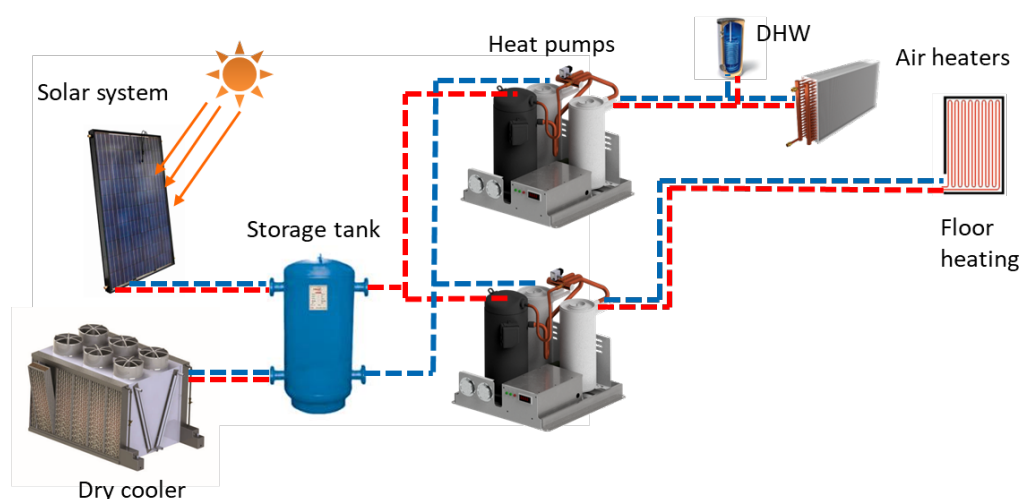


Innovative heat pumps for swine farm applications

Transitioning to Renewable Energy Sources (RES) is vital for reducing the EU's livestock sector's environmental impact. Our initiative aims to decarbonize heating in European swine farms by integrating innovative dual-source heat pumps (DSHPs). These DSHPs are designed to replace traditional boilers for space heating and domestic hot water.

At a farrow-to-finish pig farm, two DSHPs replaced a 60 kW gas condensing boiler. The low-temperature (25 kW) provides floor heating at 42°C, while the high-temperature (40 kW) handles air heating and domestic hot water at 60°C. Combined with a photovoltaic thermal (PVT) system and a short-term thermal energy storage tank, the HPs achieve a higher Coefficient of Performance (COP). A dry cooler supplements the system when solar energy is inadequate. The system operated 85% in air-water mode and 15% in water-water mode, with average COPs were 2.95 for the high-temperature HP and 4.87 for the low-temperature HP in air-water mode, and 9.85 and 4.10, respectively, in water-water mode.

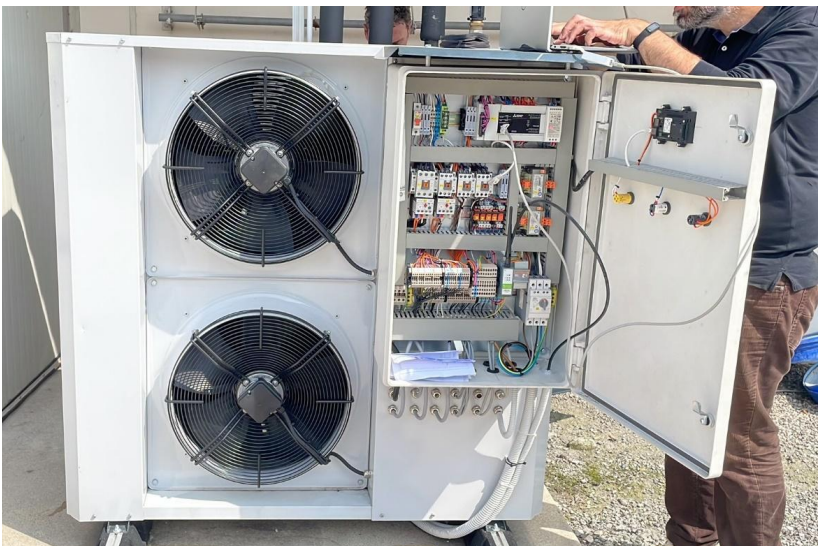
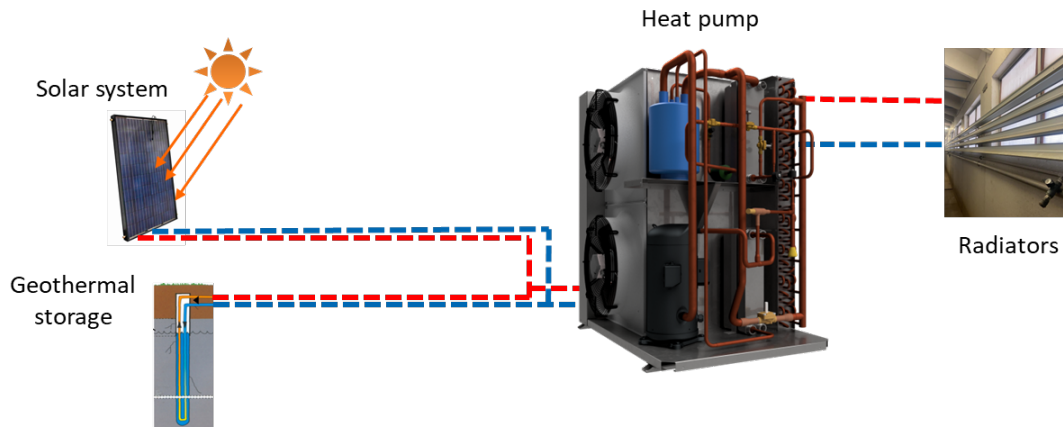


In a second pilot farm, a multi-source HP replaced a 34 kW LPG boiler for the nursery barn's heating system. Here, PVT collectors are linked to a borehole thermal energy storage system, facilitating long-term heat storage. The HP utilized ambient heat via dry cooler. The HP maintained hallway temperatures near the setpoint, operating 17.4% of the time. It delivered 75% of its heat in ground mode and 25% in hybrid mode, with no air mode activation. The average COPs were 4.67 (ground), 3.50 (hybrid), and 4.34 (overall). This project offers valuable insights for practitioners seeking to adopt sustainable practices in





livestock farming, demonstrating the feasibility and benefits of integrating RES technologies.



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