

Heat Pump Awards 2026

Application submission

Hemphouse Berlin

Urban Clean Building | Building Solutions Award

1. Application overview

Award category	Building Solutions
Title of the project	Hemphouse Berlin
Organisation Name	Urban Clean Building
Exact address of the project	Goyastraße 10, Berlin-Weißensee, Germany
Funding	Private; Public
Organisations involved in the project	Urban Clean Building — Michael Bader, project architect and integrated building concept. Die Erdwärmebohrer — geothermal feasibility, permits, EED design and drilling of two 90 m boreholes. Bosch Thermotechnik / Buderus — ground-source heat-pump manufacturer.
Project ending date	30/05/2026
Project website	https://www.urban-clean-building.de/
Sector of application	Residential

2. Applicant & EHPA contact details

Full name	Michael Bader
Email address	nachhaltig@urban-clean-building.de
Phone number	491718369326
EHPA member involved	Bosch Thermotechnik (Buderus)
Role of EHPA member	Bosch Thermotechnik (Buderus), an EHPA member, supplied the ground-source heat pump for the project. Die Erdwärmebohrer, a member of the German Heat Pump Association (BWP), which is itself a member of EHPA, was responsible for the geothermal source: feasibility check, permits, EED design simulation according to VDI 4640, and drilling of the two 90 m boreholes. Together with the architect, Urban Clean Building, the partners integrated the heat pump and heat source into the overall building concept.

3. Project description and benefits

Project description (goal, problem addressed, and solution provided by the heat pump)

Hanfhaus Berlin is a family home in Berlin-Weißensee that brings circular construction and fossil-free heating together on a constrained urban plot. Its goal is to address both the material impact of construction and the energy required to operate a home. A single ground-source heat pump uses two approximately 90-metre boreholes for space heating and domestic hot water. Roof and façade photovoltaics, battery storage and a heating buffer are connected through the building energy management system. The configured SG Ready strategy raises the buffer temperature when the battery is full and further solar generation is forecast, retaining additional energy as heat. Hemp-lime exterior walls, hemp-clay interior construction and reused elements, including stair treads from former Berlin Tegel Airport, give the energy concept a distinctive architectural setting. The project demonstrates an integrated approach using commercially available components. Energy flows can now be read separately for PV generation, grid supply, household use, the heat pump and battery charging and discharging. Seasonal performance and the effect of the newly completed control integration remain subject to monitoring.

Expected or achieved benefits

Implemented: Ground-source heating and hot water, on-site PV (roof and façade), battery storage and a completed SG Ready connection. Energy flows can now be read separately for PV, grid supply, household consumption, heat-pump consumption and battery charging/discharging.

Achieved (operating data, 2026): Across 112 selected, fully recorded days between April and August, the house covered 98.4% of its electricity demand — including the heat pump — from its own PV system and battery. Only 29 kWh were drawn from the grid, against a total consumption of 1,782 kWh. PV generated 6,121 kWh — 3.4 times consumption — and fed 4,319 kWh of surplus into the grid. These are spring–summer results, not an annual value.

Expected: The system was designed with EED for a peak heating load of 7.8 kW and annual heat demand of 14.9 MWh. The two 90 m boreholes remain frost-free in the 50-year design simulation. The EED design assumes a seasonal performance factor of 4.4 for space heating and approximately 3.8 MWh of annual heat-pump electricity consumption including hot water. These are design assumptions, not measured results. SG Ready coordination should further increase on-site solar use. The first full heating season will show the measured performance.

Obstacles/barriers encountered during development

A concrete challenge was completing the interfaces between the heat pump, PV, battery and building management system. Connection was not achieved in one step: components became available at different times and the SG integration was completed over the summer. The lesson is to specify interface responsibilities, required components, setpoints and commissioning tests early across the trades. A connected gateway alone does not demonstrate the complete control response under real heat demand. The project therefore distinguishes physical connection, configuration and subsequent performance verification.

Industrial

Residential

Commercial

Other

Why should this project win an award?

Walk up its stairs and you are stepping on treads from Berlin's former Tegel Airport. Open a kitchen drawer and you pull on an old fire hose. The walls are made of hemp. And the heat comes from 180 metres of boreholes beneath a small city plot. These are not separate

sustainability gestures — they form one building concept.

The Hanfhaus shows that a heat pump project does not have to be a compromise. Its heat pump connects local ground heat with solar electricity, battery storage and forecast-informed thermal charging. Across 112 selected, fully recorded days between April and August, the house drew just 29 kWh from the grid while producing more than three times the electricity it consumed. These are spring–summer results, not annual performance. The first winter is still ahead, and we will share those results just as openly.

Low-tech materials, high-efficiency geothermal heat and real measured data: the Hanfhaus shows what the heating transition can look like at the scale of a family home — beautiful, circular and built with technology available today.

4. Technical specifications

Capacity of unit(s)	One Buderus Logatherm WSW196i.2-8 TP50 brine-to-water heat pump serves the building. The nominal heating capacity is 8 kW for low-temperature operation, with a modulating heating range of 2–8 kW. The TP50 configuration incorporates a 50-litre heating buffer; domestic hot water is stored separately in an SH290 cylinder.
Energy sources used	The heat pump runs on electricity. Its heat source is the ground: two geothermal boreholes (2 × 90 m) supply renewable ground heat. Electricity is supplied by the building’s roof and façade PV system, battery storage and the public grid. The proportions vary with operating conditions and season; the spring–summer monitoring results are not an annual supply balance. No gas and no recycled waste heat are used.
Coefficient of Performance (COP)	The manufacturer specifies a COP of 4.61 at B0/W35 according to EN 14511 for the WSW196i.2-8: brine at 0 °C and heating water at 35 °C. This is a standardised product rating, not measured annual performance or electricity savings at Hanfhaus Berlin. A measured seasonal performance factor for the project is not yet available.
Service provided	The heat pump supplies space heating through underfloor heating and domestic hot water. The project deliberately prioritises passive summer comfort. Hemp-lime exterior walls combined with clay materials help buffer heat and moisture and moderate indoor temperature fluctuations. The project team considered a mechanical cooling installation unnecessary. This material-based contribution to summer comfort is distinct from active refrigeration. If future use requires it, passive cooling via the geothermal probes can be retrofitted with a suitable cooling station, hydraulic integration and condensation protection.
Refrigerant type	R410A, according to the manufacturer’s specifications for the WSW196i.2-8 family.

Heat pump details (compressor technology, heat exchanger, system configuration)

The building is served by one inverter-controlled Buderus Logatherm WSW196i.2-8 TP50 brine-to-water heat pump. Compressor output is continuously adapted to heating demand. There is no series or parallel cascade of multiple heat pumps. In the refrigerant cycle, the evaporator absorbs heat from the borehole brine circuit and the condenser transfers useful heat to the heating-water circuit. The installation connects two vertical geothermal probes, a 50-litre TP50 heating buffer and a separate SH290 domestic-hot-water cylinder. Modulating operation and low-temperature underfloor heating form the basis of demand-oriented heat supply.

The ground heat exchangers comprise two 90 m vertical boreholes arranged in line at 6 m spacing. The EED design specifies single-U probes with 40×3.7 mm plastic pipes in 152 mm boreholes and thermally enhanced grout with thermal conductivity of $2.0 \text{ W/(m}\cdot\text{K)}$. The system was designed and simulated with EED according to VDI 4640.

The specific compressor mechanism and the construction type and materials of the internal refrigerant heat exchangers are not documented in the project information available for this application. No unverified component details are claimed.

5. Renewable energy integration and grid response

Integration of renewable energy sources

The system combines geothermal heat with on-site solar electricity. Two boreholes of 90 m each supply the heat pump. According to the EED design simulation, around 11.1 MWh of the building's annual heat demand of 14.9 MWh — roughly three quarters — is extracted from the ground. These are design values, not measured annual results.

39 PV modules, 33 on the roof and six integrated into the façade, supply electricity to the heat pump and household, while a battery stores surplus for later use.

The façade modules complement the roof array during periods of low solar elevation; their seasonal contribution is not yet quantified. The building management

system coordinates heating, PV and storage so that surplus solar power can influence when heat is produced.

Across 112 selected, fully recorded days between April and August 2026, the house covered 98.4% of its electricity demand itself, drawing only 29 kWh from the grid and exporting 4,319 kWh. This is a spring–summer whole-building result, not a heat-pump efficiency figure or an annual balance. The savings attributable specifically to the recently completed control integration have not yet been measured separately.

Describe how the system responds to changes in energy demand and integrates with smart grids or load management strategies.

*

26.

The heat pump is connected to the building energy management system through its SG Ready interface. The configured strategy considers battery state and the weather forecast. When the battery is full and further solar generation is expected, the system raises the heating-buffer temperature setpoint above its normal level, allowing additional energy to be retained as heat. This provides a local load-management function alongside the heat pump's modulating operation. It does not imply island operation or participation in an external electricity flexibility market. The 50-litre buffer provides limited thermal storage; no large storage capacity or quantified grid-relief effect is claimed. Connection and control setup were completed progressively over the summer as components became available. End-to-end response under actual heat demand and the resulting benefits remain to be verified with operating data. The earlier monitoring period must not be attributed entirely to the completed control strategy.

Response to energy demand / smart grid integration

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6. Innovation, monitoring and replicability

General (all awards)

Why the project is innovative *(all awards)*

The Hanfhaus addresses both construction materials and operational energy within one building concept. The exterior walls are made of hempcrete — hemp shives, lime and water — while interior walls use hemp-clay with vapour-permeable plasters. Reused components, including stair treads from former Berlin Tegel Airport, old fire hoses as drawer handles and former hotel benches in the bathroom, bring circular construction into everyday housing.

A ground-source heat pump, supplied by two 90 m boreholes on a tight inner-city plot, is combined with roof and façade PV and coordinated battery storage. The heat pump is both an essential building service and a controllable electricity load. Across 112 selected, fully recorded spring–summer operating days, the house covered 98.4% of its electricity demand itself. Annual performance and the benefits of the completed control strategy remain to be verified.

The innovation lies in site-specific integration rather than proprietary technology: commercially available components are combined with circular material choices in a realised urban home, providing a planning approach that other teams can adapt.

Monitoring approach (performance, cost, and carbon targets) *(all awards)*

Heat-pump electricity consumption and heat output are metered. The readings are transferred through an interface to the building energy management system, where they are displayed and evaluated. The system also provides separate views of PV generation, grid supply, household electricity consumption and battery charging/discharging.

Monitoring will assess heat output in relation to electricity input and the interaction between the heat pump, on-site solar generation, storage and control strategy.

The first full winter evaluation is particularly important: the available spring–summer whole-building electricity results are not a measured annual heat-pump performance figure.

No quantified annual electricity-cost or carbon-reduction targets have yet been set. The project team expects low electricity demand and reduced grid dependence from the combination of PV, geothermal heat, building energy management, the natural-material building envelope and decentralized ventilation with heat recovery.

These are expectations to be tested against the first winter's operating data, not claimed achieved annual savings.

For Large Heat Pump or Building Solutions Award

Why the project serves as a model for others (*Large Heat Pump or Building Solutions Award*)

The Hanfhaus shows that low-carbon construction and fossil-free heating can be combined with available technology on an inner-city plot, not only in large demonstration schemes.

What others can adopt is not a fixed equipment size, but a planning sequence: assess the building's actual heat demand and the local ground resource; right-size the borehole field by simulation — here two 90 m boreholes for a heat load of 7.8 kW; coordinate the heat pump, PV, storage and controls; and monitor performance transparently.

Early collaboration between architect, drilling specialist, installer and control specialists aligns the heat source and building design. Standard products make the planning approach transferable, while each project still requires site-specific assessment and design.

Explain whether the project can be expanded - e.g., implemented in more locations or adapted for different industries and/or buildings.

30.

Yes. The integration principle — ground-source heat, PV, battery storage and coordinated controls, combined with ecological building materials — can be adapted to other buildings and locations.

More locations: The Hanfhaus shows that a constrained urban plot can accommodate a geothermal system.

Suitability remains site-specific: space, geology, neighbouring installations and permits must be checked for each project.

Larger buildings: A redesigned borehole field, heat-pump capacity and heat distribution can adapt the approach to multi-family, commercial and public buildings or neighbourhoods.

Existing buildings: Ground-source heat pumps can replace fossil heating where heat-emitter temperatures, building demand and site conditions allow an appropriate design.

The planning approach, not the exact installation, is the transferable element.

Potential for expansion to other locations/industries (*Large Heat Pump or Building Solutions Award*)

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Barriers to replication elsewhere (*Large Heat Pump or Building Solutions Award*)

Technical: Limited urban space and uncertain geology require early specialist assessment and simulation based on the actual heat load.

Regulatory: Boreholes require the relevant approvals; water protection zones and other site-specific restrictions must be checked before the design is fixed. Early involvement of the drilling specialist helps clarify permit requirements.

Financial: Upfront investment can be higher than for alternative heating systems. Site-specific comparisons of capital and operating costs, available funding and expected service life are needed. On-site PV can support the operating concept, but savings must be evaluated for each project.

Operational: Coordination between architecture, drilling, heating, PV and electrical trades is complex. Clear responsibility for every interface, early specification and tests under real operating conditions are essential.

Materials: Hemp-based and reused components require coordinated procurement, detailing and experienced contractors.

The project illustrates why these issues should be addressed early in the planning process.

Explain whether this project has business opportunities for expansion, licensing, or commercial production.
32.

The project is not based on a patented product, so licensing or commercial production are not the focus. Its business potential lies in replication as a coordinated

service: architecture, heat-source planning, heat-pump installation, PV and storage integration, and commissioning.

Architect and drilling specialist can transfer this planning approach to further residential, commercial and neighbourhood projects, both new builds and renovations.

The transferable asset is a structured process for interfaces, commissioning and monitoring. Expansion remains dependent on site suitability, client budgets and delivery capacity.

Business opportunities for expansion, licensing, or commercial production *(Large Heat Pump or Building Solutions Award)*

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For Innovation Award

Technology/technique developed solely for this project *(Innovation Award only)*

No answer provided. (Innovation Award section — not applicable to this application.)

Differentiation from state-of-the-art solutions & market maturity *(Innovation Award only)*

No answer provided. (Innovation Award section — not applicable to this application.)

Regional benefits (energy savings, emissions, jobs, infrastructure) *(Innovation Award only)*

No answer provided. (Innovation Award section — not applicable to this application.)

Commercial potential *(Innovation Award only)*

No answer provided. (Innovation Award section — not applicable to this application.)