TECHNOLOGY
PACKAGE #2

WHY THIS DOCUMENT?

Heat pumps (HP) and **solar panels** 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 in more detail the different **technology packages** present in the SunHorizon project. The goal is to introduce to a wider public each technology package's potential, environmental, and economic benefits. In particular, this document focuses on the Riga (Latvia) 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 2.
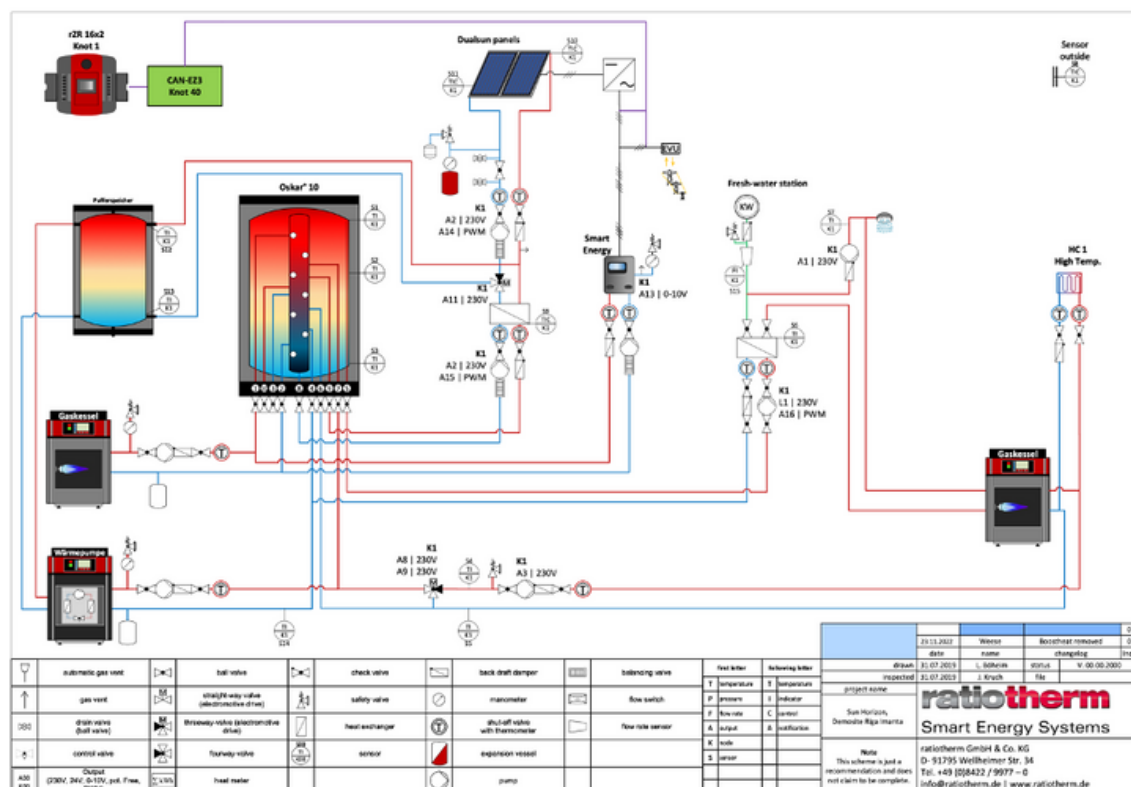
TP #2

TP2 is a technology package that combines several technologies into one integrated solution. It relies on a heat pump that consumes electricity to power the compressor and heat up the water flowing to the machine. TP2 also includes hybrid photovoltaic-thermal panels that produce electricity for household appliances and thermal energy. The thermal energy generated by the panels aids the heat pump in achieving higher performance and can be stored for space heating and domestic hot water needs. In extremely cold weather conditions, a gas boiler operates in parallel with the heat pump to provide additional heat.

The TP2 system was designed for two single-family buildings in Riga. Solar heat from the DualSun PVT panels is collected either in the Ratiotherm glycol storage tank or the stratified storage tank, Oskar, where heat from the BDR heat pump and the gas boiler is stored. The solar heat stored in the glycol tank is used to drive the evaporator of the heat pump, while Oskar provides both DHW (domestic hot water) and space heating via radiators and underfloor heating. Additionally, there is a smart electric heater that can convert surplus PV electricity into heat. Oskar collects and distributes heat from various sources, facilitating the integration of various TP2 technologies and providing flexibility through thermal storage. The operation of the entire TP2 system is controlled by the Ratiotherm central controller, which is programmed to meet the specific needs of the application and demo site.

Technically speaking, TP2 relies on the water-to-water heat pump from BDR. It is hybridised with a condensing gas boiler and complemented by DualSun hybrid PVT solar panels (~50 m2), Ratiotherm stratified thermal storage tank Oskar (1300 L), 200 L glycol storage tank, and a heat distribution control system. See the depiction of the system in the picture below:

TP #2

IN A NUTSHELL..

SunHorizon TPs	Technology	Solar-HP integration concept	Description
TP2	BDR Thermea (BDR) heat pump + DualSun (DS) PVT panels + Ratiotherm thermal storage tanks	Mixed solar-assisted / parallel integration	BDR for space heating + DHW support; DS PVT thermal output to cover as much heat demand as possible + electricity production for appliances; Ratiotherm storage and controller for integration and flexibility

SunHorizon

TECHNOLOGY PACKAGE #2

The **TP2: electric heat pump coupled with improved PVT solar panels** combines these technologies:

TP2 has DualSun PVT panels whose thermal output assists the BDR heat pump evaporator or is stored directly in the stratified storage tank, enhancing the heat pump and technology package performance. Furthermore, the electricity needs are covered with the photovoltaic output.

TP2 is applied in two single-family houses in Riga, Latvia

WHAT IS THE AIM?

TP2 aims at supplying high renewable heat and electricity share to the building's users thanks to solar heat recovery, electricity generation, and thermodynamic heat recovery from both solar energy and **ambient air.**

📍 **IMANTA - RIGA, LATVIA**
SUNISI - RIGA, LATVIA

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IMANTA - RIGA, LATVIA

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.

Ambient air = It is atmospheric air in its natural state, not contaminated by airborne pollutants.