



TECHNOLOGY PACKAGE #4





WHY THIS DOCUMENT?

Heat Pump (HP) and **solar appliances** are socially well-accepted Renewable Energy based energy 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 with lower emissions and reduced energy bills.

In this series of documents, we want to explain more understandably the different **technology packages** present in the SunHorizon project. The goal is to introduce to a wider public each technology package's potential and its environmental, and economic benefits.

In particular, this document focuses on the Madrid (Spain) demo site.

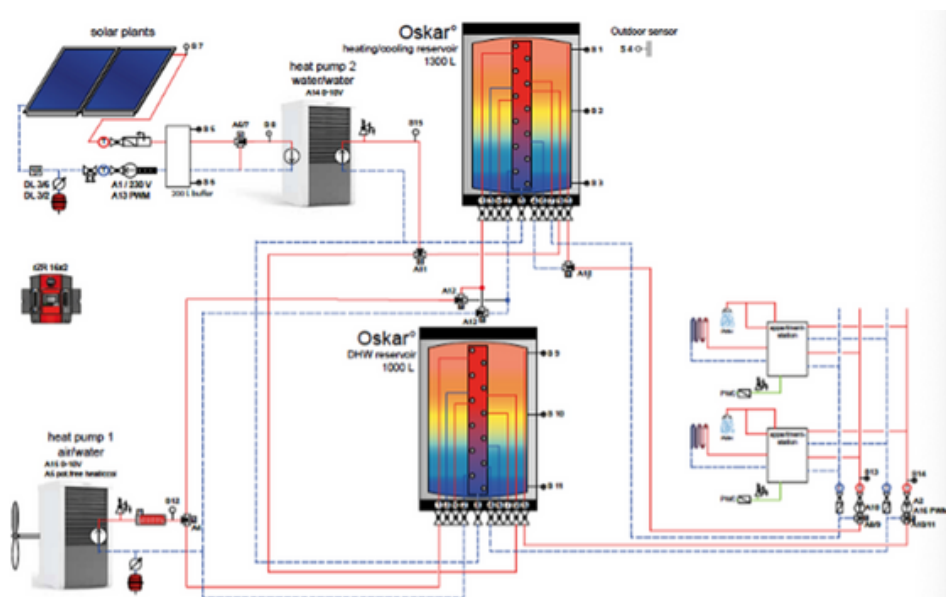
For an easier understanding of the document, we have **coloured** some more complicated terms in yellow. At the end of the document, you will find a glossary with the definitions of these words.

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 4.



Technically speaking, TP4 relies on BDR Thermea heat pump and PVT panels from Dual Sun. The **brine-to-water heat pump** is coupled with the solar thermal output from PVT panels and an **air-to-water heat pump** is used as a backup. Two storages are used: one for domestic hot water (DHW) preparation and one for space heating and cooling.



The diagram above schematized the technology system.

TP4 is applied in Madrid, Spain demo site consisting of a reversible heat pump from BDR, dual production of solar heat and electricity, and versatile thermal storage. In Madrid, the BDR Thermea brine-to-water heat pump benefits from both thermal and electricity outputs of the DualSun hybrid PVT panels, reaching high levels of performance and renewable energy coverage; while the air-to-water heat pump is used to produce space cooling in summer and as a backup in winter. The electricity production covers the heat pump's consumption and the dwelling's demand. The diagram above schematized the technology system.

IN A NUTSHELL..

SunHorizon TPs	Technology	Solar-HP integration concept	Description
TP4	DualSun (DS) + BDR Thermea (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

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The TP4: Brine water heat pump assisted with improved PVT solar panels combines these technologies:



The BDR Thermea brine-to-water heat pump benefits from both the thermal and electrical outputs of the DualSun hybrid PVT panels, with an air-to-water heat pump serving as a backup.

The TP4 heating system provides heat for domestic hot water (DHW), space cooling, and heating for a nine-apartment building in Madrid, Spain

WHAT IS THE AIM?

TP4 aims at supplying high renewable heat share to the building's users thanks to solar output and heat pumps.



MADRID, SPAIN



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ESTIMATED IMPACTS



70% of GHG emissions savings



76% primary energy savings



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.

Brine-to-water heat pump = the heat is collected from the ground or surface water by circulating a solution of water and anti-freeze (known as 'brine') through a buried or submerged, closed-loop, ground heat exchanger.

Air-to-water heat pump= transfers heat from the outside air to water, which heats your rooms via radiators or underfloor heating. It can also heat water stored in a hot water cylinder for your hot taps, showers, and baths.

Reversible heat pumps = work in either direction to provide heating or air conditioning (cooling) to the internal space. They employ a reversing valve to reverse the flow of refrigerant from the compressor through the condenser and evaporation coils.

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