

RE-WITCH

**The coolest cold from
the cleanest heat**

Project Overview

Vision and Objectives

Replicator's engagement



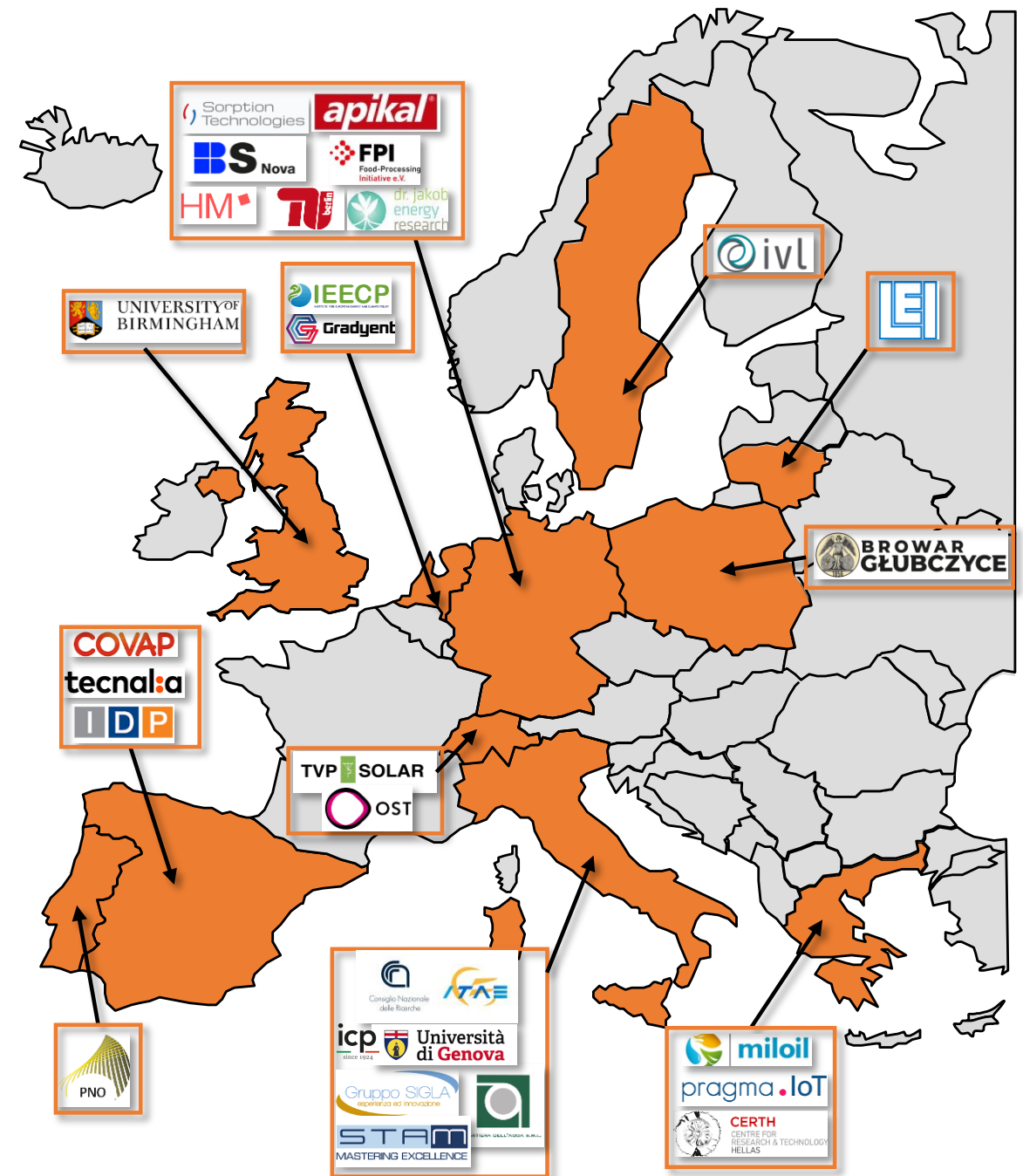
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Key Facts

Project duration: 48 months – Jan 2024 / Dec 2027

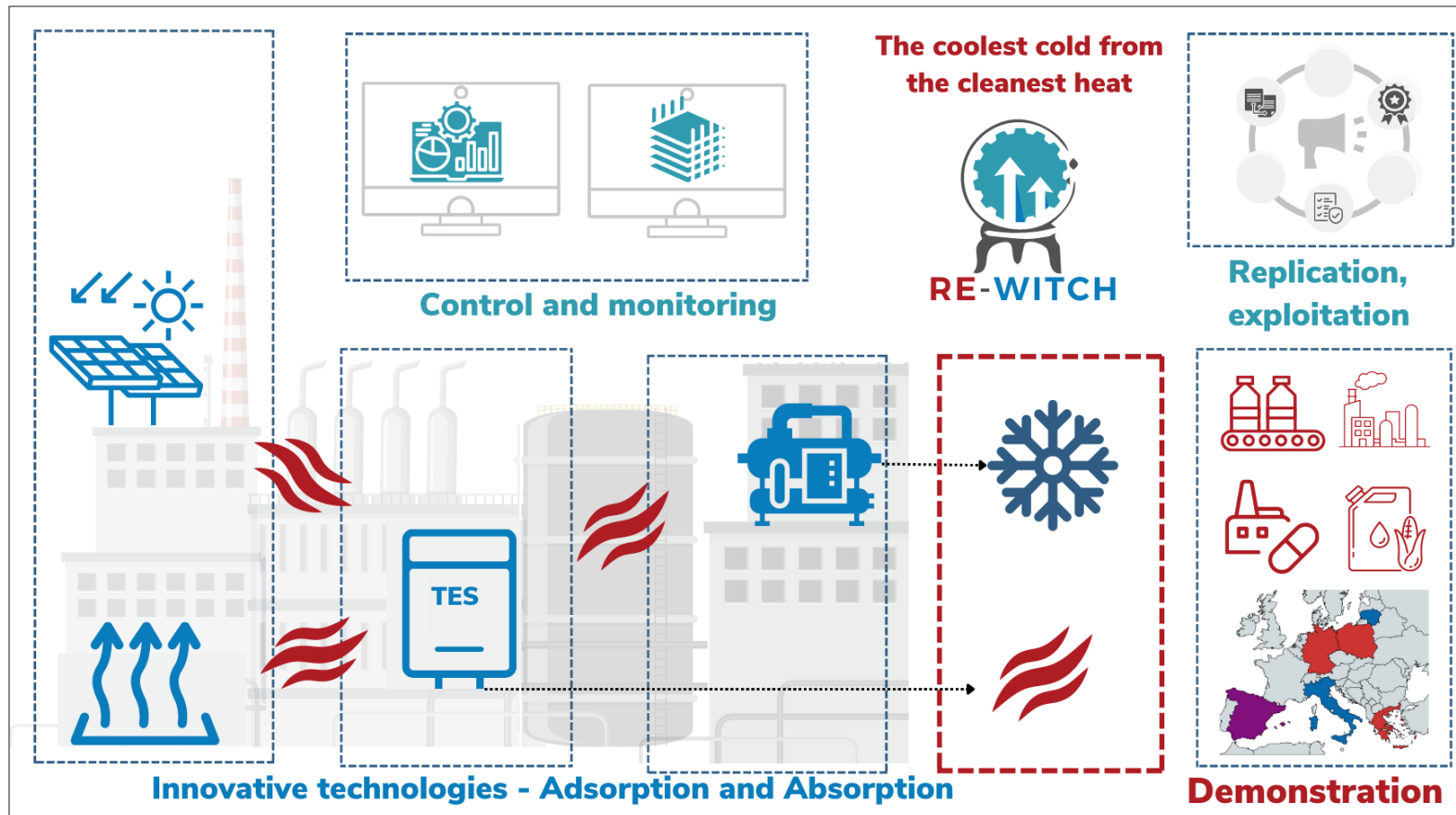
Partners number: 26 from 10 countries





Project summary

RE-WITCH aims at developing and demonstrating up to TRL7 **innovative efficient thermally-driven cooling and heating technologies** for industrial processes.

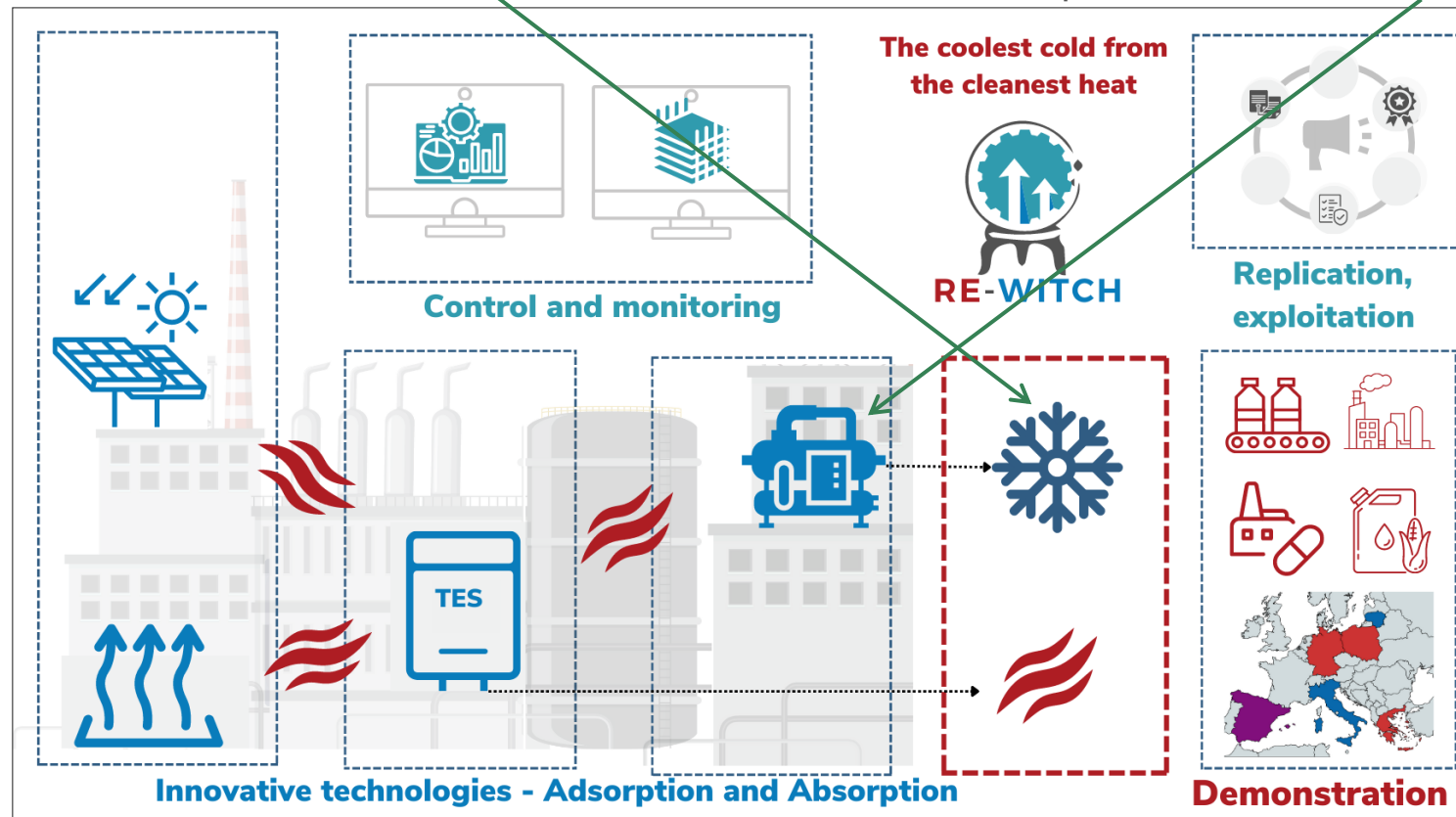




Project summary

new generation of **AD**sorption chillers, more compact and less expensive, to be either directly integrated in the process or provided in a containerized solution along with air compressors

two new working cycles of **AB**sorption chillers, integrating a mechanical compressor providing both heating and cooling as well as a dual evaporator/absorber providing cooling at different temperature levels and thermal powers



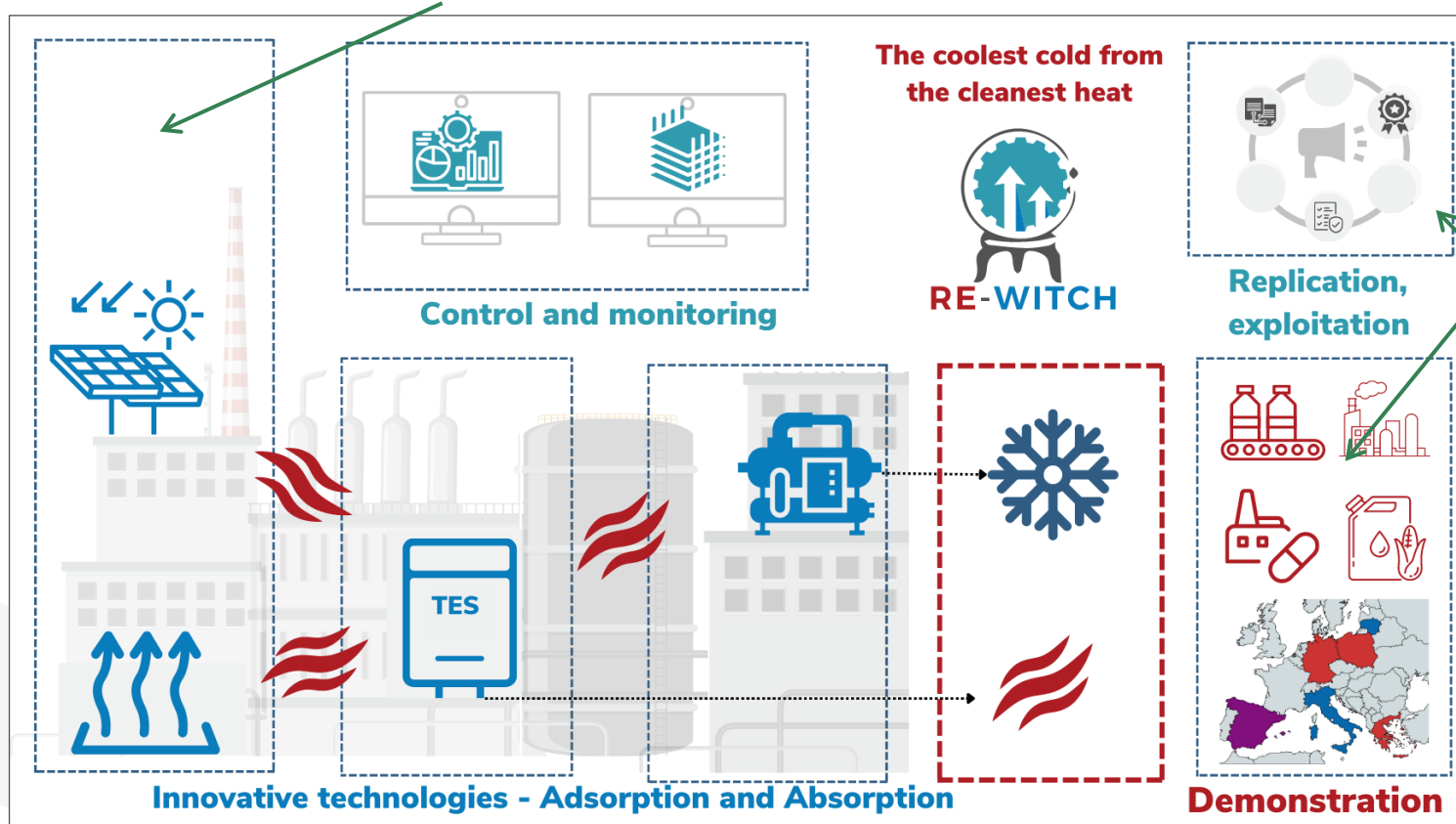


RE-WITCH

Project summary

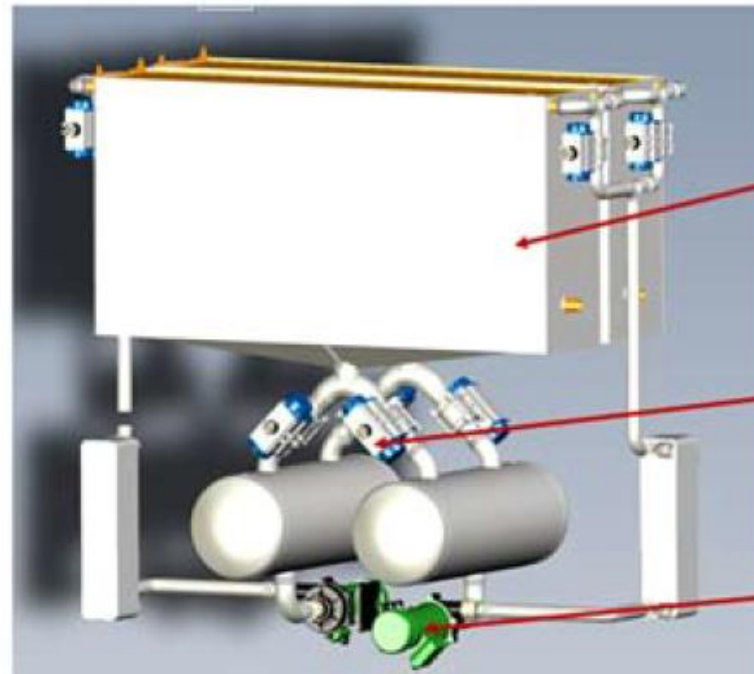
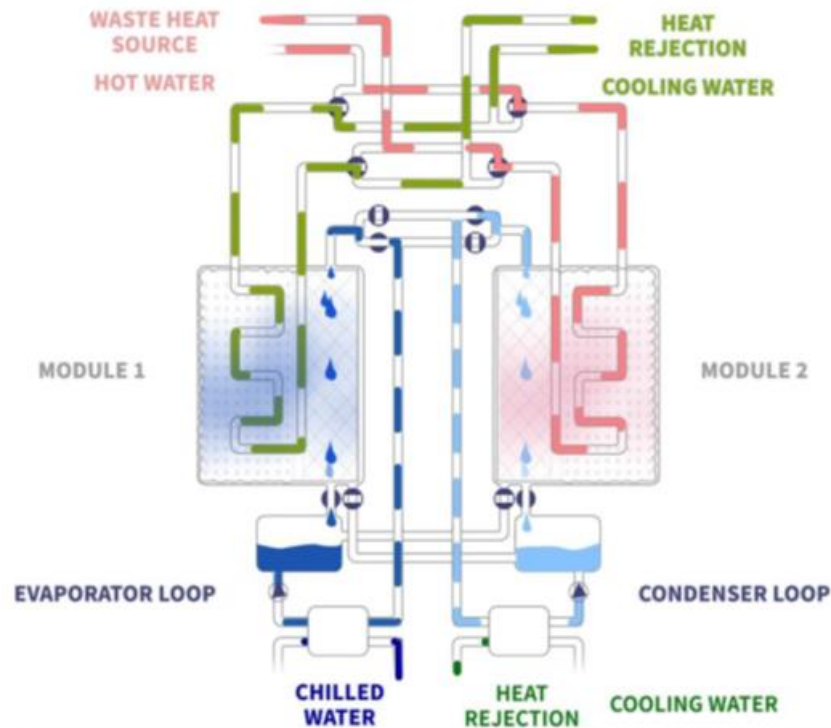
Optimized techno-economic integration between low-grade (<100 °C) industrial waste heat and high-efficiency vacuum flat plate solar collectors, to drive process cooling generation and provide process heating

Demonstration of the innovative **Ad/Absorption** cooling solutions in **4 demo sites**, covering typical industrial sectors with high cooling demand (food and beverage) and non-standard sectors (pharma, biofuels production).



Complementing the demonstration with **5 replication sites**, covering other possible relevant sectors (pulp and paper, DHN-connected industries, data centers, solar thermal installation, agri-food industry), investigating RE-WITCH potential **applications and benefits**

Innovative adsorption technology



New adsorbents:

- New design with optimized HEXs and adsorbent material
- Cylindrical vessels to reduce the size

Vacuum valves:

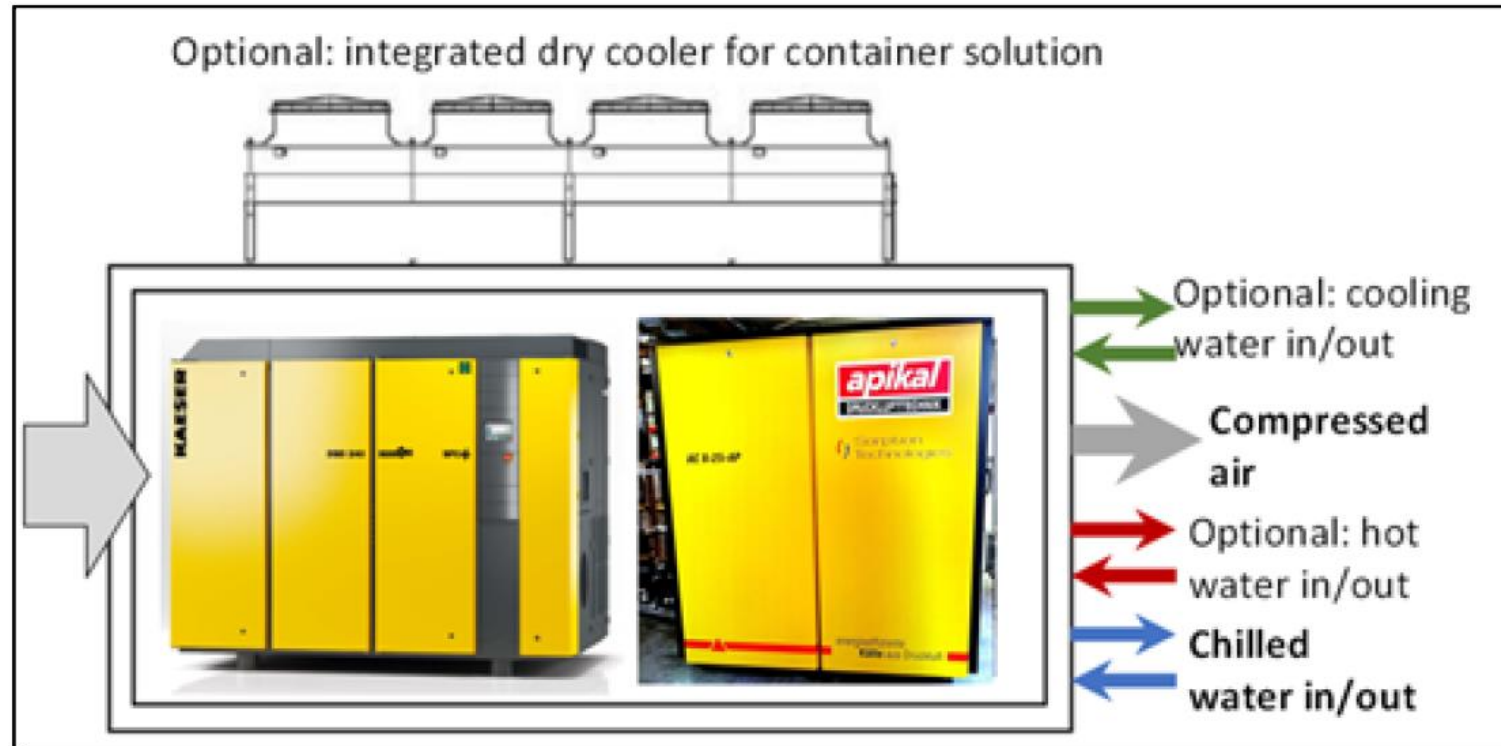
- Use of inline valves to reduce volume of valves and piping

Magnetic drive pumps:

- Better impeller design to reduce necessary height above the pumps for cavitation issues

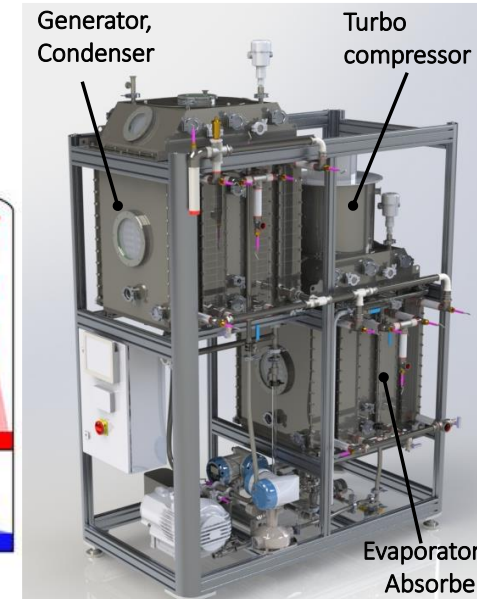
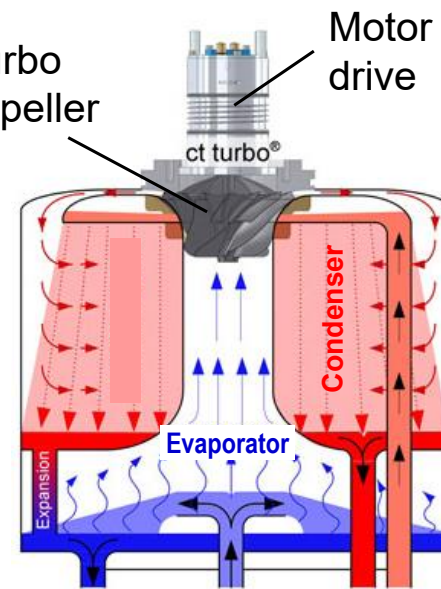
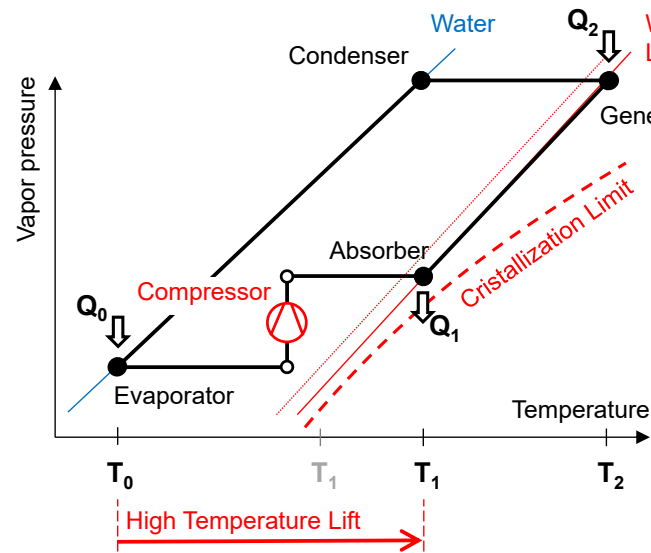
Innovative patented concept by Sorption Technologies to obtain cost effective adsorption cooling technology for industrial applications. To be further optimized during the project.

Innovative adsorption technology



Integrated containerized solution providing compressed air and H&C at high efficiency

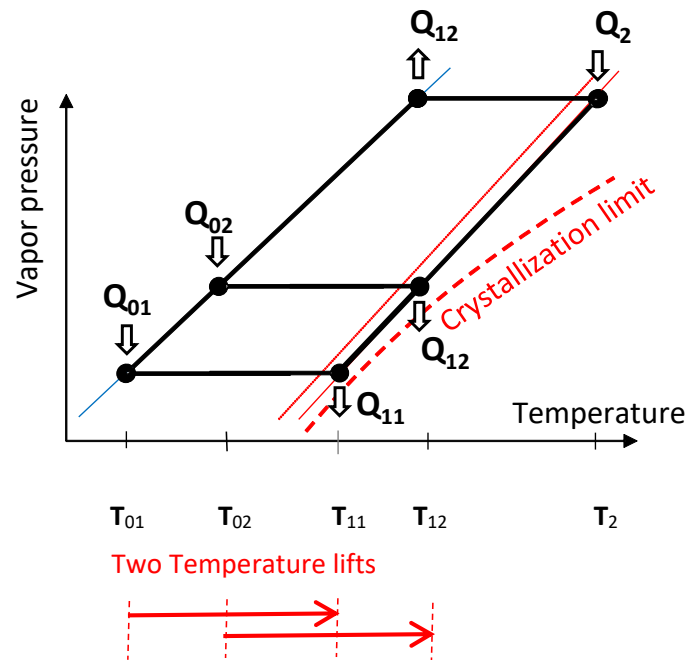
Innovative absorption technology



Hybrid compression-absorption cycle to **increase the temperature lift**, while the thermal efficiency of the sorption sub-cycle remains unchanged.

Possibility of providing both heating and cooling at the same time.

Innovative absorption technology



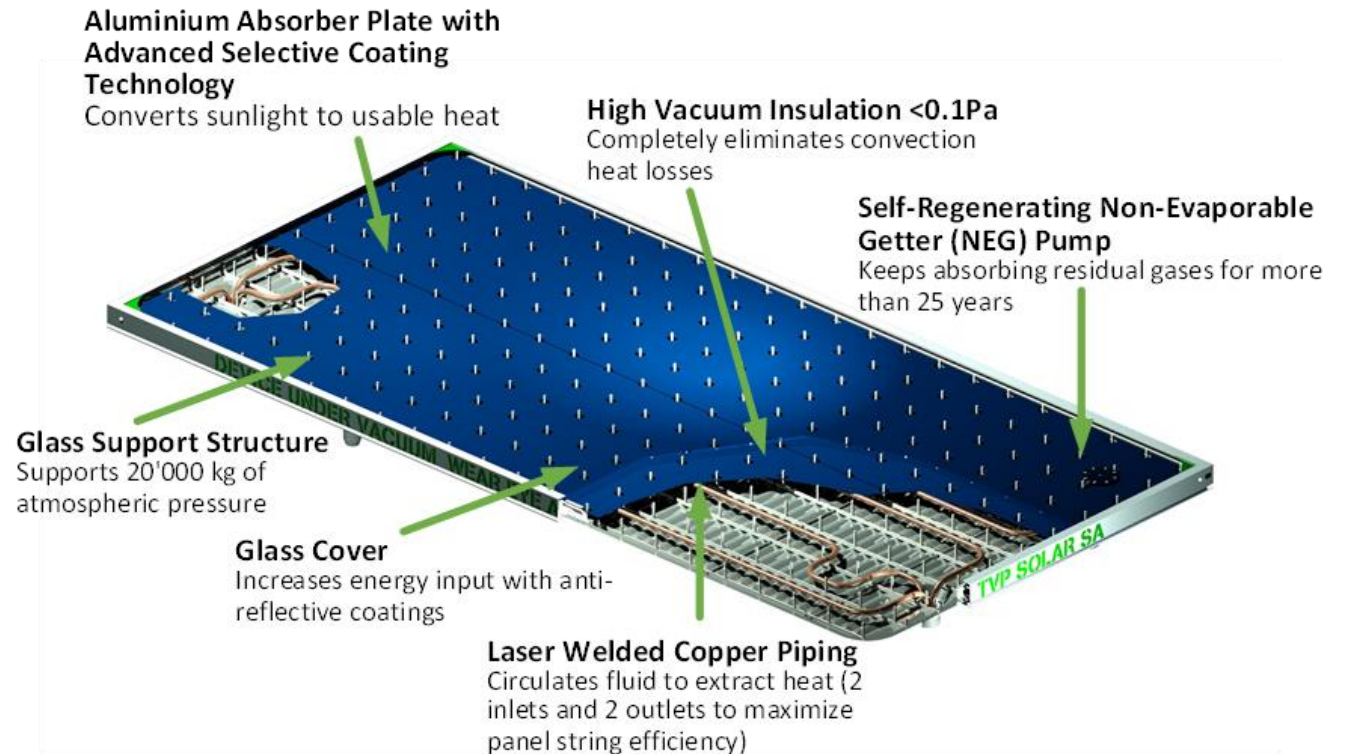
Double evaporator absorption chiller, being able to provide cooling at two different temperature levels at the same time.



High Vacuum Flat Plate solar collectors

The RE-WITCH technology is the TVP MT-Power collector being the Solar KeyMark certified **most performant solar thermal collector in the world** up to 200°C.

It can operate in the **temperature range 80°C–180°C**, for heat & steam (up to 4bar) applications and in locations with yearly solar irradiance (GHI) as low as 1,000 kWh/y, capturing both **direct and diffuse solar irradiation**





Replication modelling approach

RE-WITCH has developed an **integrated multi-level modelling framework** to assess the **technical feasibility, optimal sizing, dispatch strategy and techno-economic viability** of waste heat and renewable heat driven cooling solutions in industrial sites.

The modelling framework is **flexible and modular**: the **selection of the modelling tools to be applied is defined case by case**, based on the **level of detail and availability of site data** and on the **specific analysis needs and objectives explicitly expressed by the replicator**. This approach allows the tools to be effectively used both for preliminary screening studies and for more detailed techno-economic and dynamic assessments, supporting replication activities across heterogeneous industrial contexts.

The tools description and roles are as follows:

1. Thermo-economic optimisation – UNIGE (W-ECOMP / MEDO)

Role: First-level feasibility and sizing

Focus: Used for early screening of RE-WITCH solutions, this tool evaluates techno-economic feasibility and provides preliminary sizing of heat-to-cold technologies and thermal energy storage based on annual cost optimisation.

Key feature: Works with limited temperature detail (0-D approach), ideal for early screening and replication studies.



Replication modelling approach

2. Dispatch & TES optimisation – University of Birmingham (Python / Pyomo)

Role: System-level operational optimisation

Focus: This tool optimises the hourly dispatch of heating, cooling, electricity and thermal energy storage, refining sizing and operation strategies under variable demand, renewable availability and energy prices.

Key feature: Multi-energy optimisation (electric, thermal, cooling buses) with hourly resolution.

3. Dynamic thermo-hydraulic simulation – OST (pyTRNSYS)

Role: Detailed physical validation

Focus: Provides time-dependent simulation of temperatures, mass flow rates and storage behaviour to verify the physical feasibility and operating limits of the proposed system configurations.

Key feature: High-fidelity dynamic simulation to verify thermodynamic feasibility and operating limits.

4. Component performance modelling – CERTH / CNR and partners

Role: Technology performance backbone

Focus: Delivers validated performance models of RE-WITCH technologies that feed all system-level optimisation and simulation tools, ensuring coherent and realistic results.

Key feature: Validated time-dependent performance models used as common input across all tools.





Thank you!



Email



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