

Sun Horizon

Sun Coupled Innovative Heat Pumps

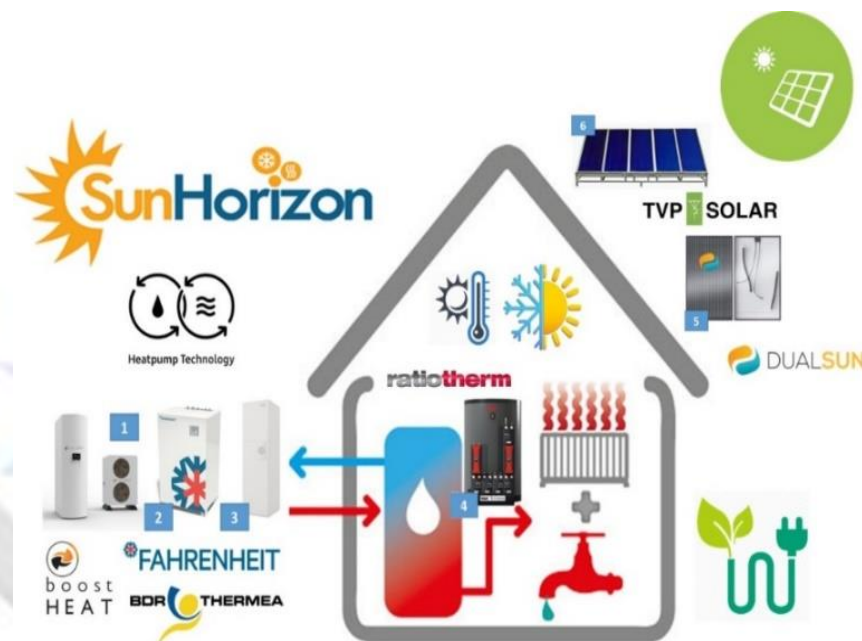


Presentation Agenda



- Project introduction, motivation and objectives
- The SunHorizon consortium
- SunHorizon Project: A demonstration to Market Project

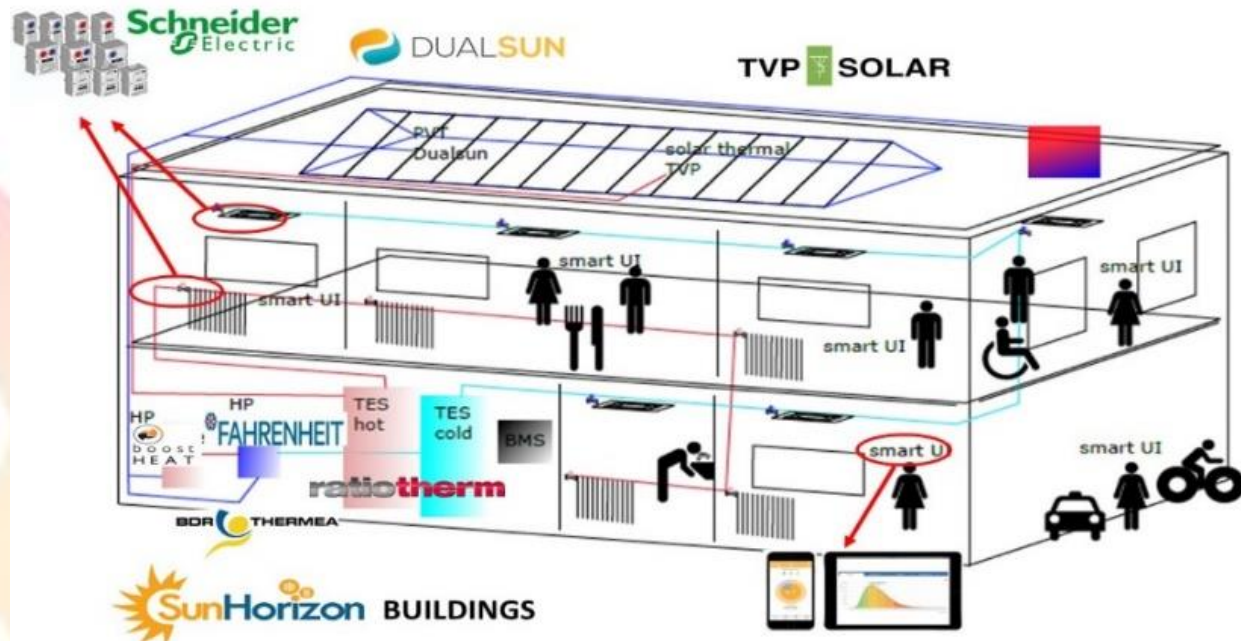




TRL 7 – Sun and HP as baseload of EU H&C systems
6 Technologies to be integrated – 5 Technology Packages – 7 Demos
3 Research Pillars based on Functional Monitoring Data exploitation

DESIGN – MANUFACTURE - CONTROL

Our Vision



Key Message: As stated in EU Strategy for H&C, “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”

Heat Pump and solar appliances are the most social accepted residential Renewable Energy based energy systems. SunHorizon will demonstrate up to TRL 7 innovative and reliable Heat Pump solutions (thermal compression **(BH)**, adsorption **(FAHR)**, reversible **(BDR)**) that acting properly coupled and managed with advanced solar panels (PV, Hybrid **(DS)**, thermal **(TVP)** can provide heating and cooling to residential and tertiary building with lower emissions, energy bills and fossil fuel dependency. A Cloud based functional monitoring platform **(SE)** will be realised in the project to be the “performance data mine” for the development of Data Driven/KPI oriented optimized algorithms and tools to predict maintenance **(CAR, EXE)**, optimize the management towards maximisation of solar exploitation and give to the manufacturer inputs for new installation design, via an innovative “robust design under uncertainty approach” **(RINA-C)** which aims to overcome classical H&C equipment oversizing due to safety factors . This monitoring platform **(CW, IES)** will also drive smart end user interfaces that will be applied at building level to collect thermal comfort data towards a new end-user driven H&C control system. SunHorizon tools will be applicable not only to proposed solar coupled HPs, but to all H&C appliances towards a global increasing efficiency of EU H&C stock and its decarbonisation. 5 low emission H&C Technology packages (TPs) will be tested coupling HP and solar installation. SunHorizon aims to be a breakthrough demonstration to market project involving 21 partners and 8 demosites **(GRE, AJSCV, EMVS, RTU)** all around EU focusing its activities on “reducing system costs and improving performance as well as optimising existing technologies for H&C applications”. SunHorizon will be focused on three main research pillars interacting each other towards project objectives achievement, demonstration and replication: **i) OPTIMIZED DESIGN, ENGINEERING AND MANUFACTURING OF SUNHORIZON TECHNOLOGIES ii) SMART FUNCTIONAL MONITORING FOR H&C,iii) KPI DRIVEN MANAGEMENT AND DEMONSTRATION.**

MO1: Increase SunHorizon H&C technologies performances – WP2 - WP3

HOW? Enhancement of BH, BDR, FAHR, TVP, DS, RATIO performances

MO2: Promote cloud based functional monitoring for H&C purposes – WP4

HOW? Smart End User interface - platform as data mine for H&C manufacturers for optimized management and design

MO3: Reduce SunHorizon H&C technologies CAPEX and OPEX – WP4 - WP5

HOW? Data driven Predictive Maintenance and controller, Design Under Uncertainty Tool

MO4: Demonstration of SunHorizon Innovations in different EU countries and type of buildings – WP6

HOW? Demonstration in 7 demosites

MO5: Promote the replication of SunHorizon Concept – WP7

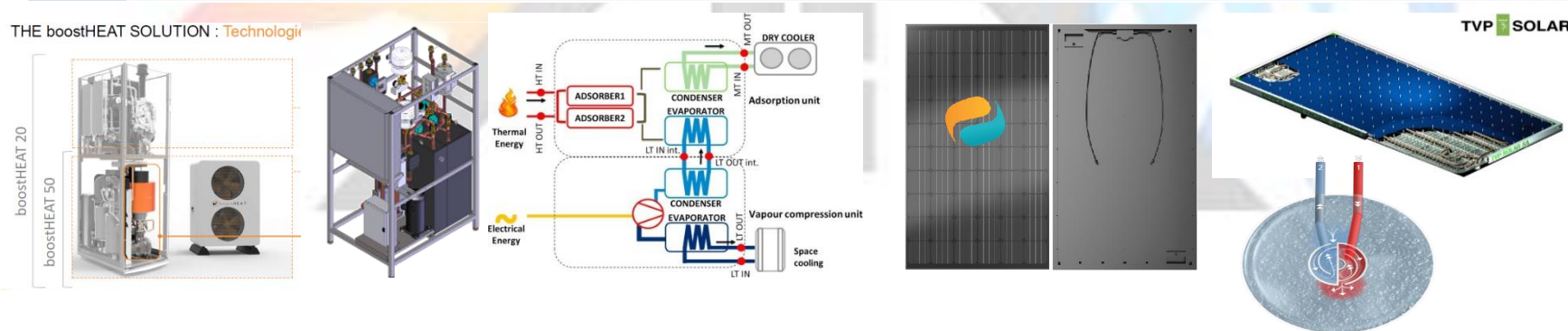
HOW? Study of specific business models – Replication feasibility studies

MO6: Dissemination and Capacity Building – WP8

HOW? Stakeholders Engagement – Policy Positioning paper

SunHorizon TP		Solar-HP integration concept	Description
TP1	TVP+BH	Parallel integration	TVP for space heating + DHW; BH to cover non solar periods
TP2	DS+BH	Mixed solar-assisted/ parallel integration	BH for space heating + DHW support; DS PV-T thermal output to cover as much heat demand as possible + excess electricity production for appliances
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)
TP4	DS+BDR	Parallel integration	DS PV-T thermal output to cover part of SH and DHW heat demand + electricity production to cover reversible HP electricity consumption
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

THE boostHEAT SOLUTION : Technology



WP1 MANAGEMENT AND COORDINATION

WP2 SUNHORIZON USES CASES SCENARIO DEFINITION AND DEMONSTRATION STRATEGY

T2.1 REQUIREMENTS

T2.2 MAPPING AND BUSINESS MODELS

T2.3 KPI-DRIVEN METHODOLOGY FOR ASSESSMENT

T2.4 CONCEPT DESIGN

WP3 PILLAR 1: SUNHORIZON ENABLING TECHNOLOGIES

T3.1 Thermal compression HP

T3.4 hybrid solar PV/T

T3.2 Hybrid adsorption HP

T3.5 vacuum solar TH

T3.3 P2H HP with solar PV&TH

T3.6 Thermal Storage

T3.7 Validation, Final Design and Commissioning

WP4 PILLAR 2: FUNCTIONAL MONITORING PLATFORM AND OPTIMIZATION TOOL

T4.1 Monitoring platform

T4.2 Predictive maintenance

T4.3 Optimal design under uncertain

T4.4 Tool for optimised design

T4.5 Validation and fine-tuning

WP5 PILLAR 3: THERMAL COMFORT AND MONITORING DATA DRIVEN CONTROL SYSTEM

T5.1 Prediction

T5.5 User interface

T5.3 Self-learning

T5.4 Decision making

T5.5 Predictive maintenance and surveillance integration

T5.6 Control modules integration and validation

WP6 DEMONSTRATION AT TRL 7 [Spain - Latvia - Germany - Belgium]

T6.1 BASELINE

T6.2 ENGINEERING AND DESIGN

T6.3 DEPLOYMENT OF COMPONENTS AND TOOLS

T6.4 MONITORING AND ASSESSMENT

T6.5 LESSONS LEARNT

WP7 SUNHORIZON REPLICABILITY AND EXPLOITATION

T7.1 ENVIRONMENTAL AND SOCIAL BENEFIT

T7.2 BUSINESS MODELS

T7.3 FEASIBILITY STUDIES

T7.4 STANDARDIZATION

T7.5 IPR EXPLOITATION

WP5 DISSEMINATION, COMMUNICATION AND CAPACITY BUILDING

T8.1 COMMUNICATION AND DISSEMINATION

T8.2 STAKEHOLDERS ENGAGEMENT

T8.3 CAPACITY BUILDING AND POLICY PROMOTION

- High TRL to be achieved of integrated TPs: TRL 7
- **A pre-industrial project**
- Demonstration in different climates and type of building
- **Cruciality of Data Monitoring to drive the three research pillars**
- **Dissemination and Stakeholders' engagement is crucial: we're all committed!**
- A long but well structured project both in terms of responsibilities and timing:
 - partners have to keep themselves updated even if not so much involved!
 - Details and responsibilities have to be properly taken into account!

Project Team



An Industry Driven Consortium

No	Name	Short name	Country
1	RINA CONSULTING SPA	RINA-C	Italy
2	COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	CEA	France
3	EXERGY LTD	EXE	United Kingdom
4	Schneider Electric SPA	SE	Italy
5	BOOSTHEAT	BH	France
6	CONSIGLIO NAZIONALE DELLE RICERCHE	ITAE	Italy
7	FAHRENHEIT GMBH	FAHR	Germany
8	FUNDACION CARTIF	CARTIF	Spain
9	IES R&D	IES	Ireland
10	IVL SVENSKA MILJOEINSTITUTET AB	IVL	Sweden
11	EUROPEAN HEAT PUMP ASSOCIATION	EHPA	Belgium
12	TVP SOLAR SA	TVP	Switzerland
13	DUALSUN	DS	France
14	CHECKWATT AB	CW	Sweden
15	AJUNTAMIENTO DE SANT CUGAT DEL VALLES	AJSCV	Spain
16	GROUPEMENT DE REDEPLOIEMENT ECONOMIQUE DU PAYS DE LIEGE	GRE	Belgium
17	BDR THERMEA GROUP BV	BDR	Netherlands
18	RATIO THERM HEIZUNG + SOLARTECHNIK GMBH & CO. KG	RATIO	Germany
19	GAS NATURAL SDG SA	GNF	Spain
20	RIGAS TEHNISKA UNIVERSITATE	RTU	Latvia
21	EMPRESA MUNICIPAL DE LA VIVIENDA Y SUELO DE MADRID SA	EMVS	Spain



Third Parties involved:

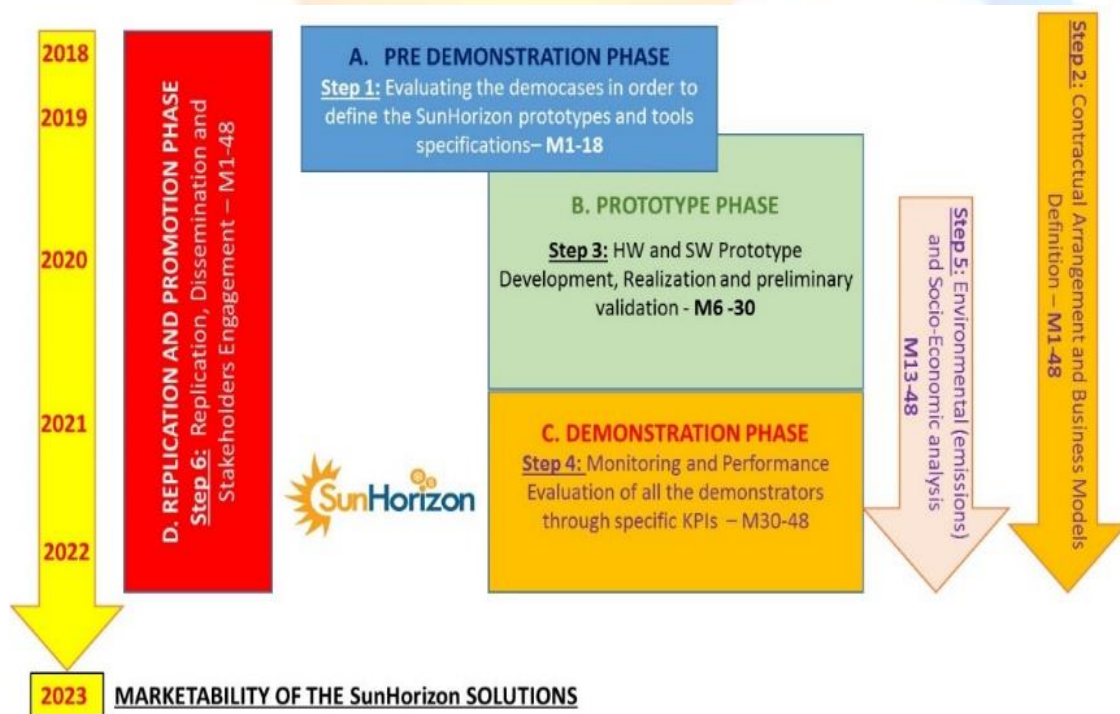
- IES UK (LTP of IES Ireland)
- GNSE and GNS (LTPs of GNF)

Roles

Clear and precise role – High Commitment Period

A. PRE-DEMONSTRATION PHASE: M1-18 – All partners committed to pave the ground to future activities at tools, technology and demosites point of view

B. PROTOTYPE PHASE: M6-30 – industrial partner strongly involved



C. DEMONSTRATION PHASE: M30-48

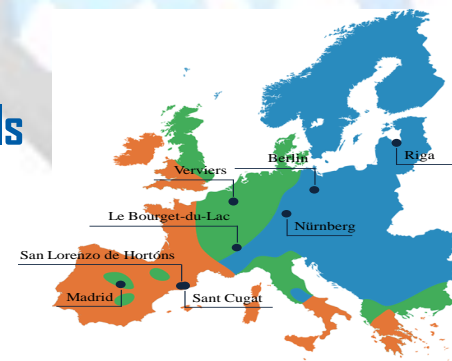
D. REPLICATION AND PROMOTION PHASE:
 M1-48 – all partners involved under EHPA and RINA-C leadership

SunHorizon: A demonstration to Market Project

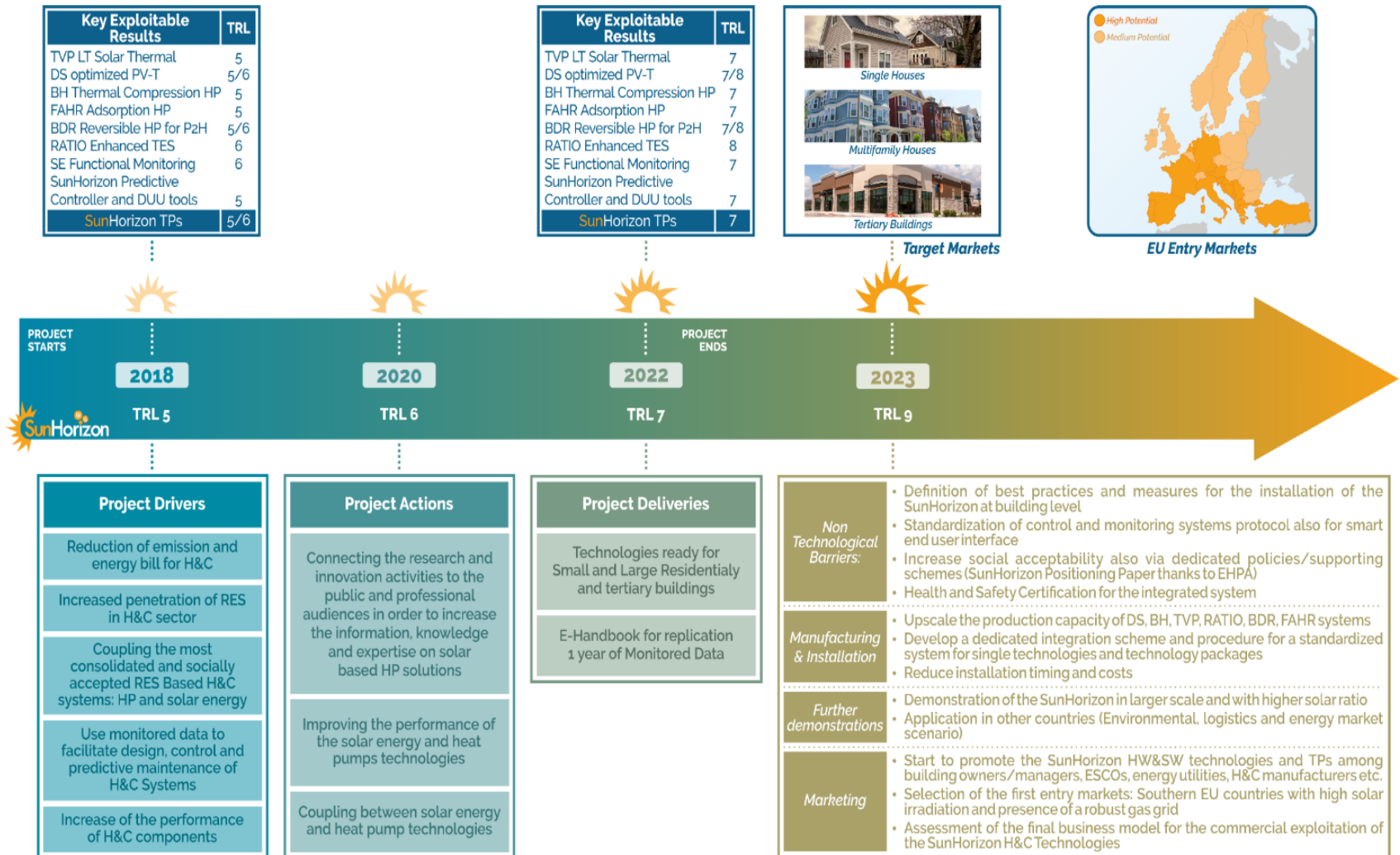


Nº	Location	Climate	Building type	SunHorizon TP	Climate and local energy market challenges
1	Berlin (Germany)	Cold	Small residential	TP1: TVP+BH	Cold continental climate with harsh winters and warm summers, presences of local gas grid and DHN (increasing number of disconnections), high penetration of RES and distributed generation in the local energy market, considerable price of electricity (0,15-20 €/kWh)
2	Nürnberg (Germany)	Cold	Large residential	TP2: DS+BH	
3	Saint Cugat (Spain)	Warm	Tertiary (Civic centre)	TP3: TVP+FAHR	Good solar irradiation, municipalities looking for new reliable technologies to save money, achieve SEAP objectives and to be promoted among their citizens
4	Madrid (Spain)	Average	Large residential	TP4:DS+BDR	Cold winter and hot summers, good solar potential, social housing needs renovation both at envelope and H&C level also to reduce their OPEX and rental fees
5	S. Lorenzo (Spain)	Warm	Small residential	TP4:DS+BDR	Good solar potential, significant summer cooling demand during sunny periods, single houses can become active players on the energy market thanks to Power-to-Heat (P2H) schemes
6	Verviers (Belgium)	Average	Tertiary (Sport Centre)	TP1: TVP+BH	Sport facilities are often not well energy managed all around EU, even if heated volumes are considerable. Promote coupling of solar + HP for low temperature usage such as DHW and swimming pool water.
7	Verviers (Belgium)	Average	Tertiary (Swim. pool)	TP2: DS+BH	
8	Riga (Latvia)	Cold	Small residential	TP2: DS+BH	Scandinavian country with the higher penetration of gas grid, robust presence of HP -smart systems, harsh winters

DEMONSTRATION IS CRUCIAL IN SunHorizon – let's define details ASAP (logistic responsibilities, calendar, costs, permitting...)
Collaboration between TPs/Demos responsible is crucial



SunHorizon: A demonstration to Market Project



SUN HORIZON NEEDS YOUR SUPPORT

IN SunHorizon an Industrial stakeholder group will be established starting from EHPA Network – **Partners to be involved:** ESCOs, energy utility, building owners/Managers, HP, solar and H&C technology manufacturers. Energy agencies, etc.



Their support is crucial to foster replication and marketability.

Main targets:

- **within M12:** Analyze current bottlenecks/challenges towards SunHorizon TPs implementation – presentation of SunHorizon tools and guidance towards their specification refinement
- **Final Event:** promotion of demonstration results and engagement for replication

THANKS FOR YOUR TIME!!!

www.sunhorizon-project.eu

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