



TECHNOLOGY PACKAGE #3





WHY THIS DOCUMENT?

Heat Pump (HP) and solar appliances are socially well-accepted renewable energy-based systems. The SunHorizon project demonstrates TRL7 innovative heat pump solutions (vapour compression, adsorption, reversible) coupled with solar technologies (thermal, photovoltaic, hybrid) to provide heating and cooling to residential and tertiary buildings, reducing emissions and lowering energy bills.

In this series of documents, our aim is to explain the various technology packages within the SunHorizon project in a more understandable manner. The goal is to introduce each technology package's potential and its environmental and economic benefits to a wider audience. This document, in particular, focuses on the Sant Cugat del Vallés (Spain) demo site.

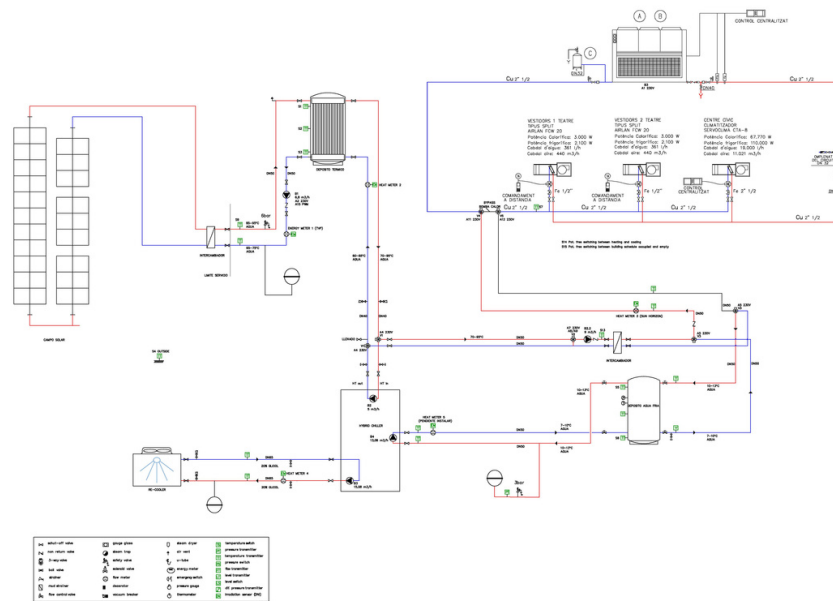
For an easier understanding of the document, we have **coloured** some more complicated terms in yellow. At the end of the document, you will find a glossary with the definitions of these words.

If you are curious about our project you can find more information on our website [here](#).

Read our article *Four innovative solar coupled heat pump solutions for building heating and cooling* [here](#) in the section [Publications](#) on the website to learn more about Technology Package 3.



TP3 is installed in an existing civic center, so it has been integrated into the existing heating and cooling system (HVAC) based on a reversible air-to-water heat pump. The heat pump has 93.6 kW (nominal cooling capacity) – 96.3 kW (nominal heating capacity), and an air handling unit of 110 kW (cooling capacity) – 67.78 kW (heating capacity). The conditioned area and volume are respectively 816 m2 and 3400 m3.



The image above schematized the technology system.

TVP solar panel is the only heat source. It produces as much thermal energy as possible with a maximum temperature range between 70°C-100°C. During winter the hot water produced by TVP panels supports the existing plant and is directly delivered to the existing heat pump. In summer it supplies the Fahrenheit thermally driven chiller. It consists of two components: a vapor compression water to water chiller and an adsorption one. They are connected in parallel to a cold buffer tank and then to the existing chiller. The nominal cooling power is 100 kW for the hybrid chiller, the TVP collector surface is 192 m2 (98 panels) south oriented (azimuth=0); tilted 30° for a nominal heating capacity that ranges up to 125kW, and the volume of stratified storage is 10 m3.

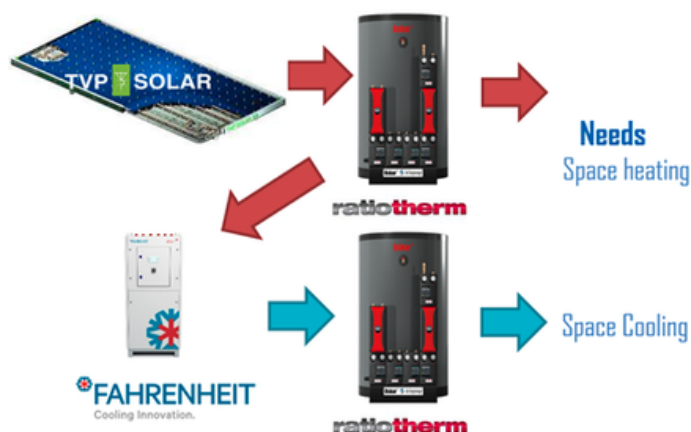
IN A NUTSHELL..

SunHorizon TPs	Technology	Solar-HP integration concept	Description
TP3	TVP Solar (TVP) + Fahrenheit (FAH)	Solar-driven heat pump for cooling	TVP for space heating + DHW in winter + activation of the thermal compressor of the adsorption chiller



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The TP3: Hybrid adsorption-compression chiller with high-vacuum solar panels combine these technologies:



The TP3 system is integrated with the existing HVAC system, incorporating the TVP panel, the Fahrenheit hybrid adsorption chiller, and the RatioTherm stratified tank. The new system is connected in series upstream of the existing heat pump.

TP3 is installed in a civic centre building - built in 2006 - in Sant Cugat del Vallés, Spain.

WHAT IS THE AIM?

TP3 aims to provide a solar-assisted heat pump system that can be reliable for summer operation and can exploit the solar source in winter as much as possible.



SANT CUGAT DEL VALLÉS, SPAIN



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ESTIMATED IMPACTS



5-50% primary energy savings, indeed:



30-50% in high solar zone



20-40% in medium solar zone



5-25% in low solar zone



GLOSSARY

Technology Package= A technology package are several complementary and connected technologies to fulfill a certain function.

Solar appliances= It refers to both solar photovoltaic-based appliances and solar thermal systems. The former produces electricity to power one-directional flow of electric charge, and the other uses heat to produce heating which can be used for generating hot water or for cooking.

Nominal cooling capacity= Nominal heating/cooling capacity refers to the ability of a heating/cooling tool that manufacturers claim to have their product when they sell it. It is different from the actual cooling/heating capacity.

Air handling unit= An air handling unit (AHU) is the composition of elements mounted in large, accessible box-shaped units called modules, which house the appropriate ventilation requirements for purifying, air-conditioning or renewing the indoor air in a building or premises.

Thermal energy= It refers to the energy contained within a system that is responsible for its temperature. Heat is the flow of thermal energy.

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