REGEN2by

Next renewable multi-generation technology enabled by two-phase fluids machines

SUSTAINABLE PLACES 2022

Sep. 6 - Sep. 9, 2022 | Nice, France

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement nº 851541

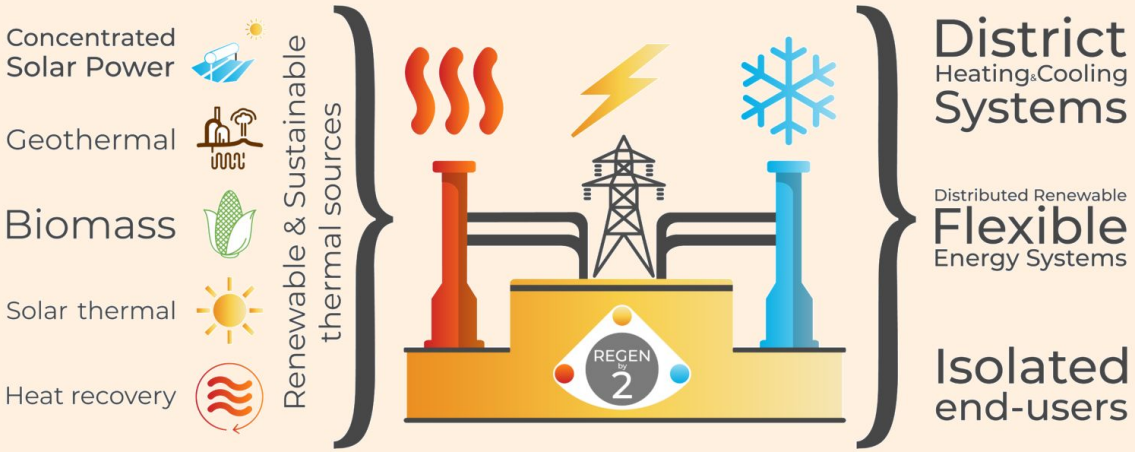
Project Data	
Project Acronym	REGEN-BY-2
Project Title	Next REnewable multi-GENeration technology enabled by TWO-phase fluids machines
Grant Agreement no.	851541
Call identifier	H2020-LC-SC3-2019-RES-TwoStages
Topic identifier	LC-SC3-RES-1-2019-2020 - Developing the next generation of renewable energy technologies
Funding Scheme	RIA - Research and Innovation Action
Project time scale	1 September 2020- 31 August 2024
Coordinator	UNIVERSITA DI PISA
Website	https://www.regen-by-2.eu/

Project partners

The **REGEN-BY-2** consortium is composed of 13 partners from 6 EU countries (Italy, France, Spain, Germany, Belgium and Greece) and 1 international partner (South Korea). The consortium is well balanced in terms of roles of participants, since all necessary stakeholders and actors are represented in sufficient number to cover all the project deployment activities.

1. **University of Pisa, Italy (Coordinator)**
2. RINA Consulting, Italy
3. CARTIF Foundation, Spain
4. CNRS, the French National Center for Scientific Research, France
5. R2M Solution, Spain
6. TIFEO, Italy
7. National Technical University of Athens, Greece
8. Liège University, Belgium
9. UNE, the Spanish Association for Standardization, Spain
10. EXOES, France
11. LSTME Busan Branch, South Korea
12. Dr. Jakob Energy Research, Germany
13. Hysytech, Italy

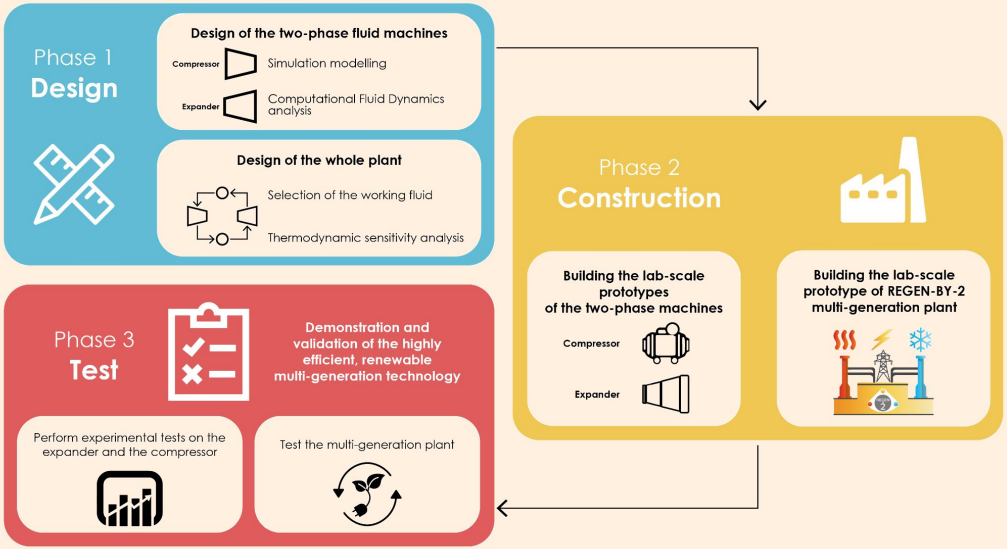
Objectives



- **REGEN-BY-2** is a Horizon 2020 EU-funded project, launched in September 2020, that aims to develop a first-of-its-kind lab-scale prototype of a highly efficient thermodynamic cycle and related plant for the re-valorisation of renewable thermal energy sources, unlocking their large potential to supply **electric, heating and-or cooling energy vectors**.
- The **REGEN-BY-2** technology, enabled by two-phase fluids machines, has been recently patented nearly worldwide by the project partner TIFEO, a start-up founded in 2018 and a potential European Unicorn.

Phases of the REGEN-BY-2 project

1. Design
2. Construction
3. Testing the prototypes



The overall objective of REGEN-BY-2 is to achieve a first-of-its-kind laboratory scale prototype (TRL4) of the patented multi-generation technology, which realizes the patented thermodynamic cycle, in order to demonstrate its functionality and advantages.

WP1: Project management

WP2: Design of the REGEN-BY-2 technology lab-scale prototype

WP3: Design and construction of REGEN-BY-2 two-phase expander

WP4: Design and construction of REGEN-BY-2 two-phase compressor

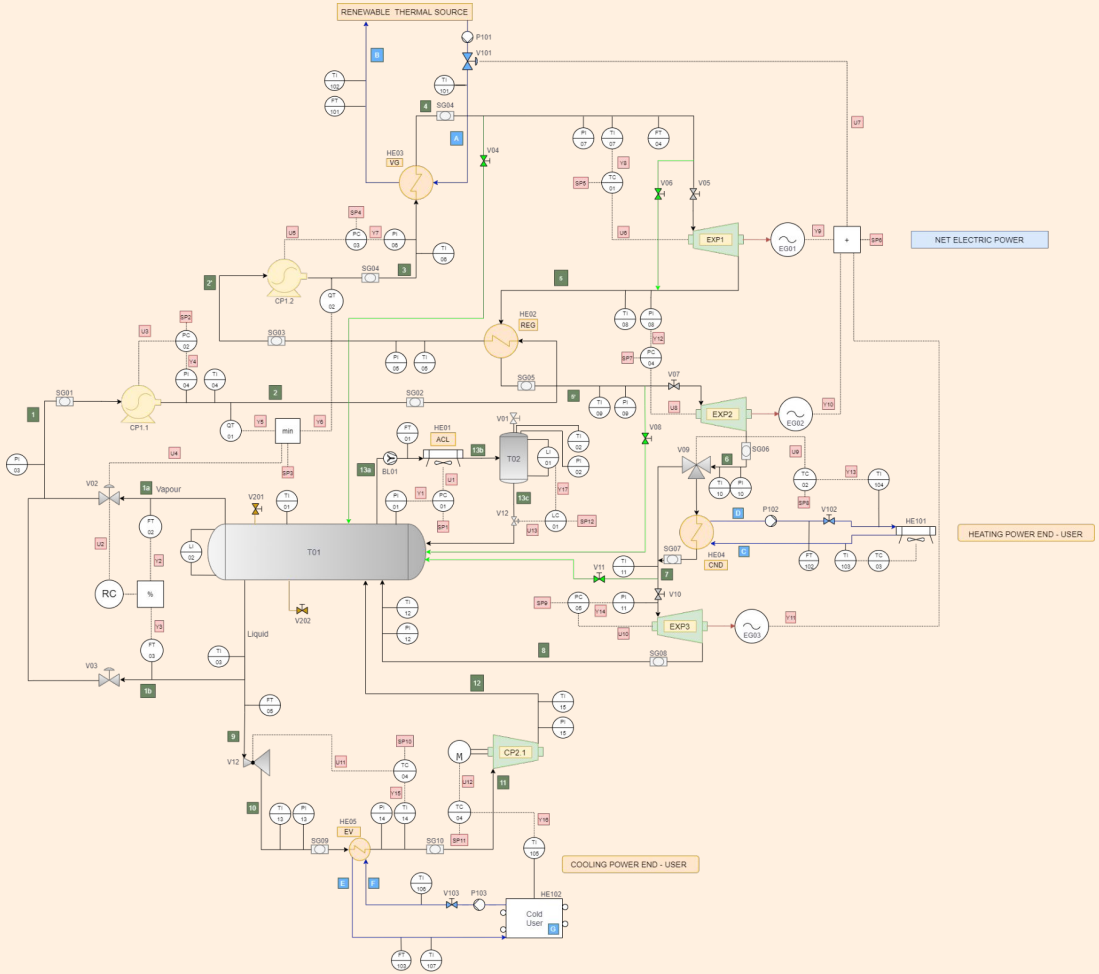
WP5: Construction of the REGEN-BY-2 technology lab-scale prototype

WP6: Experimental testing

WP7: REGEN-BY-2 development roadmap towards TRL9

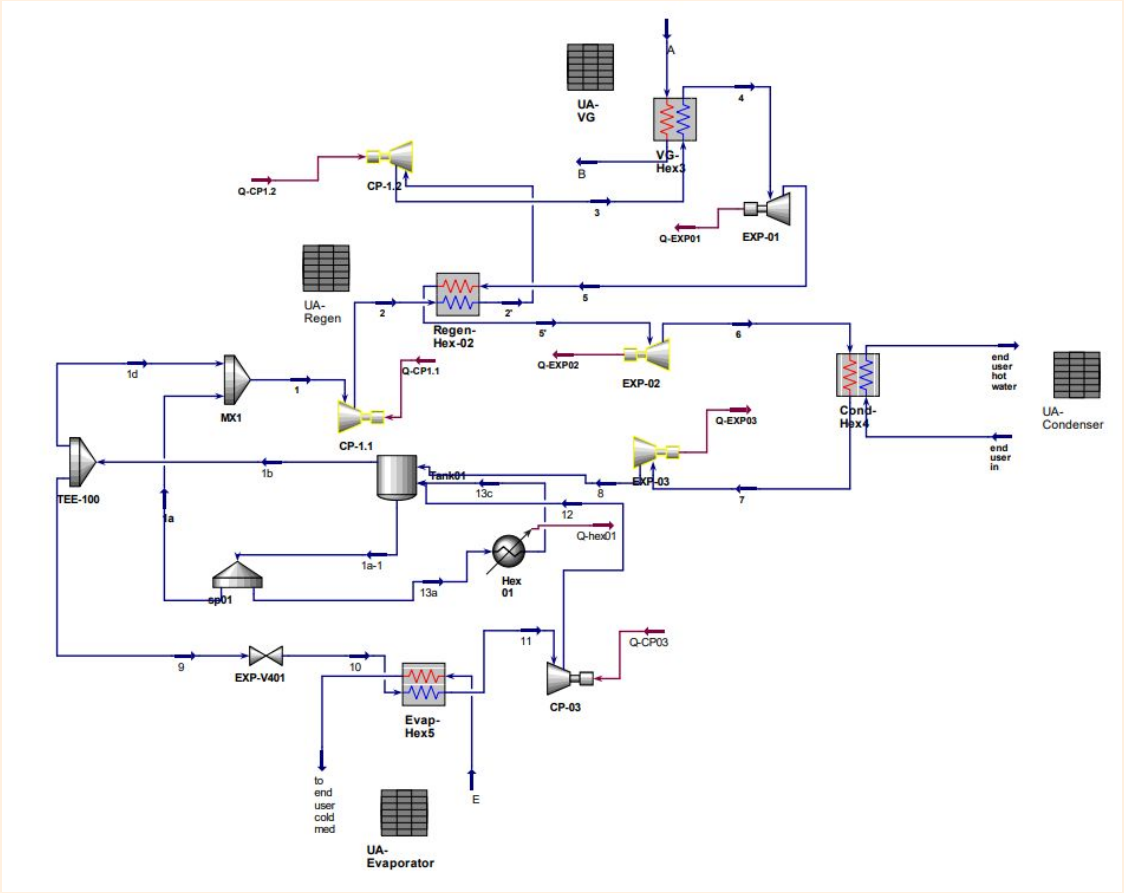
WP8: Communication, dissemination and exploitation

Layout


RENEWABLE THERMAL SOURCE
NET ELECTRIC POWER
HEATING POWER END - USER
COOLING POWER END - USER
Vapour
Liquid
Cold User
T01
T02
CP1.1
CP1.2
CP2.1
EXP1
EXP2
EXP3
EG01
EG02
EG03
HE01
HE02
HE03
HE04
HE05
HE101
HE102
RC

Layout

kW	Design
Electric	2.5
Cooling	8.75
Heating	8.75



Some of the WP Accomplished

WP2 - Design of the REGEN-BY-2 technology lab-scale prototype

Detailed analysis and preliminary design of REGEN-BY-2 technology

Task 2.1: Working fluid selection and sensitivity analysis at design point of the patented thermodynamic cycle;

Task 2.2: Preliminary design of the REGEN-BY-2 technology lab-scale prototype;

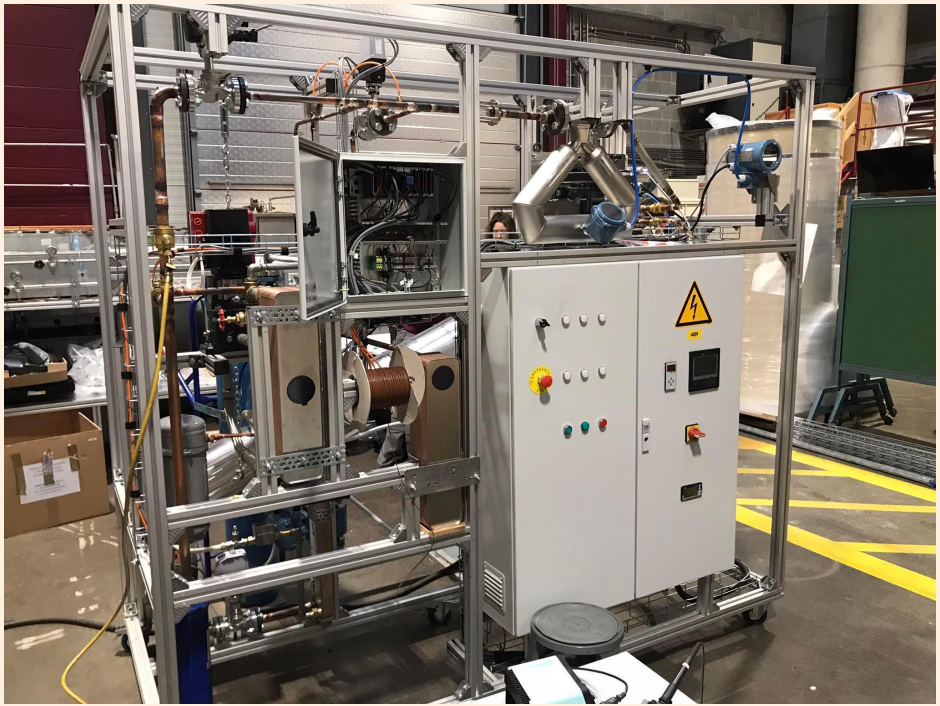
Task 2.3: Off-design performance analysis of the REGENBY-2 technology preliminary configuration;

Task 2.4: Regulation and control system of the REGENBY-2 technology preliminary configuration;

Task 2.5: Unsteady-state analysis of the REGENBY-2 technology preliminary configuration;

Design and construction of the REGEN-BY-2 two-phase expanders, and compressors

- Development of a deterministic model to carry out a **sensitivity analysis** of a scroll compressor working with two-phase flows task completed
- Construction of a **test bench** to test an off-the-shelf scroll compressor and the first lab-scale prototype manufactured by EXOES task still ongoing
- **Design** of the first lab-scale prototype task completed
- **CFD analysis** of the first lab-scale prototype task completed
- **Construction** of the first lab-scale prototype task ongoing



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