The optimal path between you and the sun

Dualsun develops high-performance Solar Hybrid Panels that lower energy costs and enhance the energy rating of homes and buildings.

DUALSUN

Dualsun introduction

Dualsun, established year 2010, is developing high-performance **Solar Hybrid Panels** that reduce energy cost & carbon emissions of our homes and buildings. Supplies also matching **PV Panels**

- 1st manufacturer in the world, year 2013, to obtain the TÜV Rheinland's solar hybrid panel certification
- €60M turnover in 2023
  180 MWp delivered in 2023
- 2 locations in France : headquarters in Marseille, production site in Jujurieux (east of Lyon)
- €19.1M invested in product development since 2010
  65 Employees

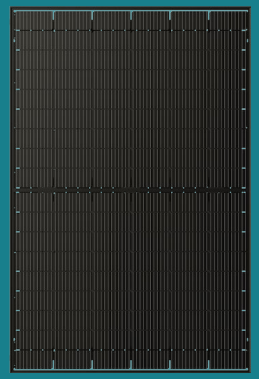
The Solar Keymark
CEN Keymark Scheme

EUPD RESEARCH
TOP BRAND PV
MODULES
SWEDEN
2024

EPD®
THE INTERNATIONAL EPD SYSTEM

The 3 solar energy technologies and their efficiency

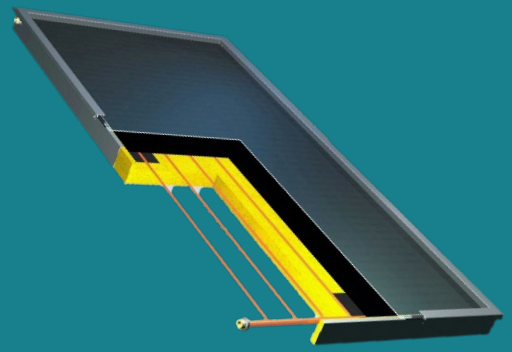
Solar panels (PV)



PV panels generate electricity with approx. **22%** efficiency

Max temperature 60-65°C

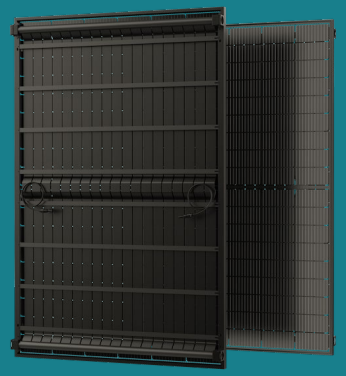
Thermal collectors (T)



T-panels generate heat and hot water with approx. **60%** efficiency

Max temperature 200°C

Hybrid panels (PVT)

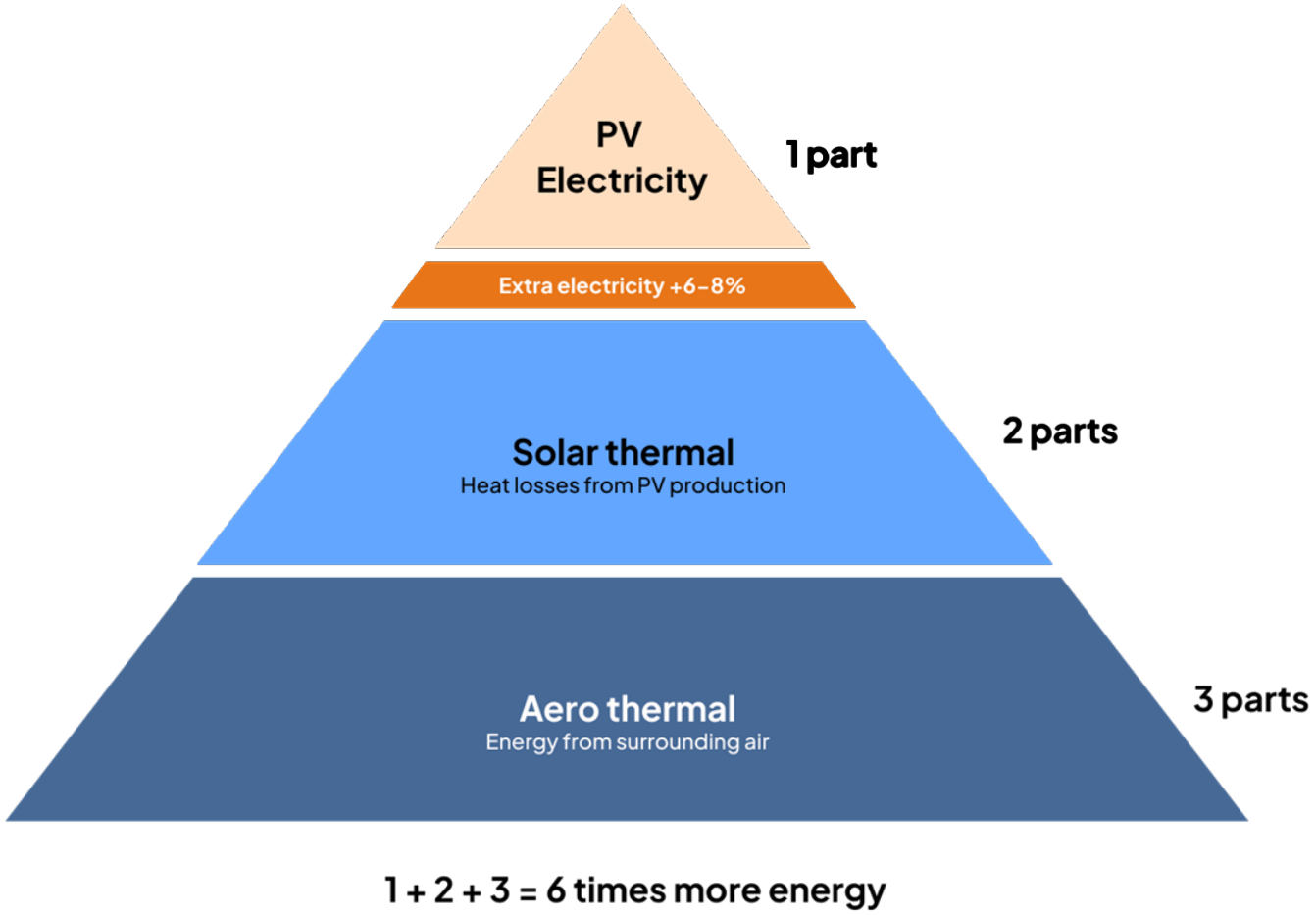


Hybrid panels generate both electricity and heat in the same panel with approx. **35-180%** (including yield from the air) depending on application

Max temperature 60-65°C

How is it possible to extract 6 times more energy from the roof tops?

A solar hybrid panel (PVT) brings together 3 different technologies/sources in one panel:



Hybrid panels do not only address electricity, but also the major energy consumers **= heating and hot water**

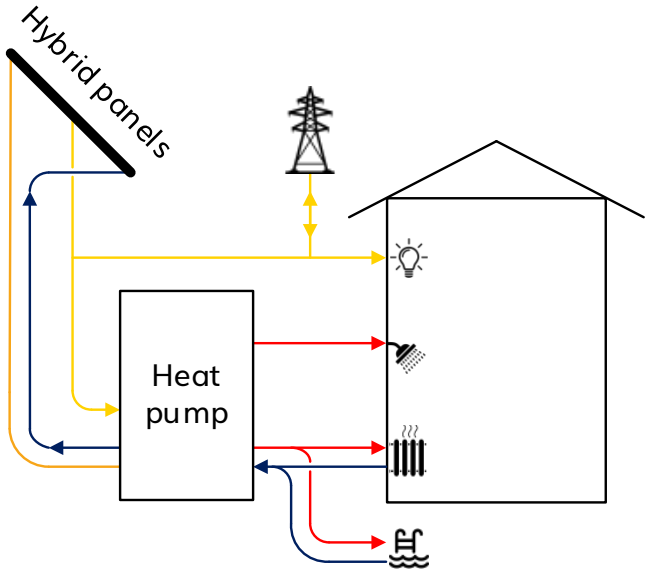
3 main applications for PVT in the Nordics, enabling new energy solutions!

1) PVT source heat pump

Annual yield: 800-1600 kWh/m²

- Heat pump with PVT panels as thermal source instead of boreholes
- Quiet and more efficient alternative to air/water heat pumps or dry cooler
- Minimize consumption of district heating, gas or biomass

Payback: 5-10 years



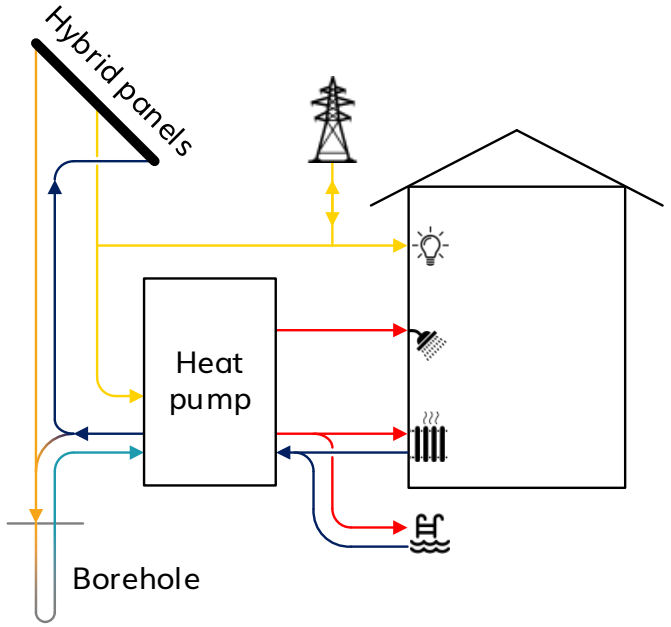
Possibility to upgrade with geothermal storage at a later stage

2) Cold boreholes or COP optimization

Annual yield: 1100-1800 kWh/m²

- Avoid additional drilling
- Recharge for improved efficiency but also power & energy coverage for geothermal heat pumps
- Reduce need of peak power & energy

Payback: 0-12 years

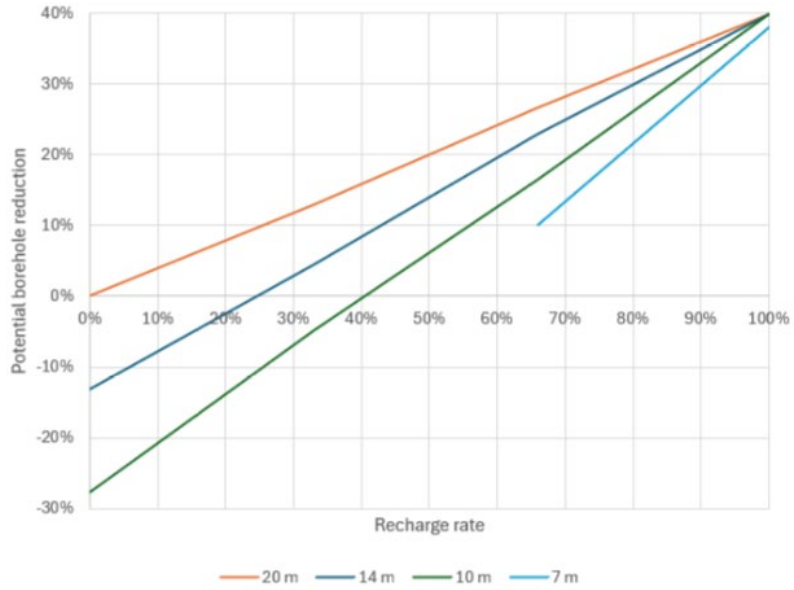


3) Optimized geoenergy storage

Annual yield: 1000-1500 kWh/m²

- Reduce borehole storage cost (number or depth)
- Limited space for borehole storage
- Passively or actively charge seasonal thermal energy storage
- Basically about cutting CAPEX and improve OPEX

Payback: 0-10 years



Cost and space-optimized borehole drilling using recharge with PVT

Areas of use:

- Enables geothermal energy on plots that with traditional GSHP systems would be considered “too small”
- Cost optimization of borehole storage
- Manage the long-term energy balance of borehole storages
- Protection for miss-calculations of thermal extraction

Reduced distance from 20 m to:

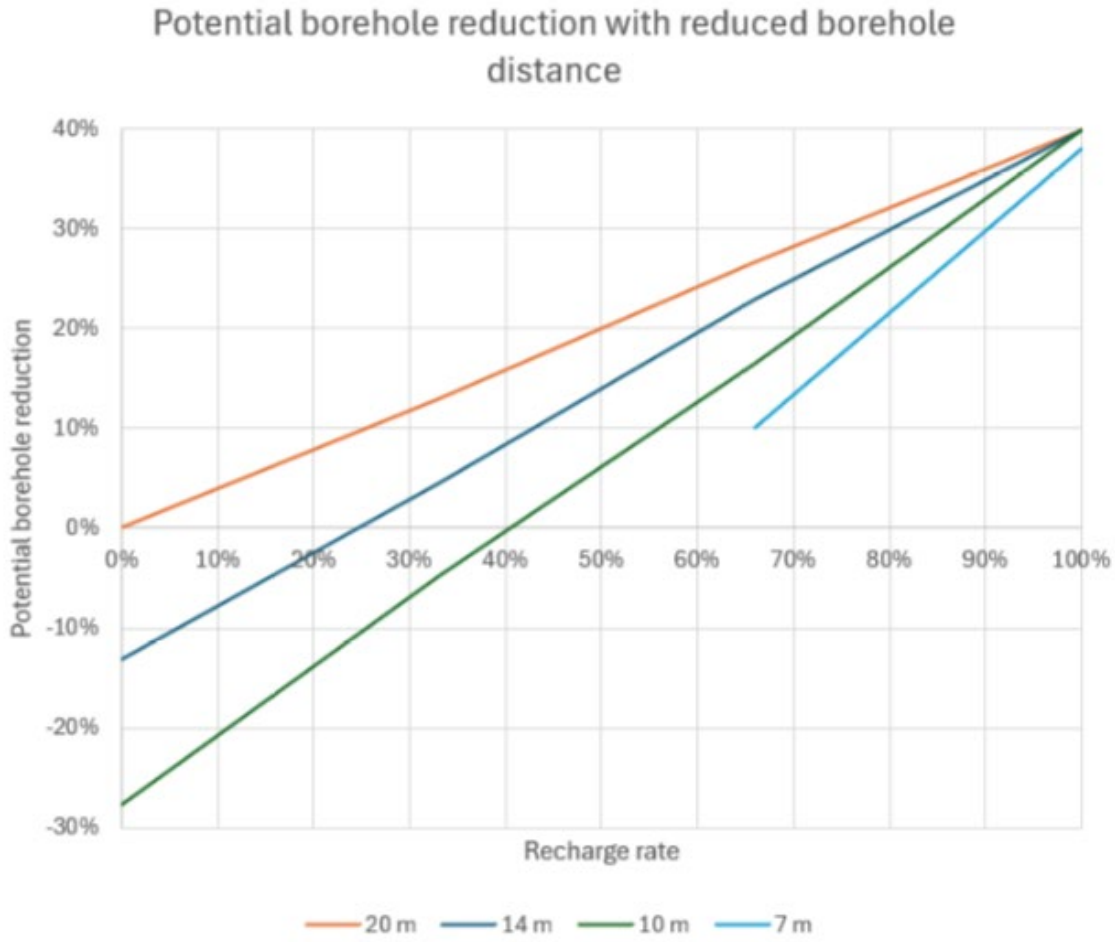
- 14 m -> 2 x boreholes
- 10 m -> 4 x boreholes
- 7 m -> 8 x boreholes

With increasing borehole storage size, the greater the saving with PVT will be

Graph on the right shows potential boreholes savings or recharge requirement to maintain the same minimum temperature of brine during peak load after 25 years

Repayment period: 0* years

*the cost saving for the borehole park corresponds to the increasing investment cost for PVT compared to PV



$$Recharge\ rate = \frac{Thermal\ energy\ from\ PVT\ and\ cooling\ to\ brine}{Thermal\ energy\ to\ heat\ pump\ from\ brine}$$

Optimized heat pump with geoenergy storage recharge

Areas of use:

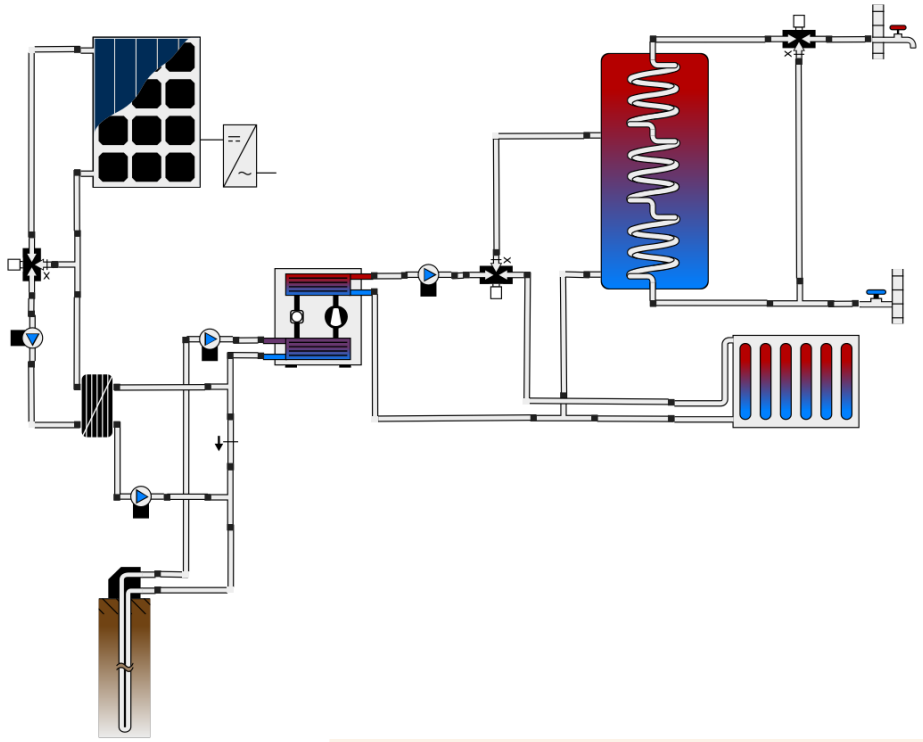
- Improved operating economy through higher power and energy coverage for heat pumps, which reduces the need for peak heating
- Increased property value through improved energy balance and higher energy classification.
- Enables zero and plus energy buildings on a commercial terms
- Optimize utilization of roof surface
- Recharge cold boreholes and achieve better operating economics in existing geoenergy systems
- Alternative to complementary drilling
- Extended heat pump capacity in existing geothermal installations for increased power and energy coverage

Performance:

- Annual efficiency (SCOP) for heating system increases by up to 30%
- Energy for peak heat is reduced by 6-100%
- Solar production increases by 5-10% (for PVT panels)

Repayment period: from 0 year

Project example: 10-storey apartment building as plus-energy building in Karlskrona, south-eastern Sweden



LinkedIn

Skanska

Two new building apartment projects, with PVT & GSHP

More references on or LinkedIn

Net-zero energy building in Karlskrona, Sweden

- Liquid-water heat pump combined with boreholes and PVT
- 100% power and energy coverage for electricity, heating and hot water
- 84 PVT panels
- 130 PV panels

Plus-energy building in Trondheim, Norway

- Liquid-water heat combined with boreholes and PVT
- The building block is a net-producer of 2 kWh/m² to the grid
- 472 PVT panels

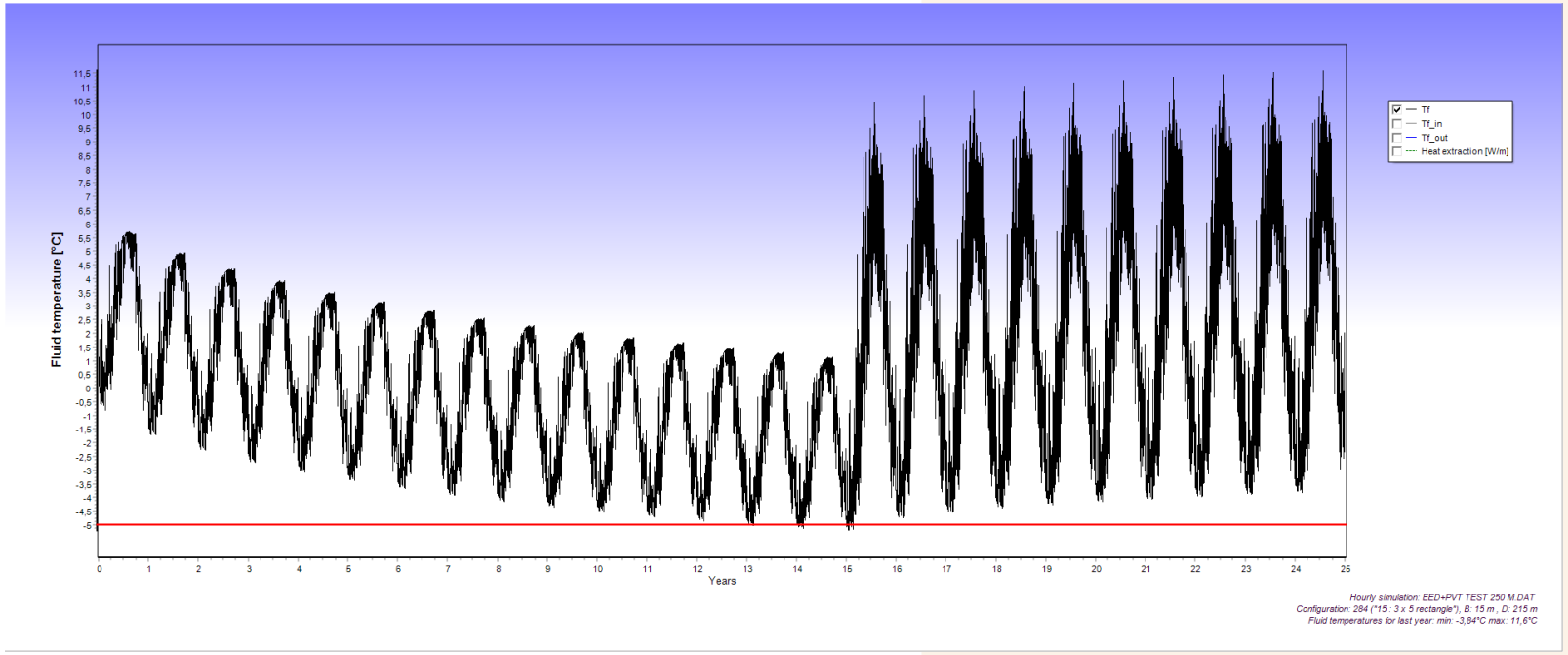
Recharge of cold boreholes

Areas of use:

- Improve energy balance of boreholes
- Avoid heat pump stop or derate due to too cold brine
- Melt frozen boreholes
- Enables increased thermal extraction from brine without the risk of cold boreholes (i.e. increased heat pump capacity or improved heat pump performance when replacing heat pumps)

Benefits

- Lower cost than additional drilling
- No drilling permits
- No destruction of outdoor spaces
- Retrieve heat pump performance without additional borehole drilling
- Reduced peak unit power and energy
- Higher performance and a quiet alt. to dry coolers



Retrofit of apartment building with PVT

12 apartments with a 30 kW heat pump in Stockholm

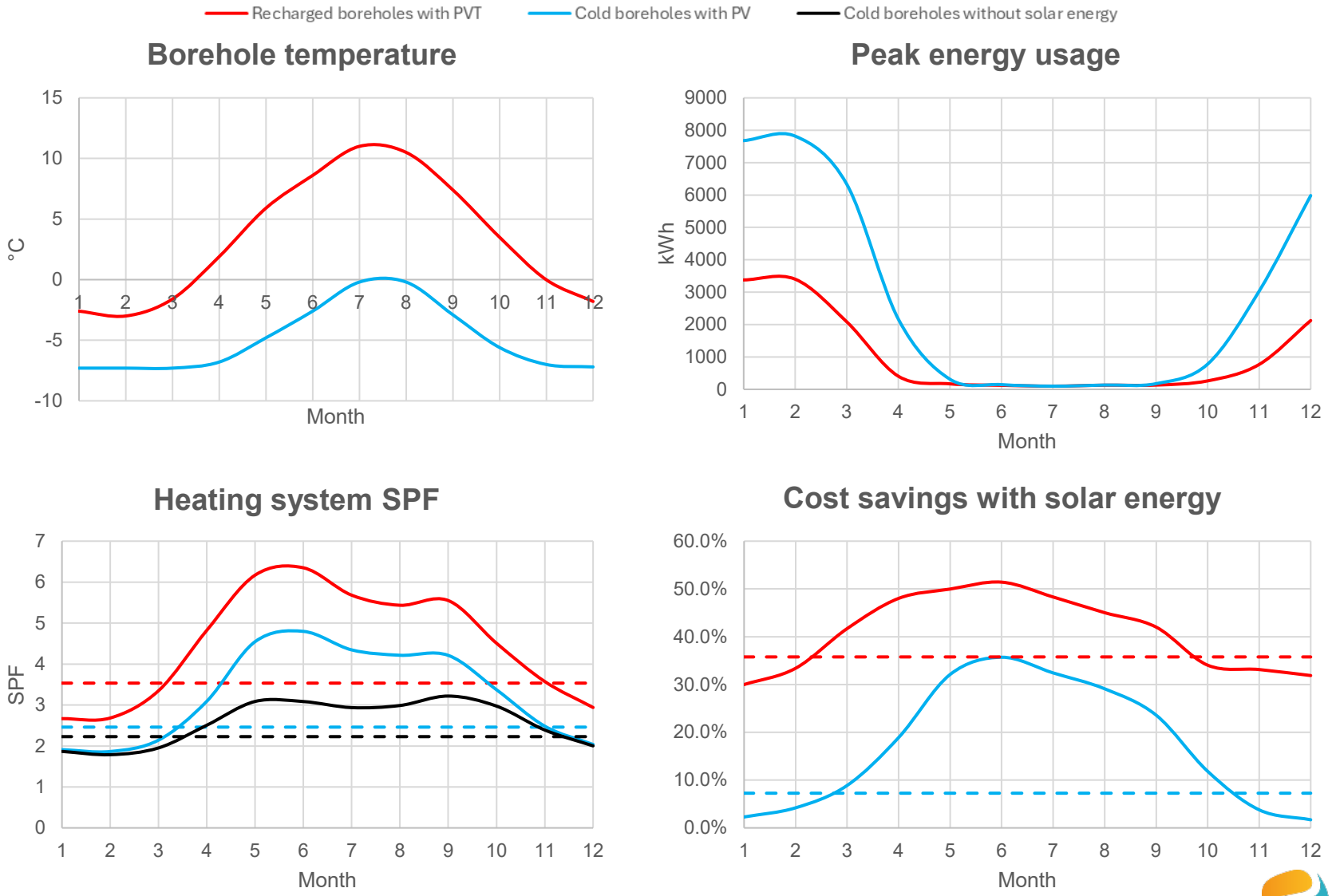
Project details:

Urban area with small plot
- 12 apartments
- 30 kW heat pump
- 3 cold boreholes of 150 m

Potential actions:
- Do nothing!
- Install 30 PV panels
- Install 30 PVT panels

Heating system SPF* includes:
- Peak energy
- Self-consumed PV electricity

* Seasonal performance factor



Customer case: Hönö projektet (SE-speaker) (EN-speaker)

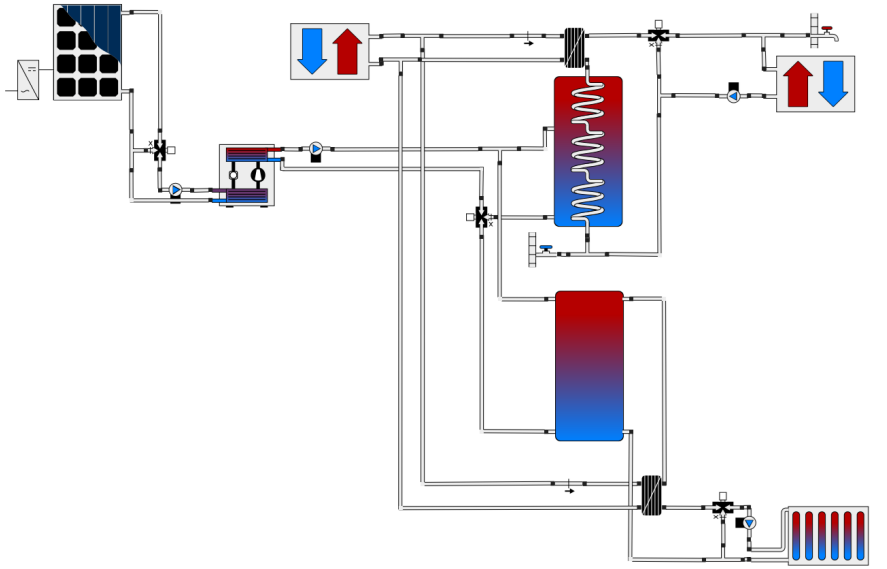
LinkedIn article

From energy class G till B

Two step process with PVT

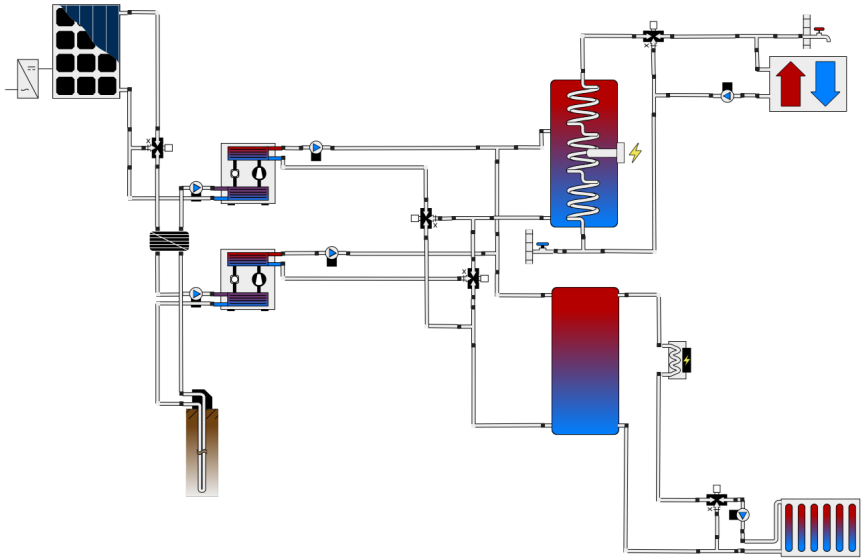
Step 1:
Reduce bought energy from district heating, gas or biomass:

- Install brine-water heat pump that would cover 20-30% of power in a full ground source heat pump installation
- Install 1.2-1.5 PVT panels per kW of heat pump
- Cover 40-60% of energy demand



Step 2:
Get free from district heating, gas or biomass dependance:

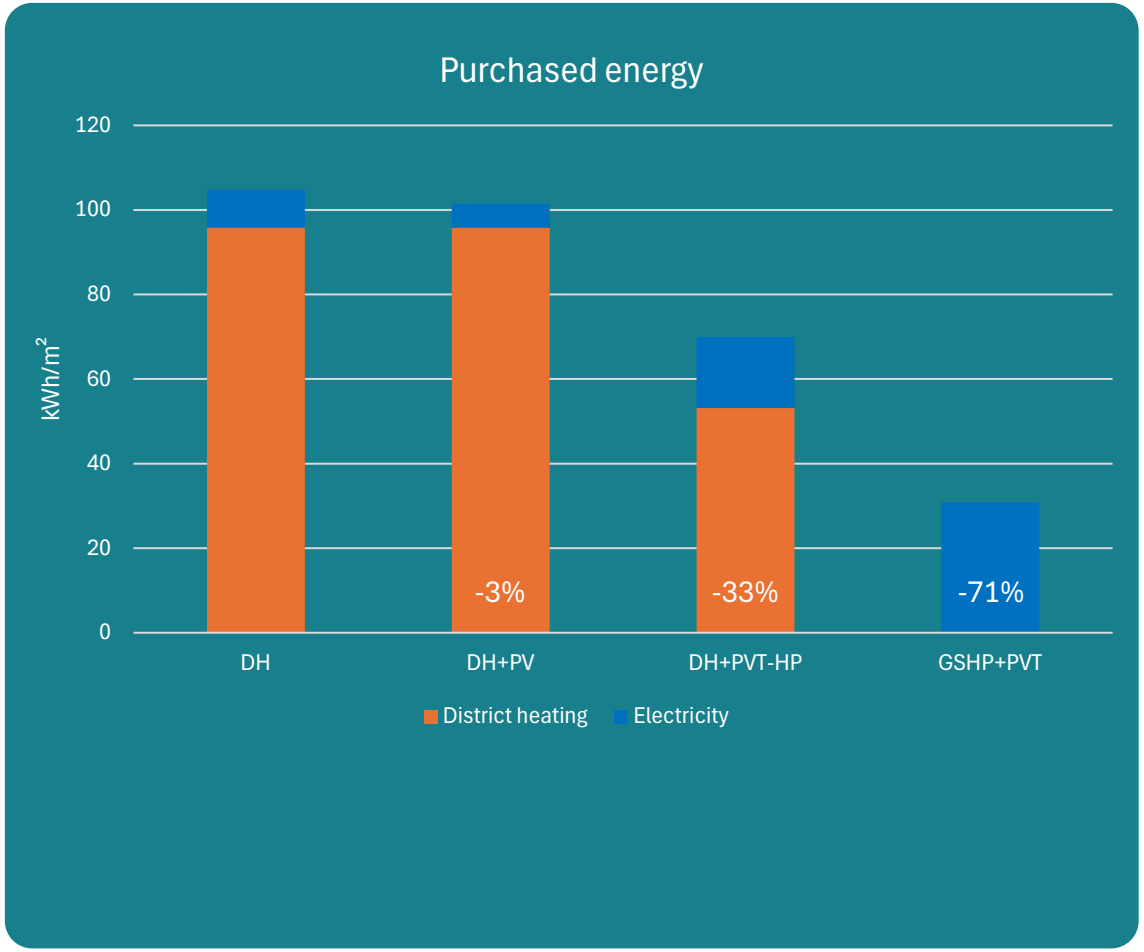
- Increase installed brine-water heat pump capacity to achieve desired power coverage
- Complement with boreholes
- The number of PVT panels already installed in step 1 then match the calculated amount in step 2 when boreholes are added (approx. 0.4 PVT panels per kW heat pump)



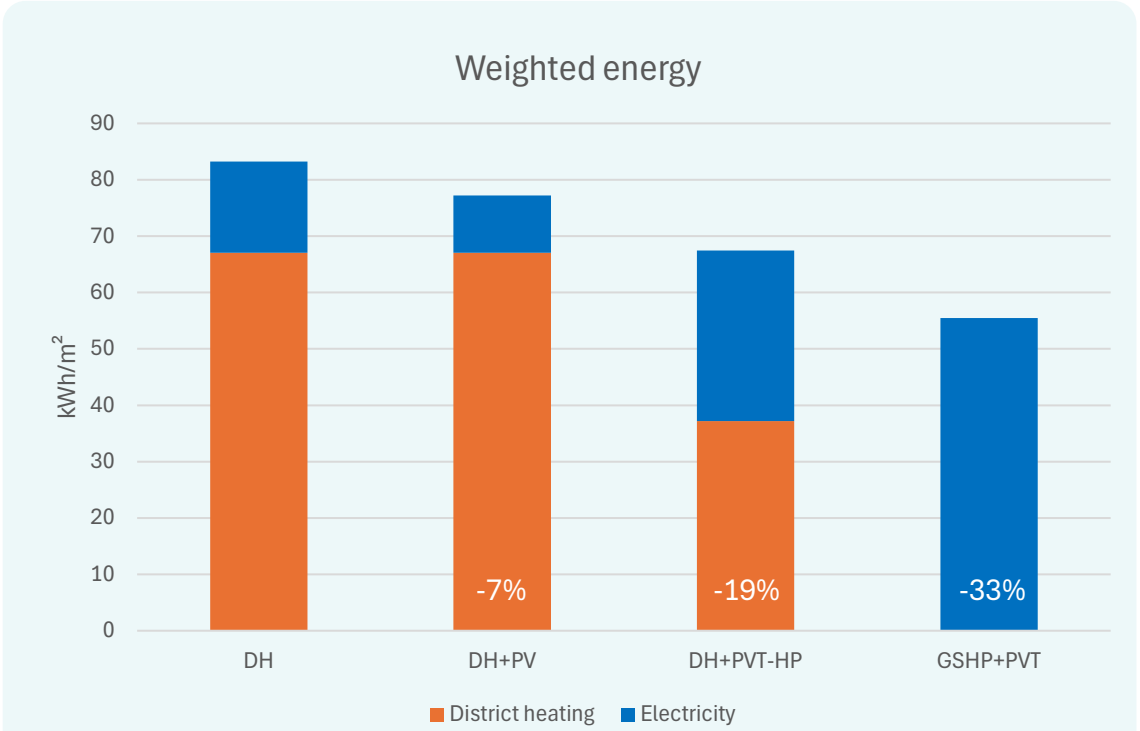
PVT-panels impact on OPEX and Energy labelling

Customer case in Stockholm: The building from 1940 is placed on a small plot, which traditionally has been too small for boreholes to a ground source heat pump. However, with recharge from PVT-panels the distance could be reduced from 20m to 13m between boreholes.

Improvement of **operation cost** with solar hybrid panels



Improvement of **energy labeling** with solar hybrid panels



Energy class: D D C B

SPRING4 (PVT) and FLASH (PV) 425W TOPcon

SPRING4 Finned

Designed for heat pump application without boreholes

Datasheet

SPRING4 Non-insulated

Designed for heat pump application with boreholes

Datasheet

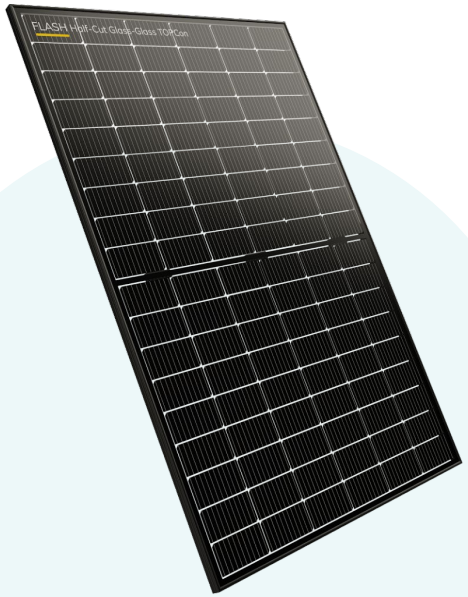
SPRING4 Insulated

Not applicable in the Nordics

Designed for hot water and pool applications

Datasheet

FLASH matching PV-panel

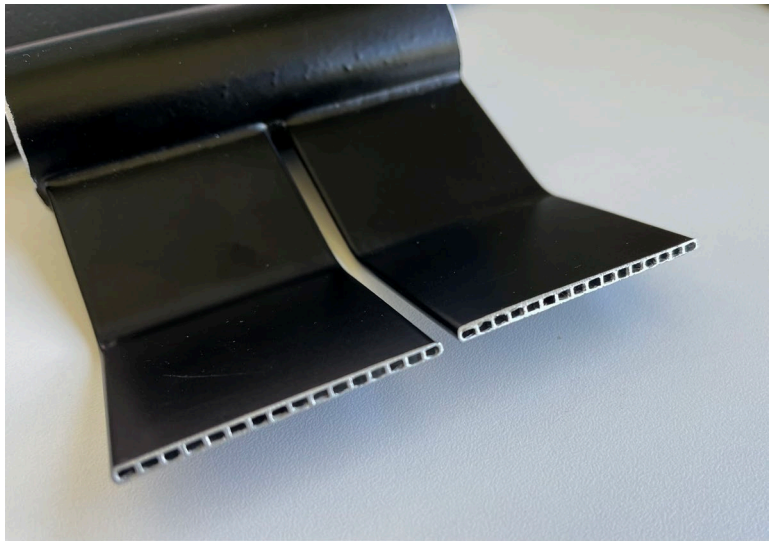


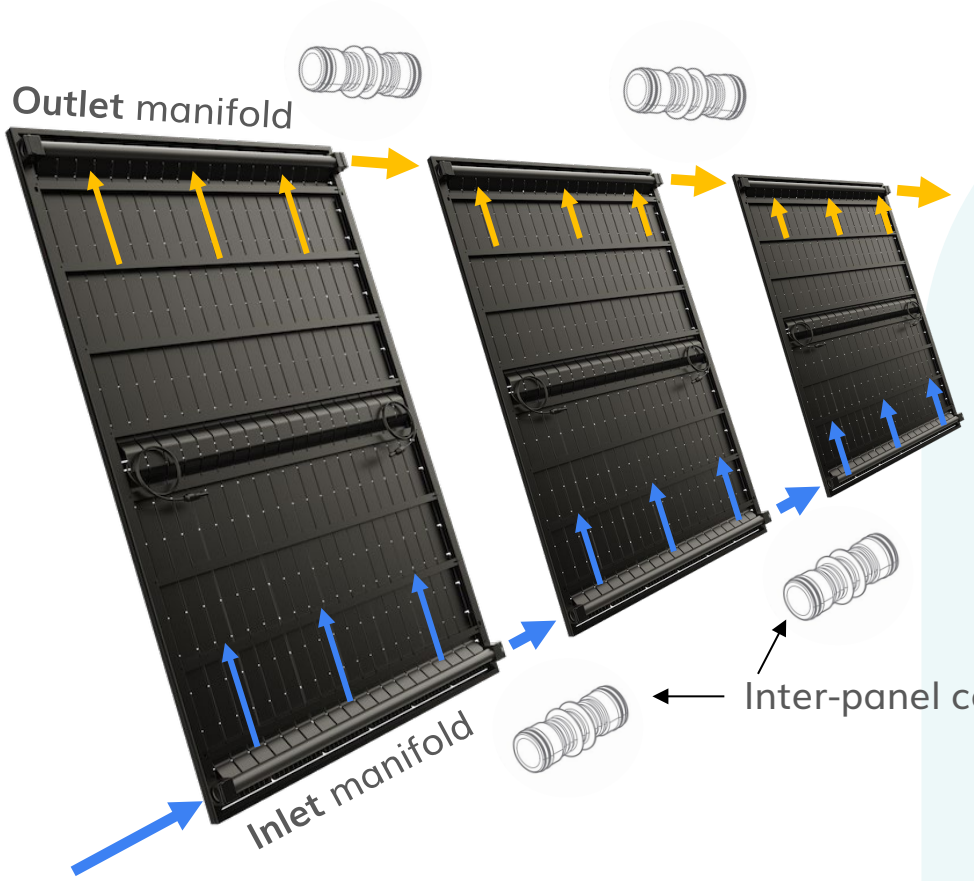
Efficient bifacial PV panel, the perfect complement to SPRING4 for a seamless design

Datasheet

How does the heat exchanger of a solar hybrid panel look like, and how are the panels connected together?

Cross-section of the heat exchangers





Maximum 7 panels in each group, which are installed by the solar panel installer.

Then a plumber connects the different groups and the pipes down to the energy central.

We will assist you with your projects!

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Thank you
for your attention

Do you have any question?

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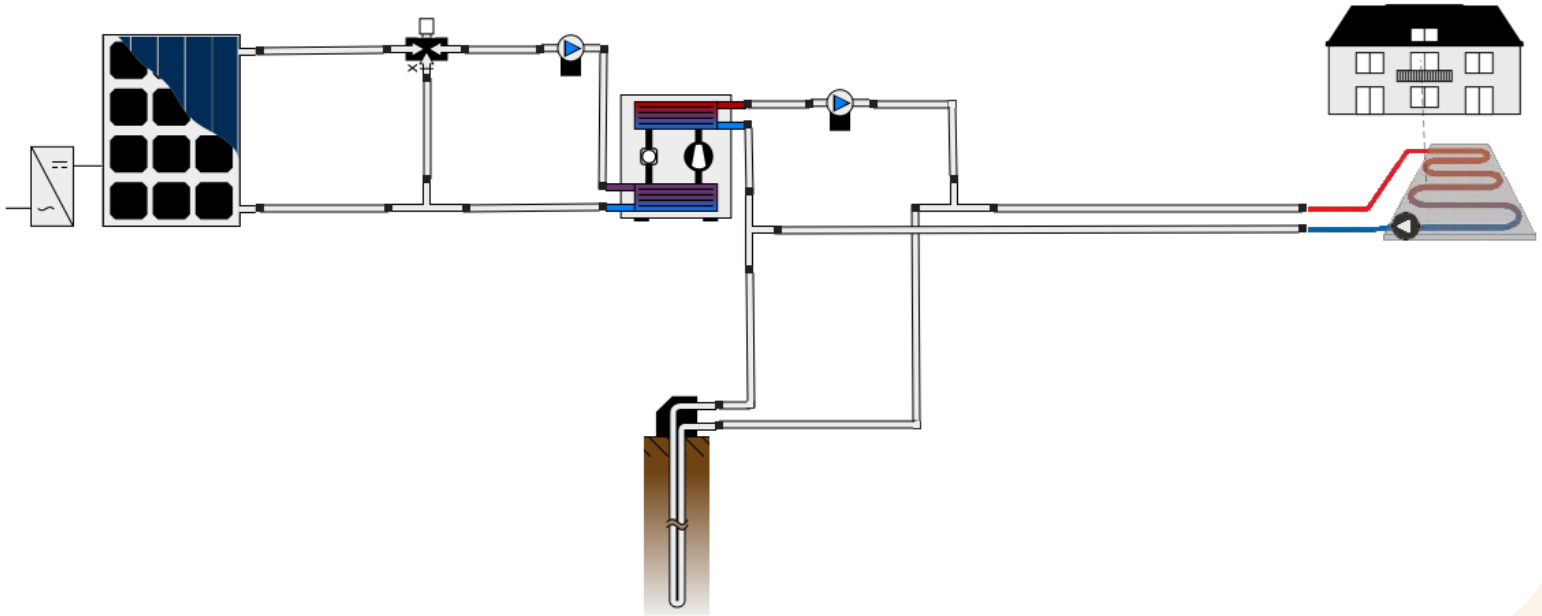
Additional material

Heat pump charged seasonal geothermal storage

PVT heat pump to change seasonal geothermal storage
Maximum usage of solar thermal and electrical production
Perfect correlation between solar thermal and electrical production for charging

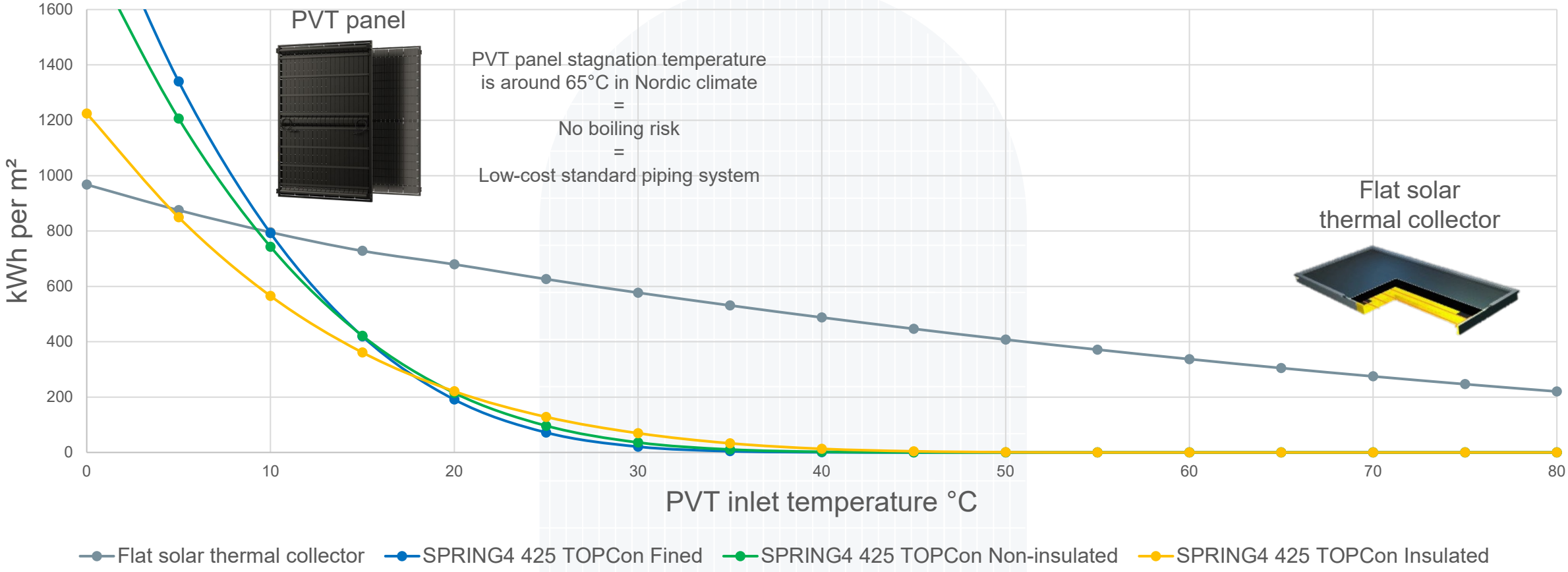
Examples of seasonal energy storage:

- ASES – Active Solar Energy Storage
- GeoTermos
- Hydroc
- Energy steel screw piles
- Energy concrete piles



Comparison of different solar heating techniques

Thermal output benchmark
Simulated yearly energy production with Polysun
Stockholm, South facing, 30° elevation
NOTE: Without the positive effect of condensation



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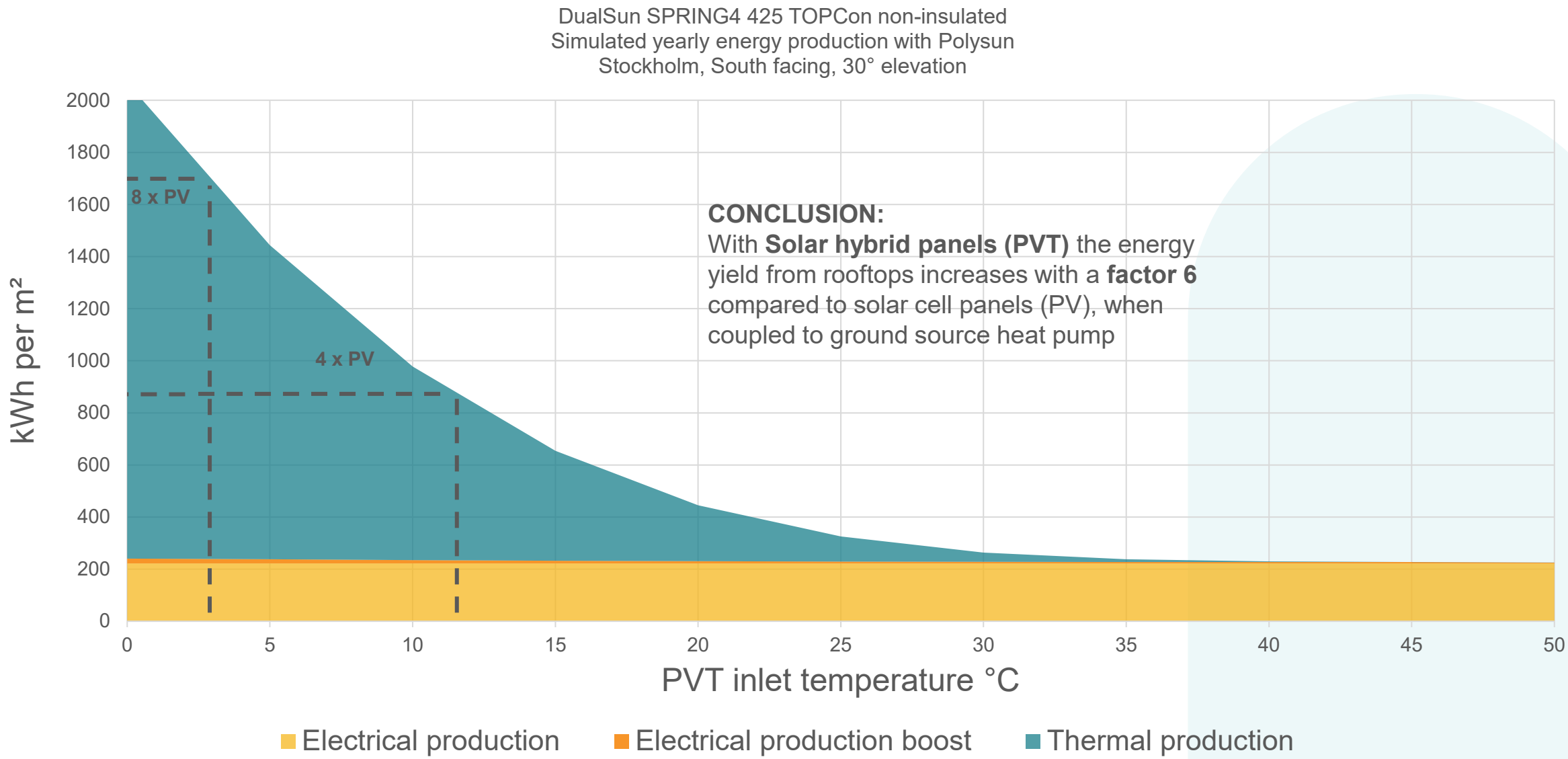
Hybrid panels in combination with geothermal heat pumps = “Match made in heaven”



CONCLUSION:
With **Solar hybrid panels (PVT)** the energy yield from rooftops increases with a **factor 6** compared to solar cell panels (PV), when coupled to ground source heat pump

Dualsun is a safe producer with the highest quality

Dualsun has the market's most generous warranties which also includes labor costs in the event of complaint:

SPRING® Hybrid panels (PVT)

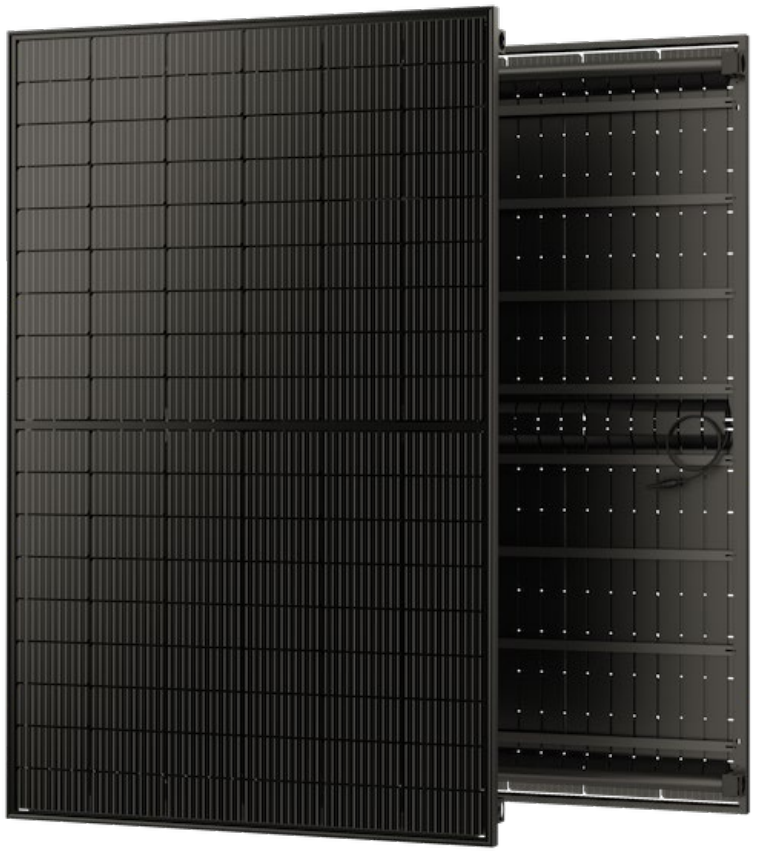
10-year product warranty which includes both product and labor costs support

30-year power performance warranty (electrical)

FLASH® Solar panels (PV)

30-year product warranty which includes both product and labor costs support

30-year power performance warranty



Dualsun is leading the global development of hybrid panels and received the Solar Keymark as early as 2013

Read more about our certifications