Project: RES4BUILD - Renewables for clean energy buildings in a future power system
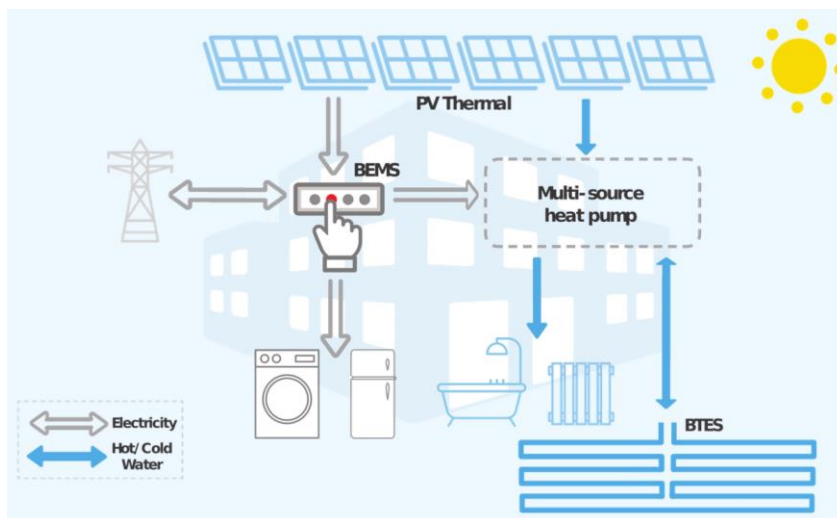
RES4BUILD

Figure 1: Concept overview for components in the RES4BUILD energy system.

Summary of project

RES4BUILD, a Horizon 2020 project, is developing renewable-energy-based solutions for decarbonizing the energy used in buildings. The approach of the project is flexible, so that the solutions are applicable to a wide variety of buildings, new or renovated, tailored to their size, their type and the climatic zones of their location.

In the heart of the solution lies an innovative multi-source heat pump with a cascading configuration, including a magnetocaloric (bottom cycle) and a vapor compression heat pump (top cycle). The heat pump will be integrated with other technologies in tailor-made solutions that suit the specific needs of each building and its owners/users.

These technologies will be selected on a case-by-case basis from a mix of standard equipment available in the market and from novel components that will be specifically explored within the project.

The novel components include innovative collectors that integrate in one panel photovoltaic cells with solar thermal energy collectors (PV/T), a borehole thermal energy storage (BTES) and a Magnetocaloric heat pump (MCHP). For all solutions, advanced modelling and control approaches will be developed and will be integrated in a Building Energy Management System (BEMS). This will allow the users to select their objectives and to optimize the use of the system accordingly, thus exploiting the full value of their demand flexibility.

The project adopts a co-development approach, where the end-users and other relevant stakeholders are engaged in an interactive and iterative process, resulting in a co-designed RES4BUILD system that meets technical and non-technical user and installer requirements. In parallel, a full life cycle assessment (LCA) and life cycle economics (LCE) analysis will be carried out, showing from an early stage the real impact of each proposed design. The diverse consortium and the dedicated
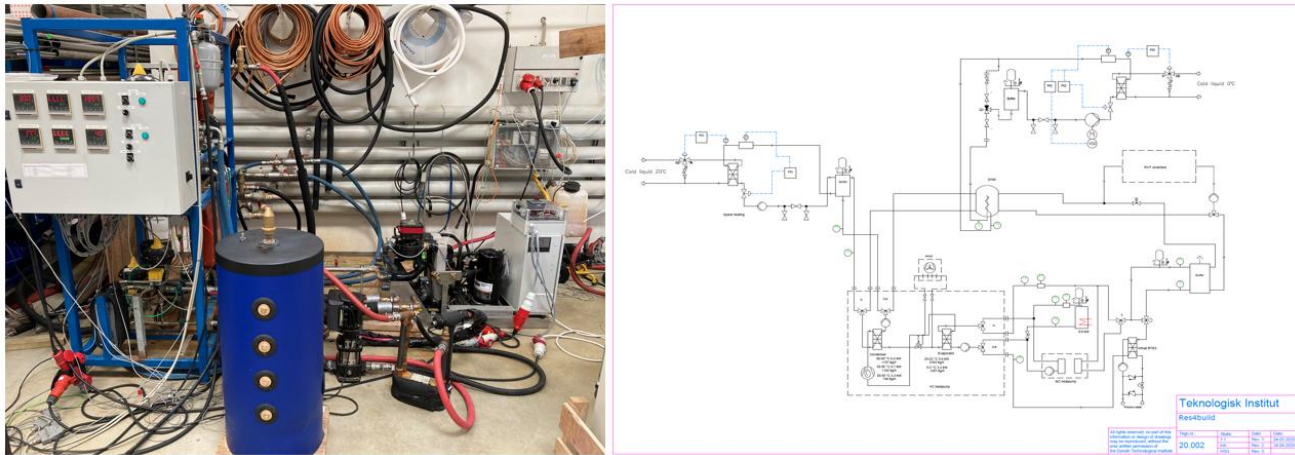
Figure 2: Preliminary test setup with the multi-source heat pump at Danish Technological institute.

exploitation tasks will connect the project with the market, paving the way for wide application of the developed solutions.

Two pilot systems will be constructed focusing on integrated systems where the innovative components of RES4BUILD are combined with the advanced control delivered by Thermovault. The two pilot systems will be developed in Denmark and Greece, respectively at the Danish Technological Institute (DTI) and at National Center for Scientific Research Demokritos (NCSRD).

The two pilot systems have many similarities since the general purpose is to validate the concept in two locations with different building energy needs and climate conditions. A major difference between the two pilot systems will be the heating/cooling demand, since the pilot system at NCSRD will be a real building corresponding to a small office building, while the pilot system at DTI will be installed in the laboratory and therefore the demand will be simulated with the use of a virtual building, modelled in Modelica by the company VITO Energyville. Both pilot systems will be tested over a one-year time frame.

FACTS ABOUT THE PROJECT

IoT Catagory: Optimize heat pump operation

Goal: Decarbonizing energy consumption in buildings by developing integrated renewable energy-based solutions for achieving the EU energy and climate goals.

Beneficiary: Operater and end-user.

Data required: Operating data and weather conditions.

Analysis method Performance analysis of overall pilot systems and validation of the building management system.

Modelling requirements: Dynamic model of the building made in Modelica, and made available as a Functional-Mock-up unit.

Quality-of-Service: Real-time.

Project participants: 15 partners from 8 countries

Time schedule: 2019-2023

Technology availability: Mix of novel and standard equipment.

Link to webpages: https://res4build.eu/

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