Speaker: Andrea Gabaldón from CARTIF

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

This Project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement N. 818329

Contents

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

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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)

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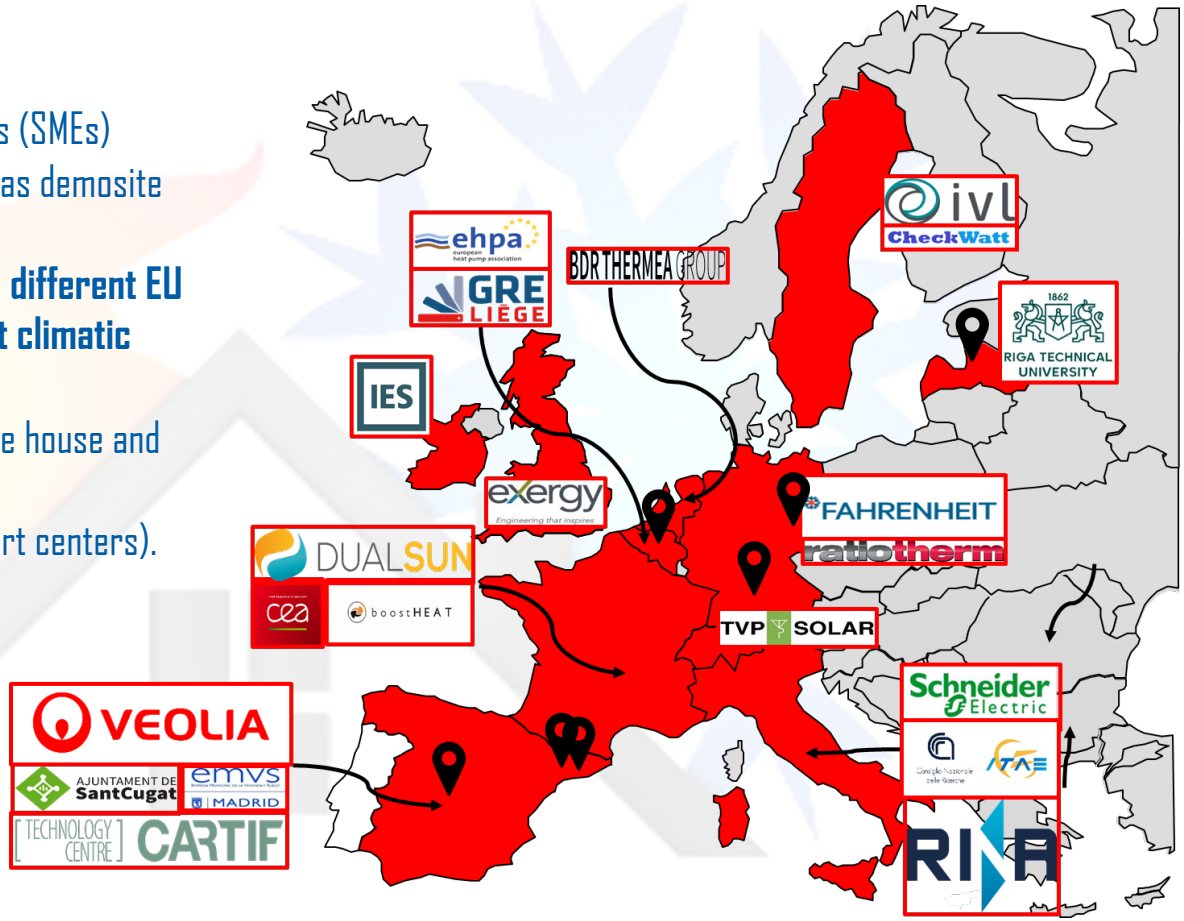
Project Team

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)

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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

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SunHorizon TPs

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

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BOOSTHEAT
ENERGY UNITES PEOPLE

Needs

Space heating

DHW

Application in:
Berlin + Verviers

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

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

Application in:
Nunrberg + Riga + Verviers

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

**Verviers only

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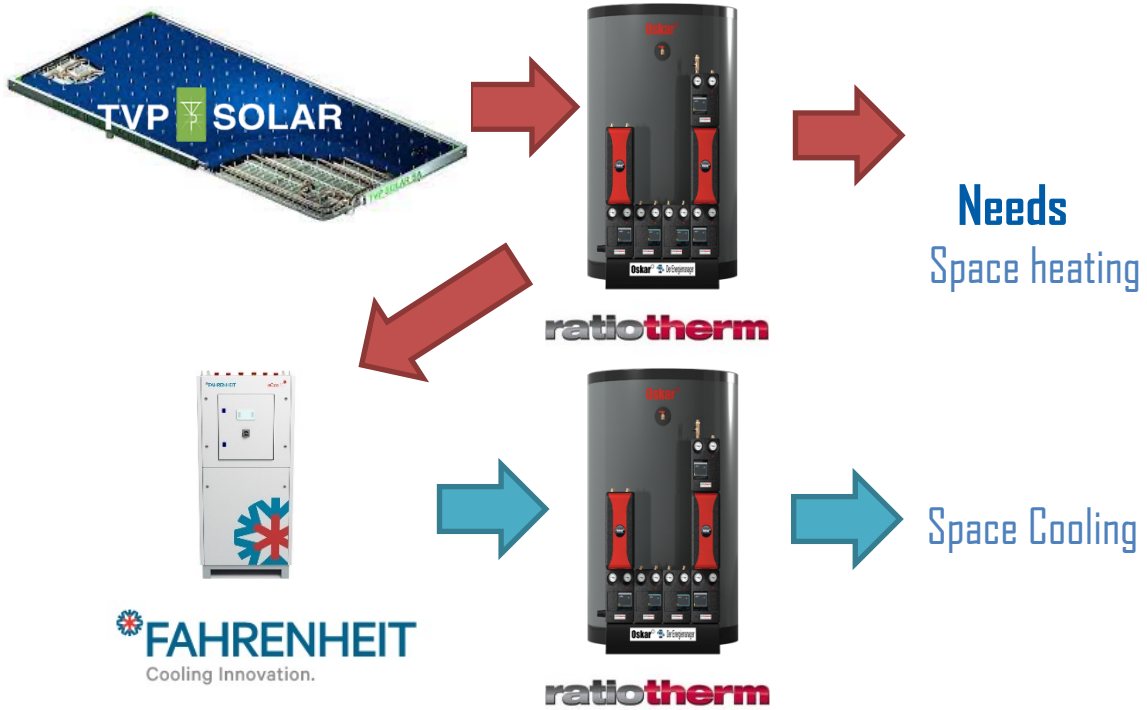
SunHorizon TPs

Tecknology 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)

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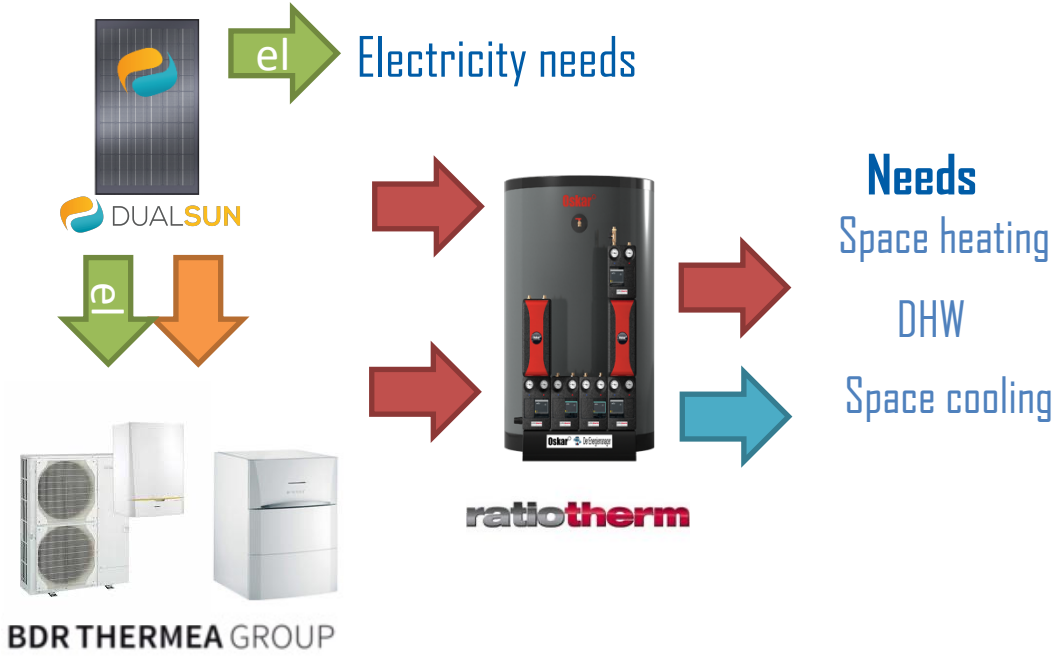
Tecknology package 4 (TP4): brine water heat pump assisted with improved PVT solar panels



Application in:
Madrid + Piera

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

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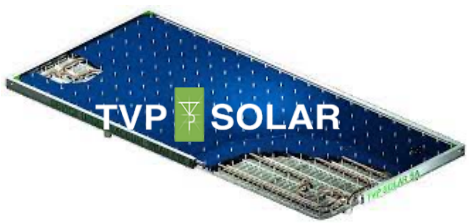
SunHorizon TPs

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



ratiotherm

Needs

Space heating
DHW*

BOOSTHEAT
ENERGY UNITES PEOPLE

FAHRENHEIT
Cooling Innovation.

ratiotherm

Space Cooling

Only in simulations

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

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SunHorizon TPs

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

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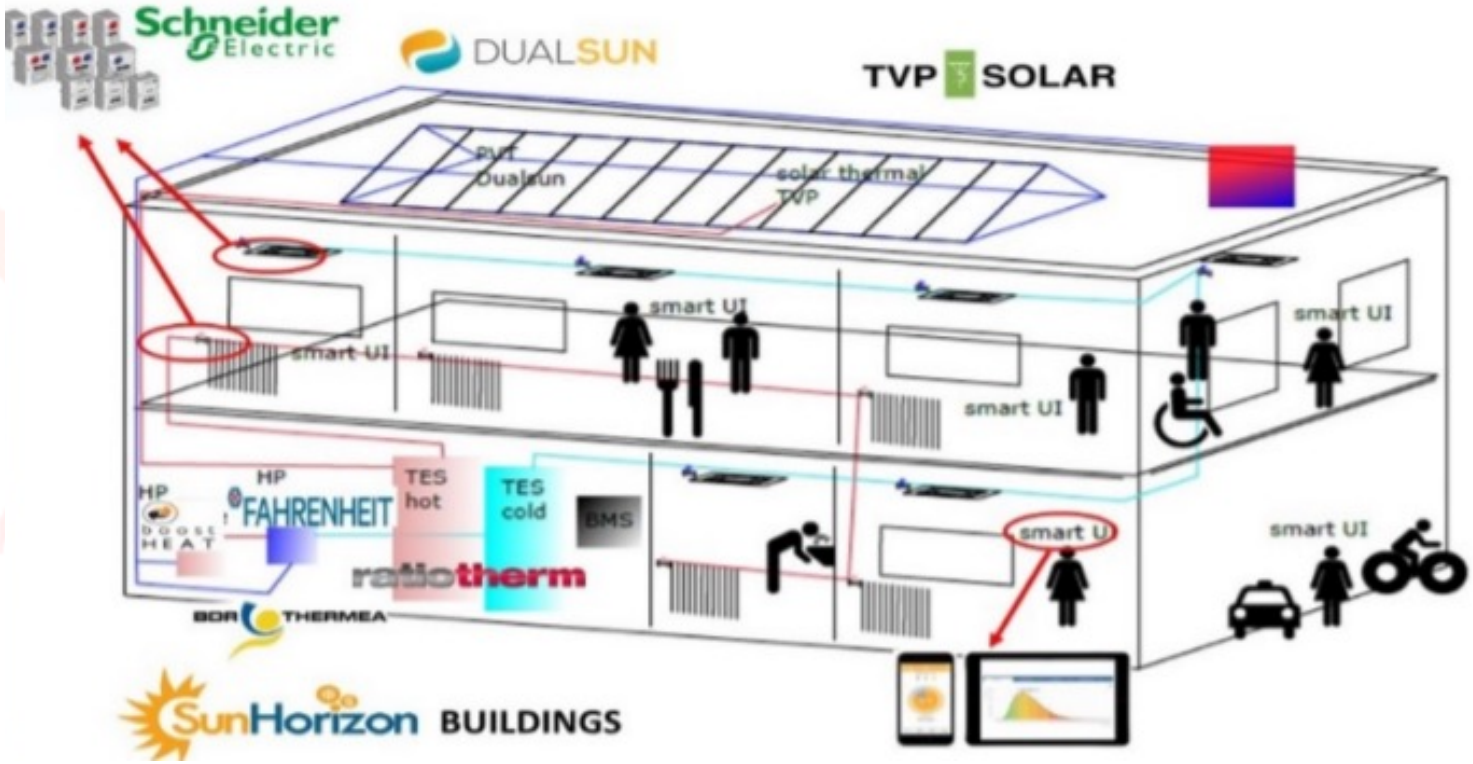
Conclusions

- 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



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THANK YOU FOR YOUR TIME

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