Solar-powered and next generation refrigerants based cooling system to boost air quality and shrink carbon emission in the city: COOLSPACES 4 LIFE Project

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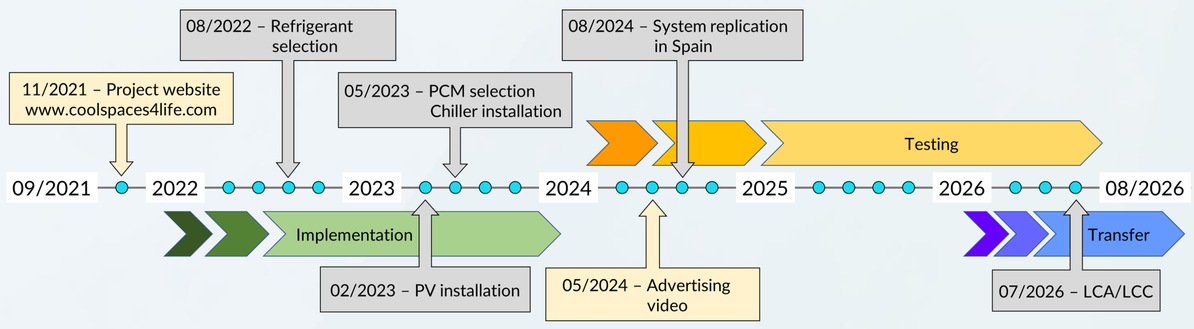
Abstract

The primary goal of this ongoing COOLSPACES4LIFE project is to replace marginal fossil-fuel-based peak energy demand with solar-powered climate-friendly refrigerants-based building cooling (BC) system coupled with cold storage systems. This novel BC system will be design and built to provide year-round cooling of a selected part of Geocentrum building at Wrocław University of Science and Technology. Implementing the technical solutions developed in the COOLSPACES project in the urban environment will impact greenhouse gas emissions in three ways: reducing the use and thus the emission of fluorinated greenhouse gases; using renewable energy as the main source of power for the presented device, thus reducing primary energy consumption from fossil-fuel combustion; and increasing the energy efficiency of large air-conditioning systems by introducing new refrigerants and incorporating the new energy accumulation system. Thanks to the use of mixtures based on natural refrigerants (hydrocarbons), COOLSPACES will provide significant support to the refrigeration and air-conditioning sector in implementing the F-gas phase-out schedules included in Regulation (EU) No. 517/2014, and transforming the refrigeration market. The above-mentioned activities, combined with the educational side of the project and its location in the center of academic cities, will highlight the transformative impact of COOLSPACES on the air-conditioning industry and on energy use in buildings.

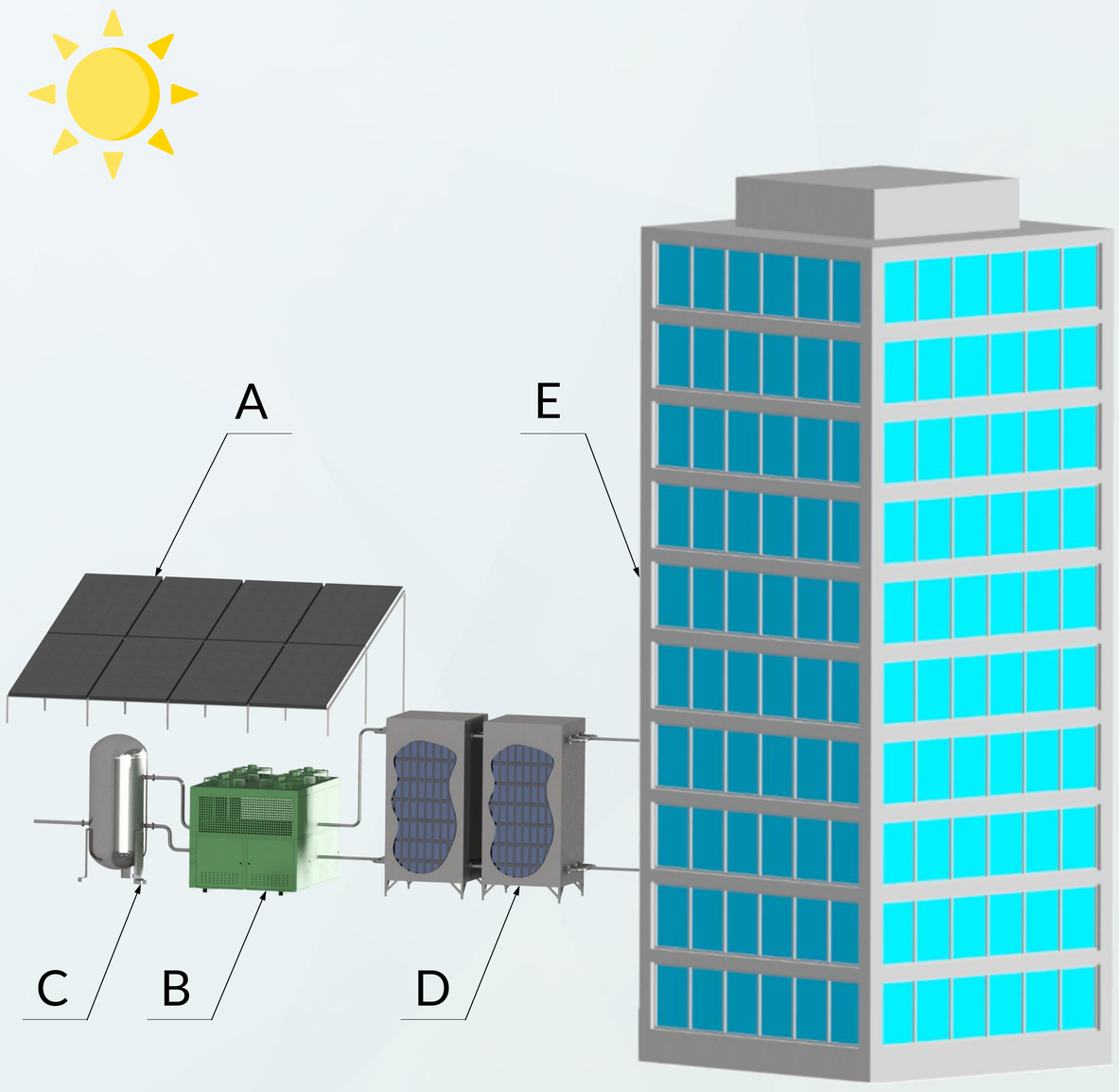


Objectives

- Reduction of greenhouse gases emission.
- The search for the most suitable heat storage material.
- The optimization, control and metering of the novel building cooling system.
- Demonstrating the potential of solar-powered building cooling systems in Poland and Spain.
- Application of Life Cycle Assessment and Life Cycle Costing analysis as instruments for policy support.

Expected technical results

- Reduction of CO_2 emissions.
- Reduction of primary energy consumption by at least 60%.
- Use of as an climate-friendly refrigerant rather than conventional refrigerants.
- Design, execution and testing of an innovative prototype.
- Geographical replication of the prototype in Spain.
- Development of a highly exploitable product applicable Europe wide.



General scheme of solar-powered (A), climate-friendly refrigerant based cooling device (B) working with phase-change materials based thermal energy storage (C) to supply domestic hot water (D) and building cooling (E).

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