

# SunHorizon

## Sun Coupled Innovative Heat Pumps

Introduction to SunHorizon 5 innovative Technology Packages



“Working towards the same mission with innovative heat pump solutions: SunHorizon in the context of Horizon Europe” 12.05.2021

- Project introduction – How SunHorizon addresses in EU H&C strategy
- 5 innovative Technology Packages
- Quick overview of results from simulations



# Project Vision

**Key Message:** As stated in EU Strategy on H&C (2016), *“large-scale demonstration projects of energy-efficient and low/zero-carbon technologies are needed to help reduce technical and market barriers by providing robust data to evaluate their performance in each market segment”*. At this purpose **SunHorizon aims to be a breakthrough demonstration to market project involving 21 partners’ expertise and 8 Demonstration Sites all around EU**, focusing its activities on *“reducing system costs and improving performance as well as optimising existing technologies for H&C applications and for some of the most promising market segments”*

- **The project will demonstrate up to TRL 7 innovative and reliable Heat Pump solutions coupled with solar technologies**
- To provide heating and cooling to residential and tertiary buildings with lower: emissions, energy bills and fossil fuel dependency.
- The technologies will be properly managed by a cloud based functional monitoring platform with services such as demand prediction, proactive and predictive maintenance tools, or a Hybrid advance controller, supported by a smart user interface; the services will help on maximizing solar exploitation and give to the manufacturer inputs for new installation design.



**6 Technologies to be integrated  
5 Technology Packages  
8 Demos (9 buildings)**

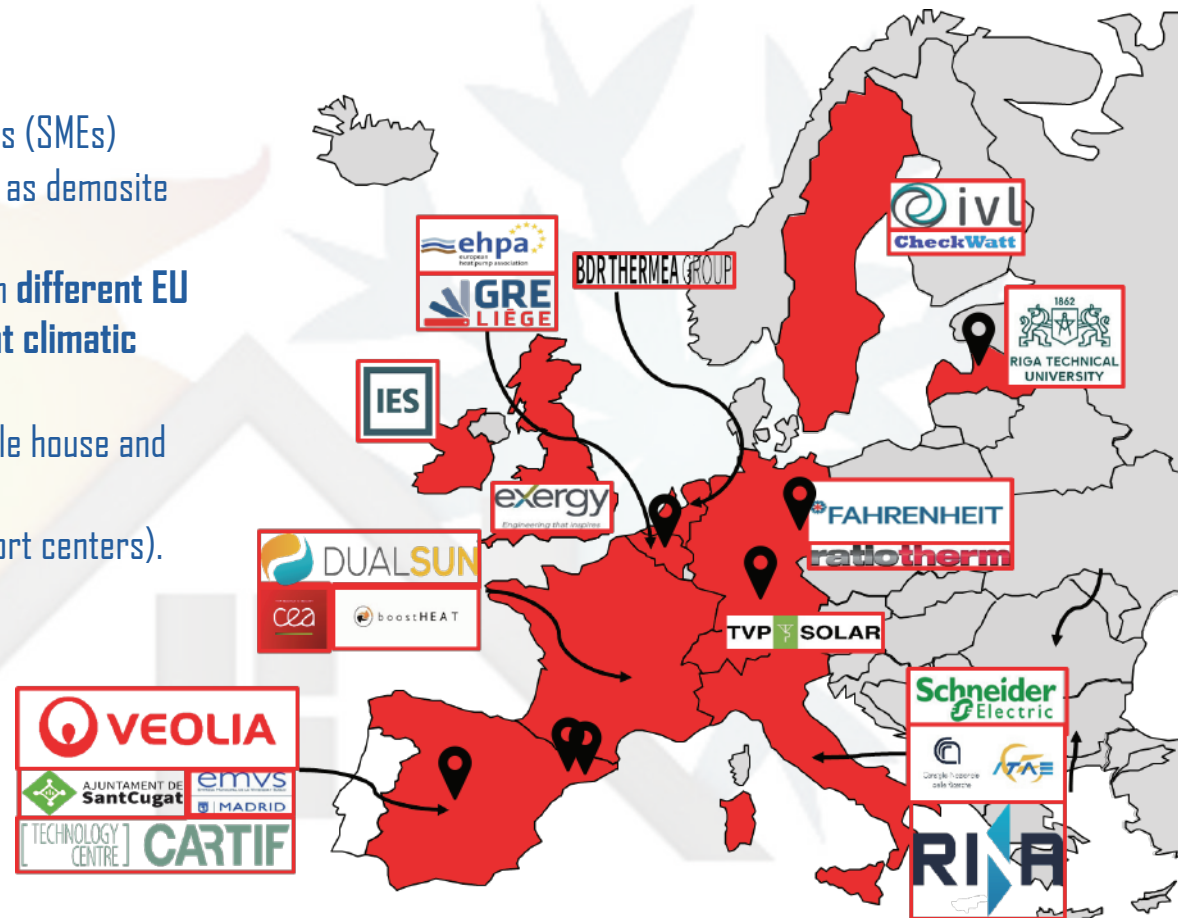
# Project Team

## An Industry Driven Consortium

- 5 top level Academic Polytechnic Institutions (RTOs)
- 12 industrial partners:
  - ✓ 5 Large Enterprise (LE)
  - ✓ 7 Small and Medium Enterprises (SMEs)
- 4 association and stakeholders acting as demosite

SunHorizon project will be demonstrated in **different EU contexts (8 demos)** to evaluate different climatic and energy market solutions.

- small and large scale residential (single house and apartment blocks)
- tertiary buildings (public buildings, sport centers).



Third Parties involved:

- IES UK (LTP of IES Ireland)
- GNSE and GNS (LTPs of GNF)

# SunHorizon TPs

The demosite needs, are supplied with 5 different technology combinations, that combines the following technologies:

## Heat pumps



**FAHRENHEIT**  
Cooling Innovation.



**BDR THERMEA GROUP**

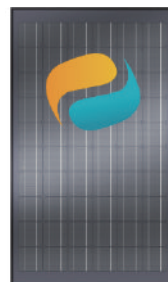


**BOOSTHEAT**  
ENERGY UNITES PEOPLE

## Solar technologies



**BDR THERMEA GROUP**



**DUALSUN**

## Storage



**ratiotherm**



**BDR THERMEA GROUP**

## Needs

Space cooling

Space heating

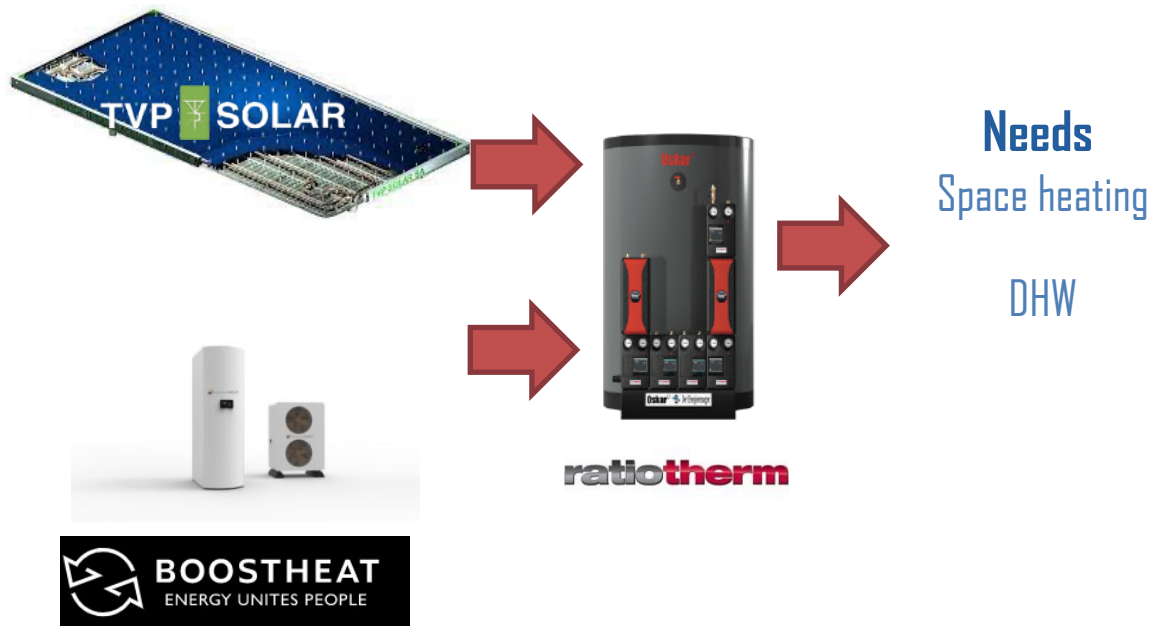
Pool heating

DHW

**5 technology packages**

# SunHorizon TPs

Technology package 1 (TP1): innovative gas-fired heat pump with high-vacuum solar panels



SunHorizon TP		Solar-HP integration concept	Description
TP1	TVP+BH	Parallel integration	TVP for space heating + DHW; BH to cover non solar periods

# SunHorizon TPs

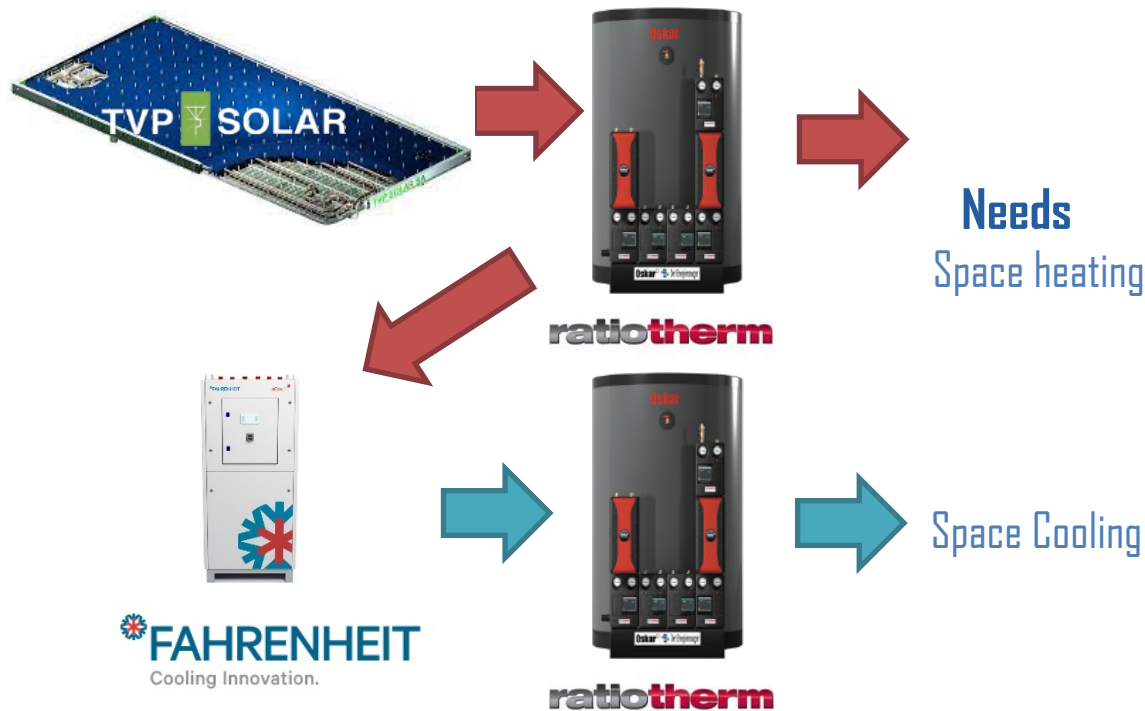
## Technology package 2 (TP2): innovative gas-fired heat pump with improved PVT solar panels



Application in:  
Nunberg + Riga

SunHorizon TP		Solar-HP integration concept	Description
TP2	DS+BH	Mixed solar-assisted/ parallel integration	BH for space heating + DHW support; DS PV-T thermal output to assist BH evaporator and cover preheating of demand; + electricity for appliances

## Technology package 3 (TP3): hybrid adsorption-compression chiller with high-vacuum solar panels



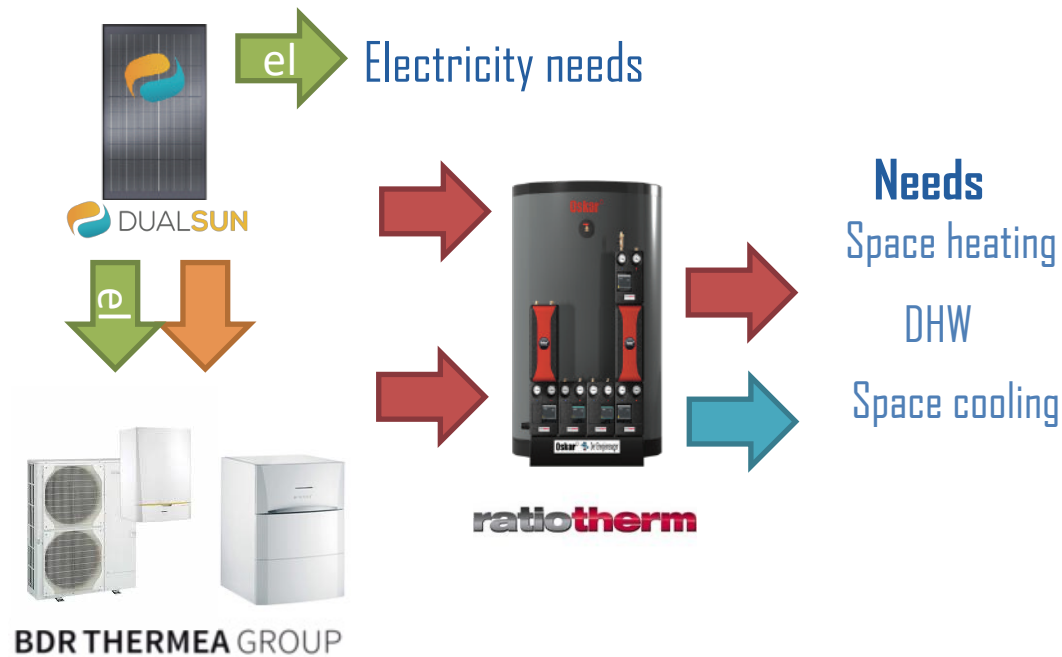
Application in:  
Sant Cugat

SunHorizon TP		Solar-HP integration concept	Description
TP3	TVP+FAHR	Solar-driven HP for cooling	TVP for space heating + DHW in winter + activation of the thermal compressor of the adsorption chiller (FAHR) for cooling in summer



# SunHorizon TPs

## Technology package 4 (TP4): brine water heat pump assisted with improved PVT solar panels

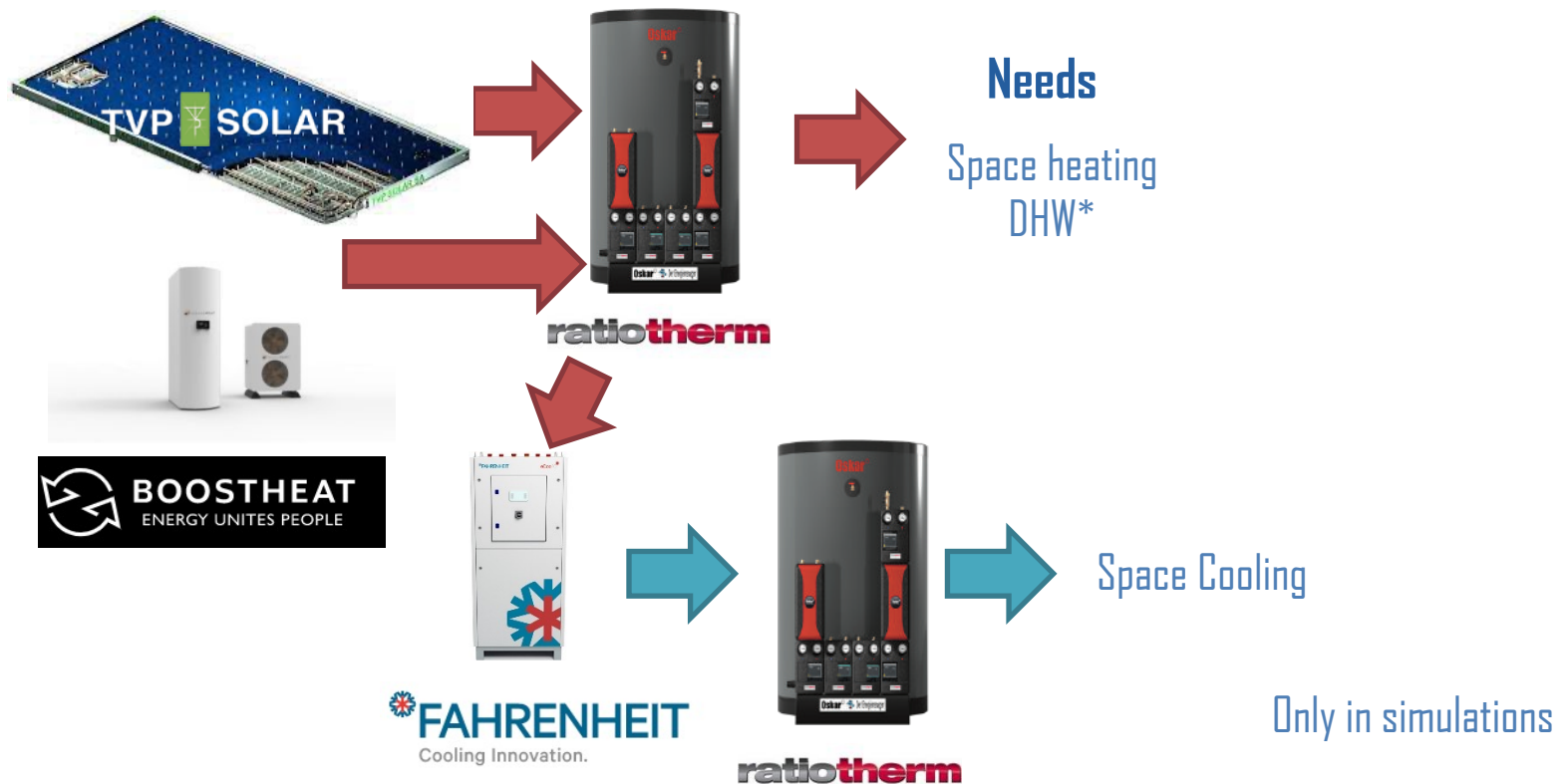


Application in:  
Madrid + Pierra

SunHorizon TP		Solar-HP integration concept	Description
TP4	DS+BDR	Mixed solar-assisted/ parallel integration	DS PV-T thermal output coupled with heat pump to cover part of SH and DHW heat demand + electricity production to cover reversible HP electricity consumption

# SunHorizon TPs

Technology package 5 (TP5): hybrid adsorption-compression chiller with high-vacuum solar panels innovative gas-fired heat pump



SunHorizon TP	Solar-HP integration concept	Description
TP5	TVP+BH+FAHR	Mixed solar-driven/parallel integration TVP for space heating + DHW; BH to cover non solar periods; FAHR adsorption chiller activated only by BH or also by TVP

\* In apartment building

It has been estimated that TPs will allow to save **33-70% GHG emissions** and **30-85% operation costs** in the different demo sites

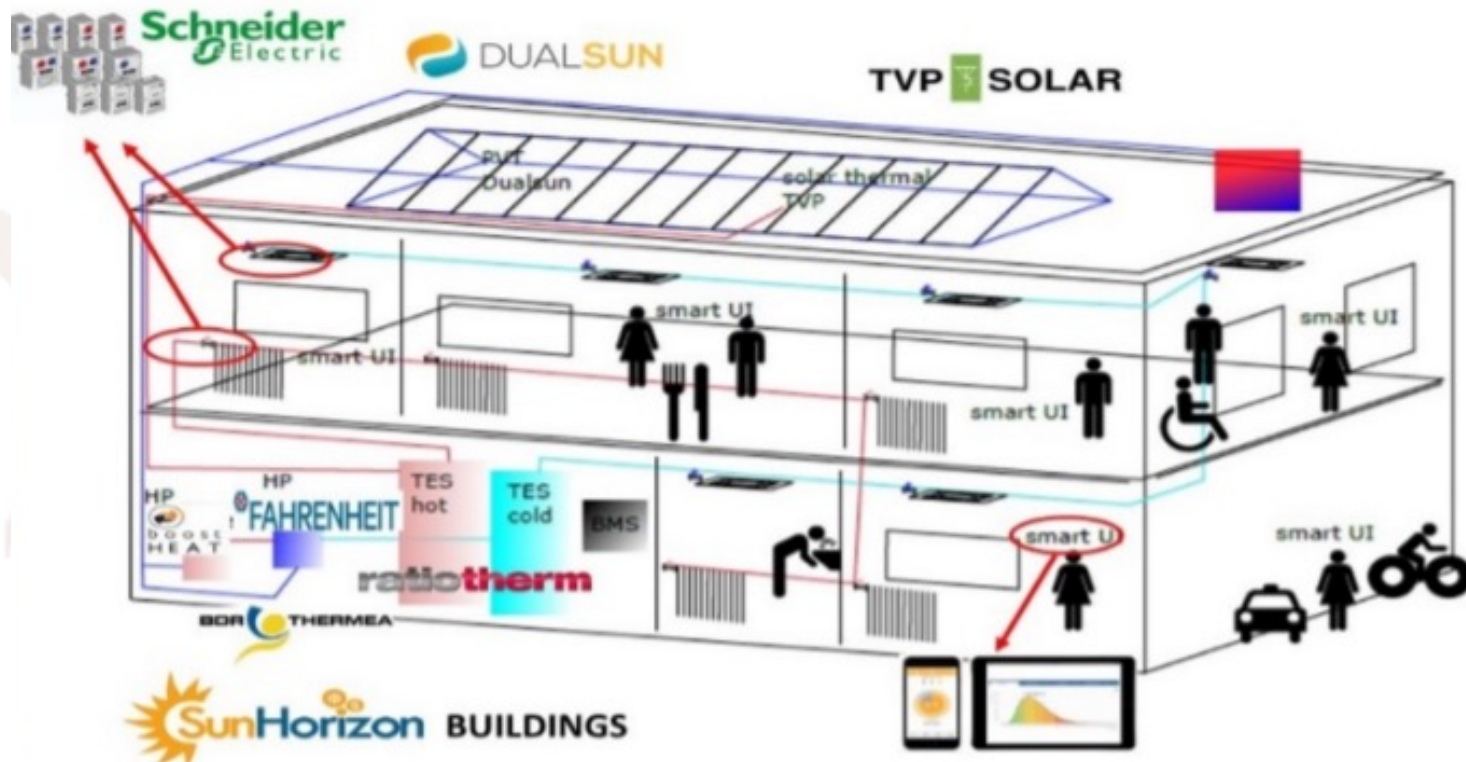
SunHorizon TP		Solar-HP integration concept	Results from simulations:
TP1	TVP+BH	Parallel integration	In Berlin: 43% of primary energy savings, and 37% of costs savings for the user In Verviers: ~30% of primary energy and costs savings.
TP2	DS+BH	Mixed solar-assisted/ parallel integration	In Nurnberg: ~ 33% of primary energy and costs savings, 80% of el. Self consumption ratio (SCR). In Verviers: ~25% of primary energy and costs savings. 95.1% of SCR In Riga: : ~37% of primary energy and costs savings. 43% of SCR
TP3	TVP+FA HR	Solar-driven HP for cooling	In Sant Cugat ~35% of primary energy and costs savings**
TP4	BDR	Mixed solar-assisted/ parallel integration	In Madrid ~76% of primary energy and 84% of costs savings, and 37% of SCR In Piera ~59% of primary energy and 53% of costs savings, and 47% of SCR
TP5	TVP+BH + FAHR	Mixed solar-driven/ parallel integration	TP only tested in simulation, in 3 locations and 2 types of buildings (tertiary and apartment building)

\*Most of them compared with the current gas-fired systems, and/or individual splits for space cooling...

\*\* compared with air handling unit supplied by an old reversible heat pump

# Conclusions

- A pre-industrial project with high TRL that combines different type of heat pump with solar technologies that will help to meet the H&C demand with lower emissions, energy bills and fossil fuel dependency



**THANK YOU FOR YOUR TIME!**

**[www.sunhorizon-project.eu](http://www.sunhorizon-project.eu)**

**Please follow us on Twitter and LinkedIn**

