ✓ **Compatible with a wide range of fluid and drastic conditions :**
 - Glycol, Chlorinated, salted and hard water
 - Resist up to +110°C
- ✓ **Flexipipe in EPDM in DN15 or DN26**
- ✓ **Ease of installation :** + compact, + design
- ✓ **Better reliability and longevity**
 - Remove of the cartridge, remove of any rotation move



The DualQuickFit connectors are fast connectors to connect Spring panels hydraulically. There are two connectors per panel and they simply need to be clipped on to **be leaktight**.



Our panel is compatible with most of standards PV mounting systems

Quick and easy to install, our hybrid solar technology can be installed on any roof. It won't change the habits of the installers and won't increase the price of the PV materials.



The DualSun panels are very well positioned into the PV market thanks to its compatibility with all the PV standards : a huge market growing fast !

The design and development of the DualSun panel is realized by our team of engineers in **Marseille**.



Because we believe in quality manufacturing and being close to our manufacturers, our manufacturing is done exclusively in France in a **ISO-9001-certified** facility near **Lyon, France**.





1ST HYBRID PANEL CERTIFIED IN THE WORLD



The DualSun panel is the first in the world to pass a new series of tests specific to solar PV/T technologies.



HAIL RESISTANCE : the panel passed the Swiss RG4 test standard and thus can resist the projection of hailstones up to 7.5cm in diameter, weighing 203g with a speed of 143 km/h.

WIND RESISTANCE : a low-pressure of 2400 Pa, the equivalent of a 130 km/h wind applied to the panel for one hour.

SNOW RESISTANCE : a pressure of 5400 Pa, the equivalent of 6 meters of snow applied to the panel for one hour.

THERMAL CYCLING : the module is exposed to 200 temperature cycles, with each cycle going from -40°C to 85°C over a 6-hour period.

DAMP HEAT : the module is exposed to extreme conditions (85°C and 85% relative humidity) for 1000 hours.

HUMIDITY FREEZING : the module is exposed to 10 cycles from 85°C and 85% RH to -40°C over a 10-day period.



"DualSun is the first manufacturer to pass the new specific PVT tests that have been developed over the past years. We believe strongly in the potential of PVT technology... otherwise, we would not spend so much time developing these new relevant tests !"

Ulrich Fritzsche – 2013

Project Manager of Hybrid PVT systems at TÜV Rheinland



Installations all over the world



France – 620 panels



Norway – 100 panels



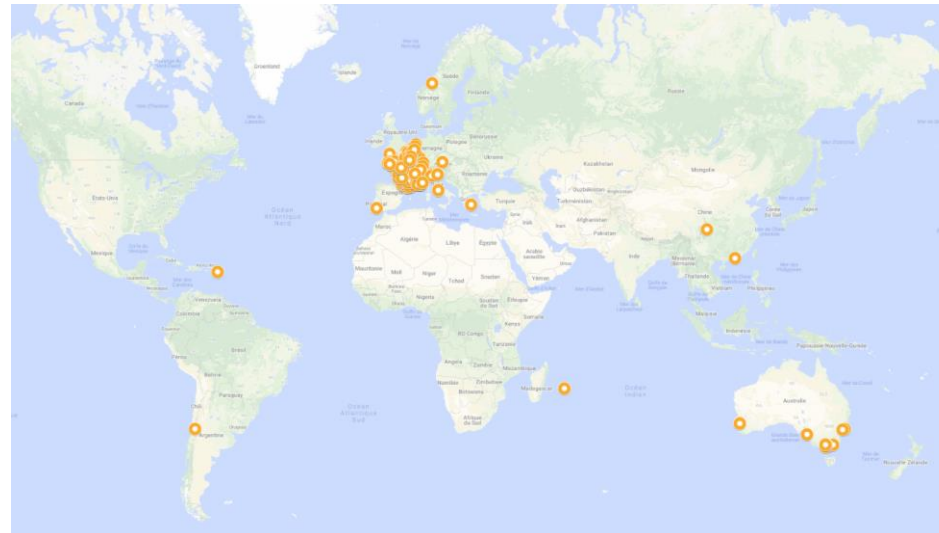
Netherlands – 303 panels



Switzerland – 40 panels



France – 40 panels



Hong-Kong – 138 panels



France – 12 panels



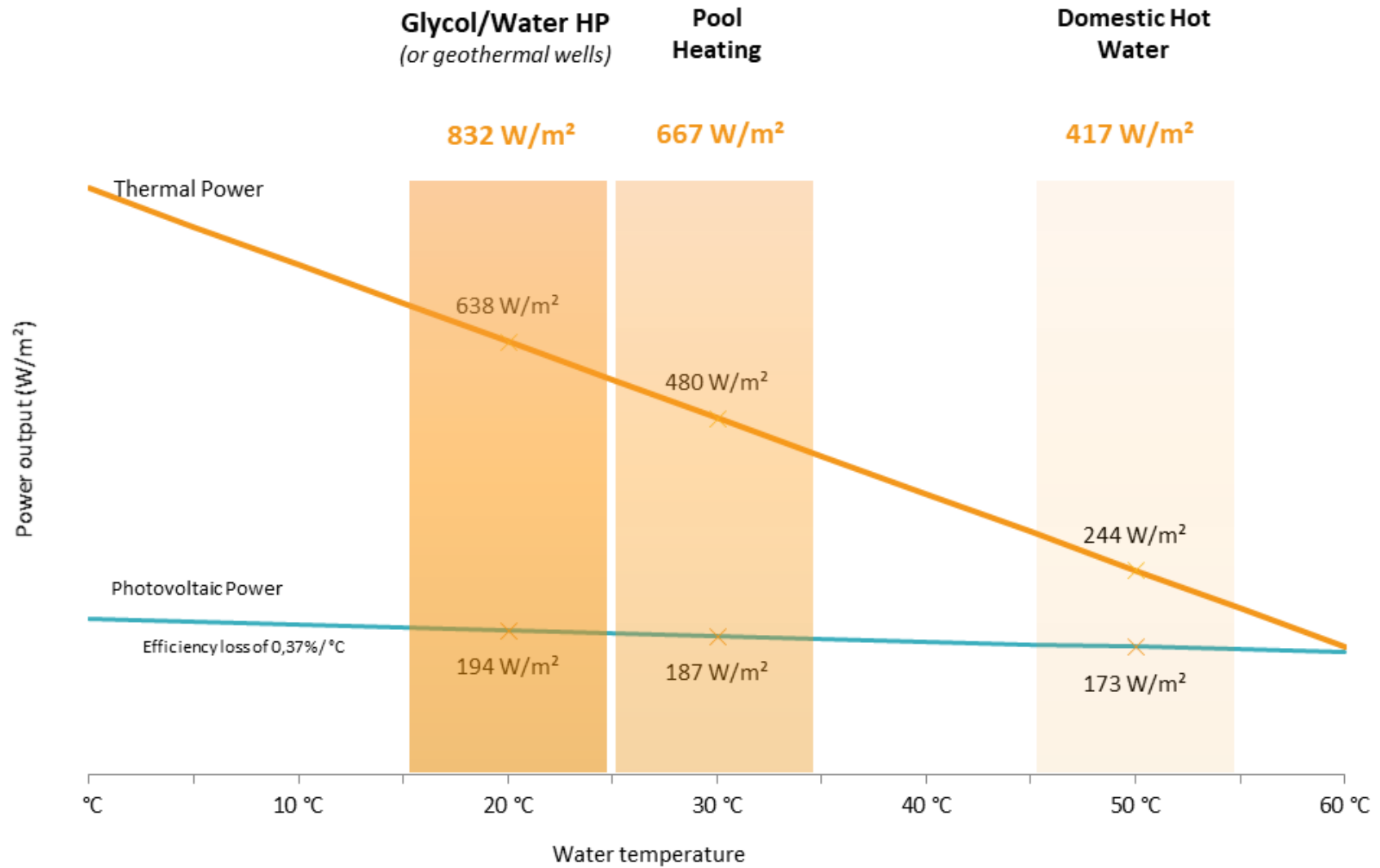
Australia – 30 panels per installation





MOST POWERFUL SOLAR PANEL FOR ALL YOUR APPLICATIONS

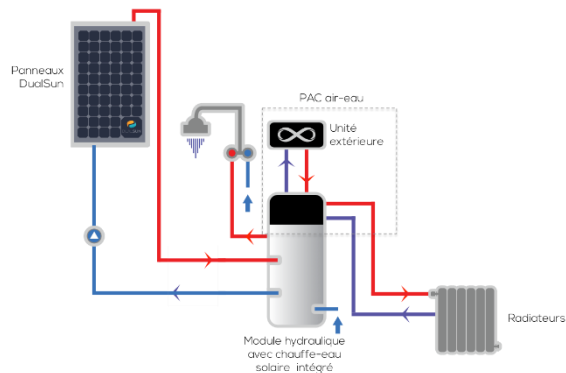
Performance from $\alpha 0$, $\alpha 1$ coefficients (wind $u = 1 \text{ m/s}$) and panel surface ($1,654 \text{ m}^2$) under STC conditions (Text = 25°C , $G = 1000 \text{ W/m}^2$).



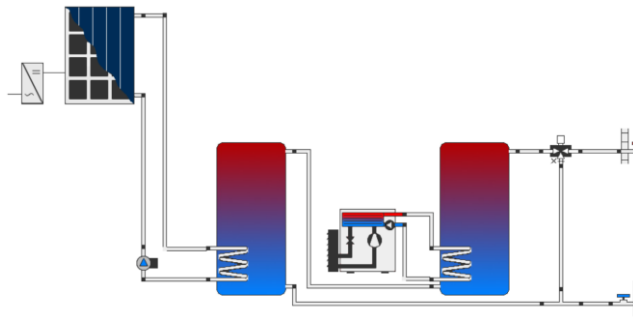


HYBRID SOLAR SYSTEMS

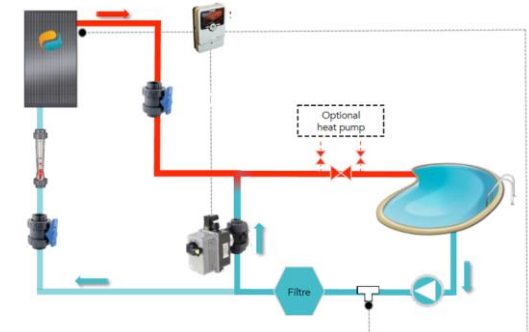
DHW individual pre-heating
(Air/Water HP or
Gas/Biomass heater)



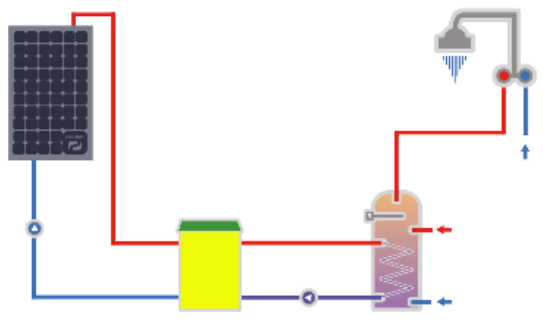
DHW collective pre-heating
(Air/Water HP or
Gas/Biomass heater)



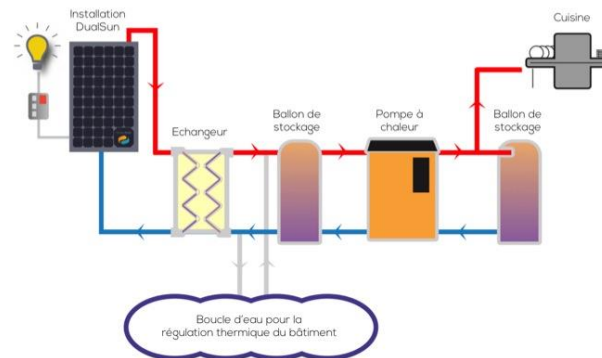
Pool Heating
(Air/Water HP)



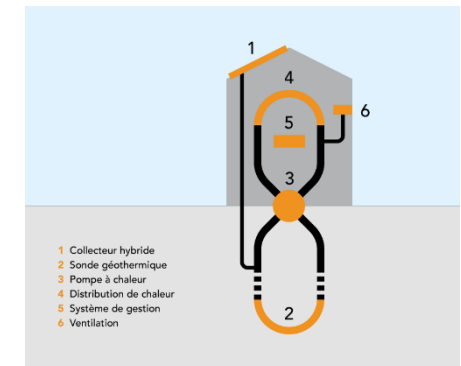
DHW &/or Heating in direct
(Water/Water HP)



DHW &/or Heating with cold storage
(Water/Water HP)

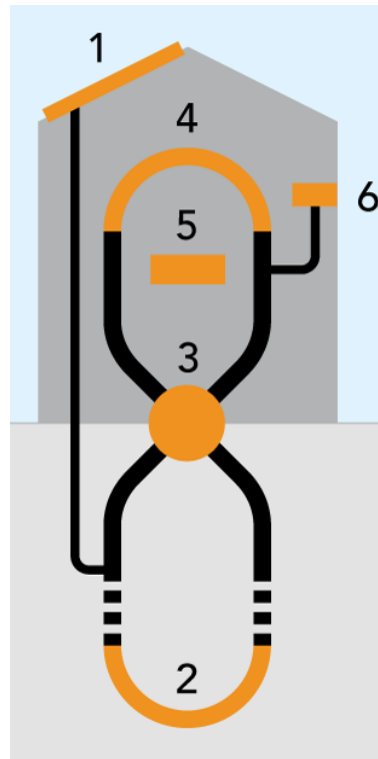


DHW &/or Heating with geothermal wells
(Ground source HP)





PVT+HP : DualSun in geothermal 2SOL systems



2Sol system :

1 :  DualSun PVT modules

2 : Geothermal probe

3 : Heat pump

4 : Heating distribution

5 : Controlling

6 : Air Conditioning

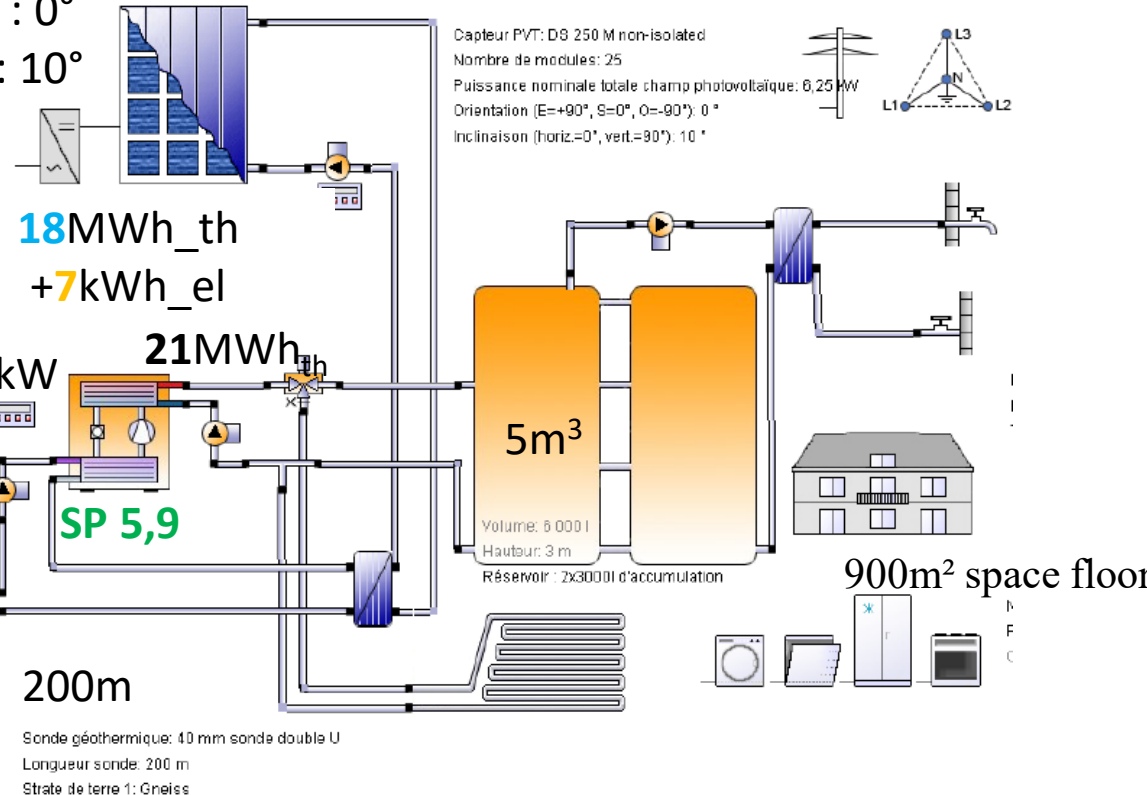


Positive energy renovation on a tertiary building (built in the 1970s!) — 40m² DualSun in a Geothermal 2SOL system

25PVT(40m²)

South : 0°

Slope : 10°



PolySun simulation

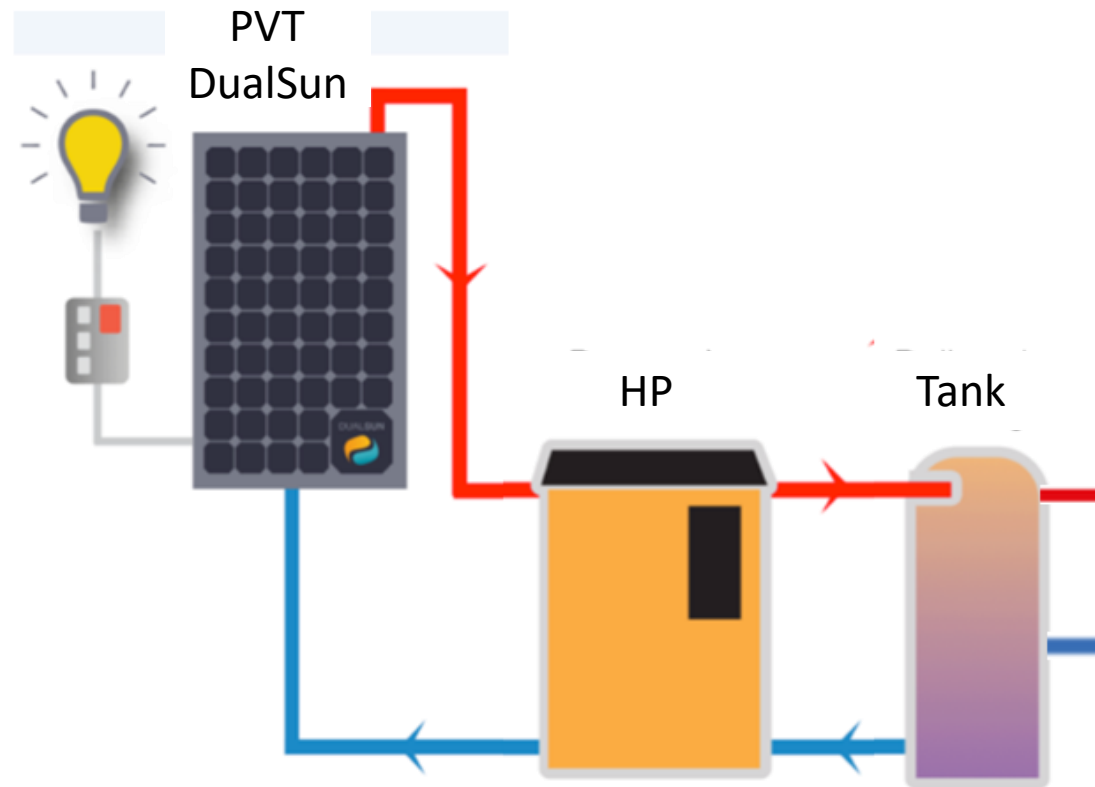
Headquarters, KTR France, Dardilly (FR).

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

<https://dualsun.com/en/realisations/lyon-fr-2018-25pvt-en/>

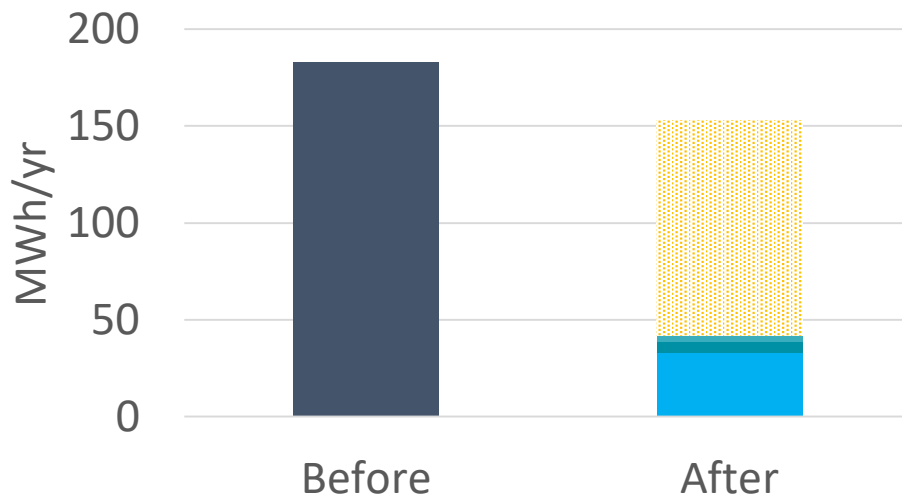


PVT+HP : DualSun as cold source

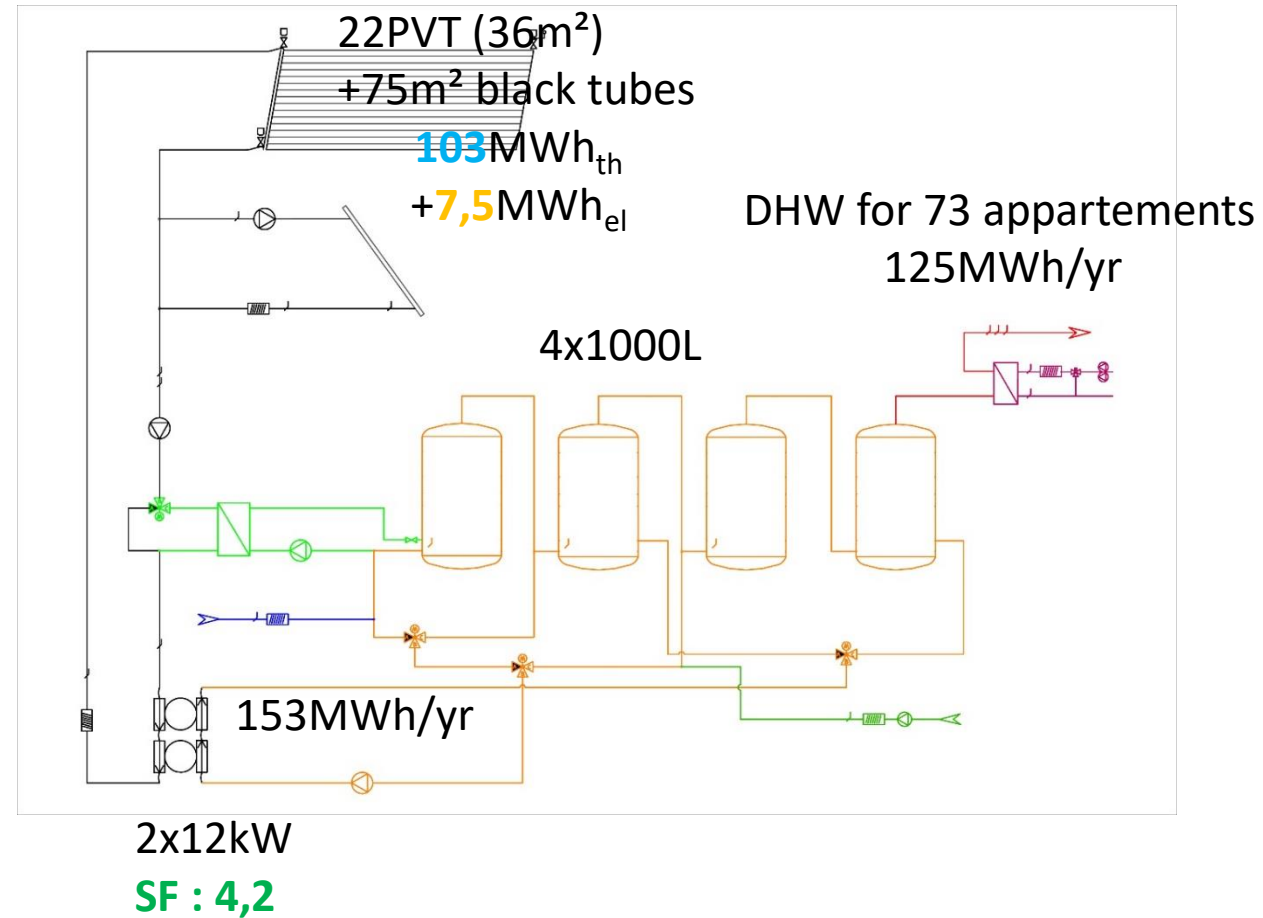




DHW for multihouse building (Marseille, 2013)



■ Elec for HP ■ Elec for auxiliaries ■ Gas ■ free REN



➔ Consumption divided by a factor 4 !



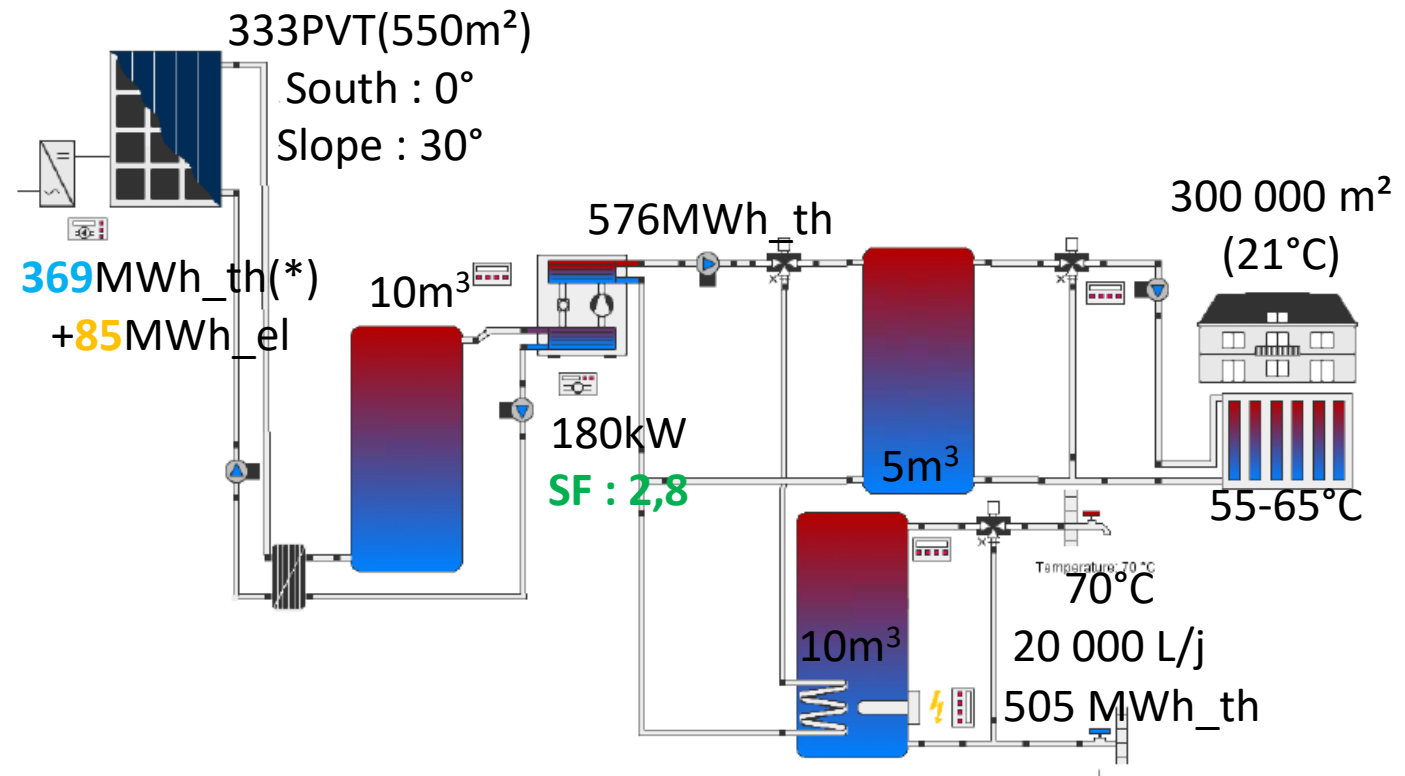
Student house (Rijssen, 2019)



303 non insulated Spring + 5m³ cold tarpaulin before HP, 150kW HP



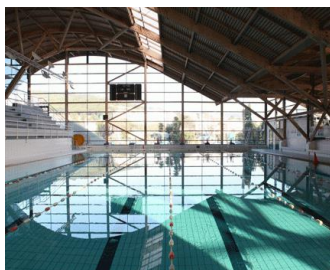
Student house (Nijmegen, 2019)



(*) night functioning not included :
up to 2,5 more energy if the tank is in average at +2°C



COMMERCIAL POOLS - SETE & PERPIGNAN



Dalkia installed 180 DualSun panels for its Energy Performance Contract (EPC) with the city of Sète.

Together with heat pumps DualSun panels help reduce the primary energy consumption of public buildings by 33%.

"Because they are well suited for swimming pools. These are panels that work at low temperatures, this optimizes production."



In addition, on a pool, there is a concomitance between consumption and production so it works well for solar. There is no need to store much for the ECS, and it is easy to unload the surplus production when there is no consumption in the basins, which themselves become the thermal stock of the Installation!

DualSun panels helped us win the project! "

- Jean-Paul Girard, Project Manager DALKIA





Economical balance

	KTR, Lyon (FR)		Zoetermeer (NL)		Marseille (Fr)		Nijmegen (NL)	
Investment (*)	70 000€		25 000€		136 000€		1 200 000€	
PVT PV part	6,25kWp	8 500€	3,64kWp	6 000€	5,2kWp	15 300€	84,8kWp	95 000€
PVT ST part	40m ²	8 000€	13m ²	3 800€	110m ²	11 800€	500m ²	82 000€
HP (+drill./storage)	26kW+4x150m	53 500€	3kW+90m	15 300€	24kW+4m ³	108 700€	150kW+5m ³	1 023 000€
Elec. Cons. kWh/yr	3 560		1900		32 700		206 000	
PV Energy kWh/yr	7 000		3 700		7 450		77 200	
Th Energy kWh/yr	SF5,9	17 450	SF3,8	5 300	SF4,2	103 300	SF2,8	336 600
Cost of PV over 20y <i>undiscounted</i>	6,1c€/kWh		8,1c€/kWh		10,2c€/kWh (2013)		6,2c€/kWh	
Overcost on Th	13%		20%		10%		7%	

(*) 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.



IEA SHC Task 60: <http://task60.iea-shc.org>
Application of PVT Collectors and New Solutions in HVAC Systems