



About Energy Machines

Electrifying buildings, eliminating carbon

Energy Machines is a leading Danish provider of integrated energy systems, offering both **Turnkey** and **Energy-as-a-Service** solutions that enable buildings and communities to decarbonize. Our philosophy is simple: capture and move energy that already exists around us, and avoid burning fossil fuels and biomass.

Energy Machines' software-driven solutions electrify heating and cooling by combining heat pumps, seasonal geothermal energy storage, and heat recovery into a single system where energy is efficiently stored, moved, and re-used. This integration enables both brand new and century-old properties to be heated and cooled with unparalleled efficiency, minimized energy costs, and a significantly reduced carbon footprint.

Supported by a portfolio of more than 100 successful projects, Energy MachinesTM integrated energy systems deliver market-leading reductions in energy usage and operating costs. Customers not only achieve, but exceed, their ESG goals, paving the way for a greener future for all.

Together, we can accelerate the world's transition to sustainable energy.

100+

Projects commissioned

1200+

Heat pumps in operation

90+

Geothermal systems

7

Offices globally

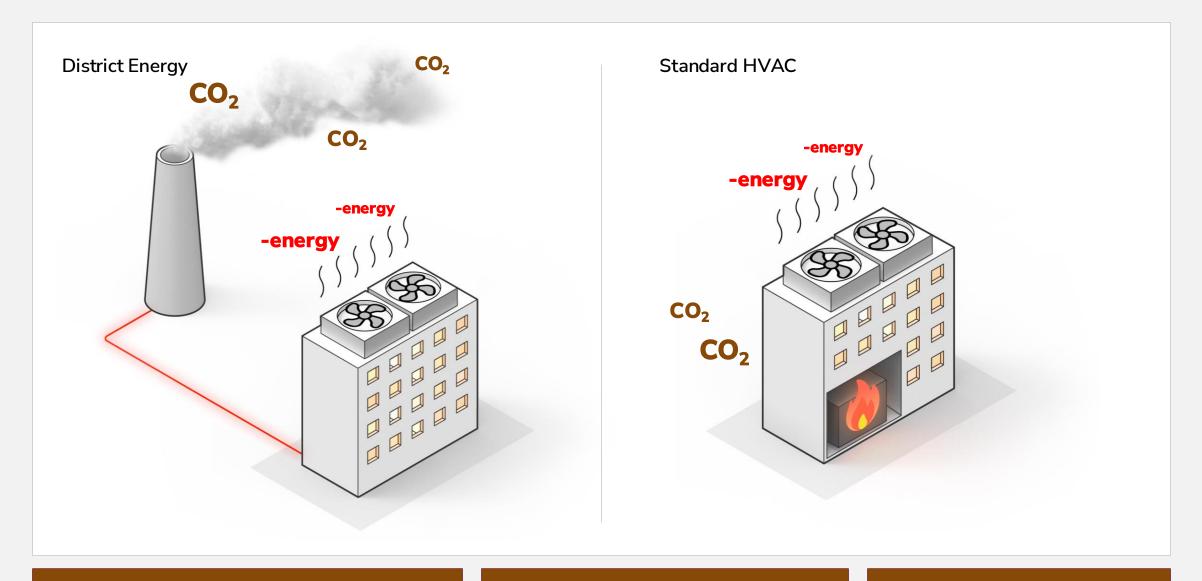
In 2024, Energy Machines won EjendomDanmark's prestigious *Most Innovative Company of the Year* award for our work in implementing forward-thinking digitalized energy solutions across the built environment.

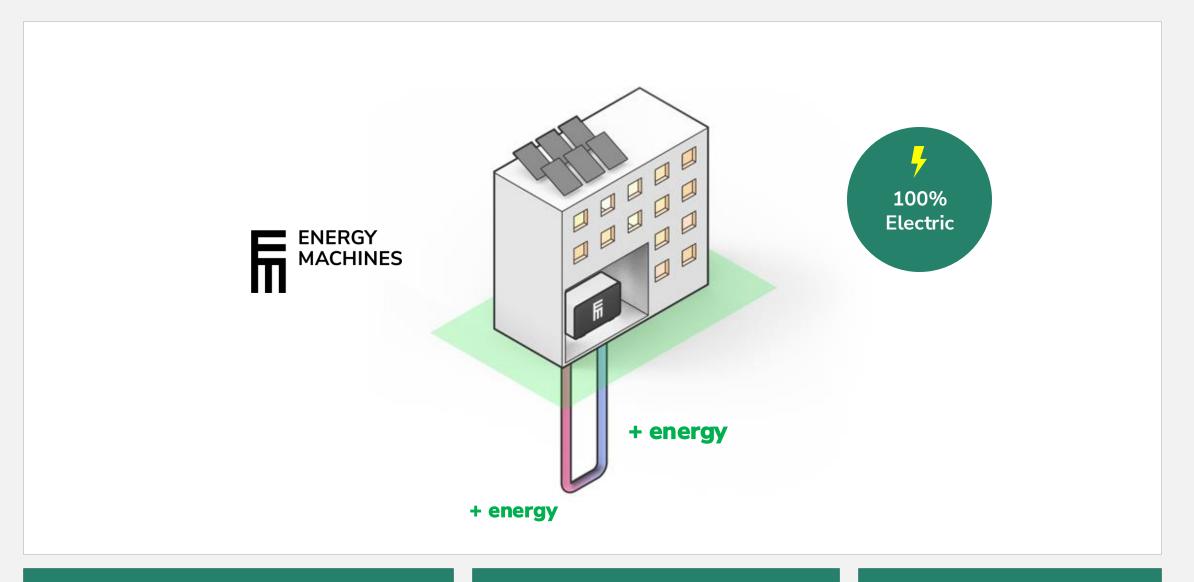




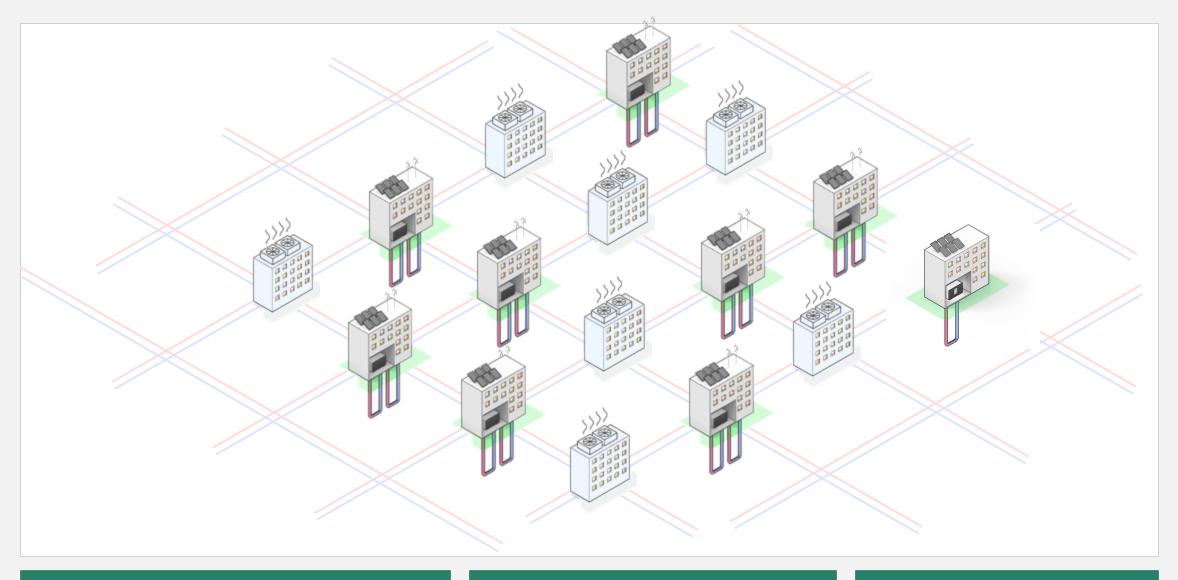




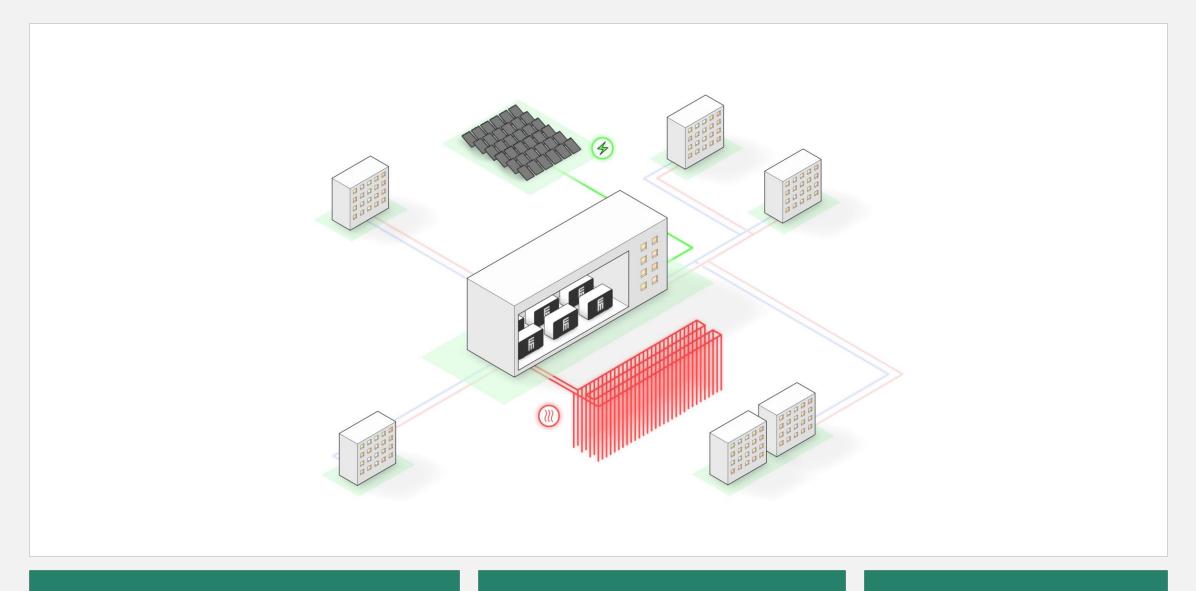




With Energy Machines, communities can become decentralized thermal energy networks where energy is shared and moved between buildings



District heating and cooling can be powered by a centralized Energy Machines™ energy hub with seasonal geothermal energy storage



Energy Machines™ Integrated Energy Systems outperform alternative heating and cooling solutions – without the carbon footprint

	Conventional HVAC	Typical Heat Pump $^{[1]}$	Energy Machines™ Integrated Energy System
COP* Heating	0.93 ^[2] Gas boiler	4-5 Heating-only heat pump	4 – 6 **
COP Cooling	2.5 – 6.1 ^[3] Typical chillers	4-5 Cooling-only heat pump	20 – 50
COP Combined	n/a	n/a	6 – 14

[1] E.g., Trane®, Carrier; [2] Source: Energistyrelsen - Technology Data for Energy Transport; [3] Source: Energistyrelsen - Energy Policy Toolkit on Energy Efficiency in New Buildings

^{*} Coefficient of Performance (COP): Measures efficiency by telling us how much energy is created for every 1 kWh of energy that's used; The amount of energy provided divided by amount of electricity consumed.

^{**} Ground-source heat pumps are 44% more efficient than air-source and 72% compared to conventional HVAC equipment. (Source: U.S. Department of Energy)



Electrified

heating & cooling



70-90%

less energy used



75%

lower energy costs



Zero

operational CO₂

When using green electricity



Futureproofed

energy resilience



Our solutions are versatile and applicable across a wide range of markets, from individual buildings to entire communities – both new & retrofits



Data Centers

All types and sizes



Large Buildings

- Office buildings
- Residential properties
- Shopping centers
- Hotels and resorts
- Museums
- Government facilities
- Metro



Industrial Process

- Refrigeration
- Ice rinks
- Plastics processing
- Indoor agriculture



District / Campus

- District energy networks
- Hospitals
- Universities
- Stadiums / Arenas





Energy Machines' software-driven energy solution integrates **proven** low-carbon energy technologies into a **single system** where energy is efficiently **stored**, **moved**, **and reused**



Heat Pumps

MOVE ENERGY



Geothermal Energy

STORE ENERGY



High-efficiency Air Handling Units

RECOVER ENERGY



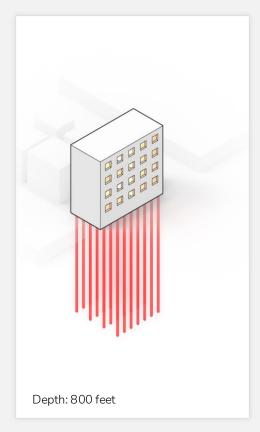
Flexible Control System

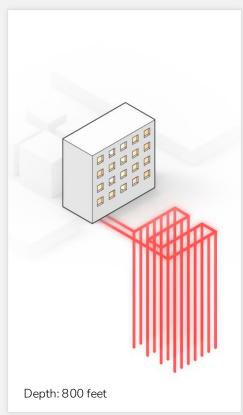
OPTIMIZE ENERGY USAGE



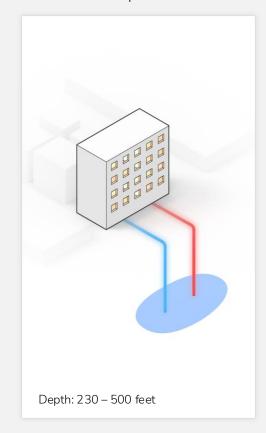
Near-surface Geothermal Energy Storage Types

BTESBoreholes

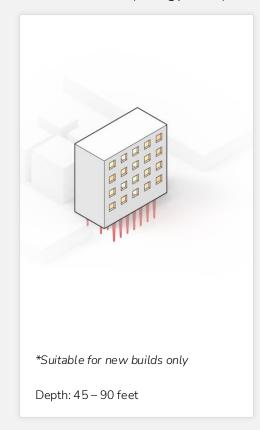




ATESGroundwater Aquifers



PTESFoundation Piles ('Energy Piles')





ATES

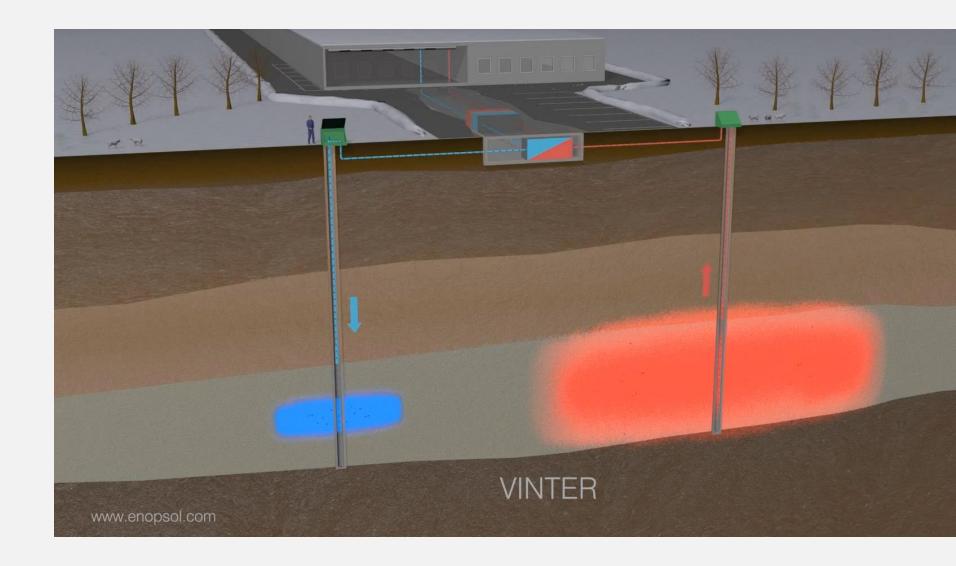
How it works:

During Summer

Cold groundwater is pumped from an aquifer to the building, where it passes through a heat exchanger and absorbs heat from the building, cooling it in the process. The warmed groundwater is then returned to the aquifer, storing the heat for winter.

During Winter

The process reverses. The heat stored in the aquifer is extracted through the heat exchanger, and a heat pump transfers this heat to the building, warming it while cooling the groundwater before it returns to the aquifer.





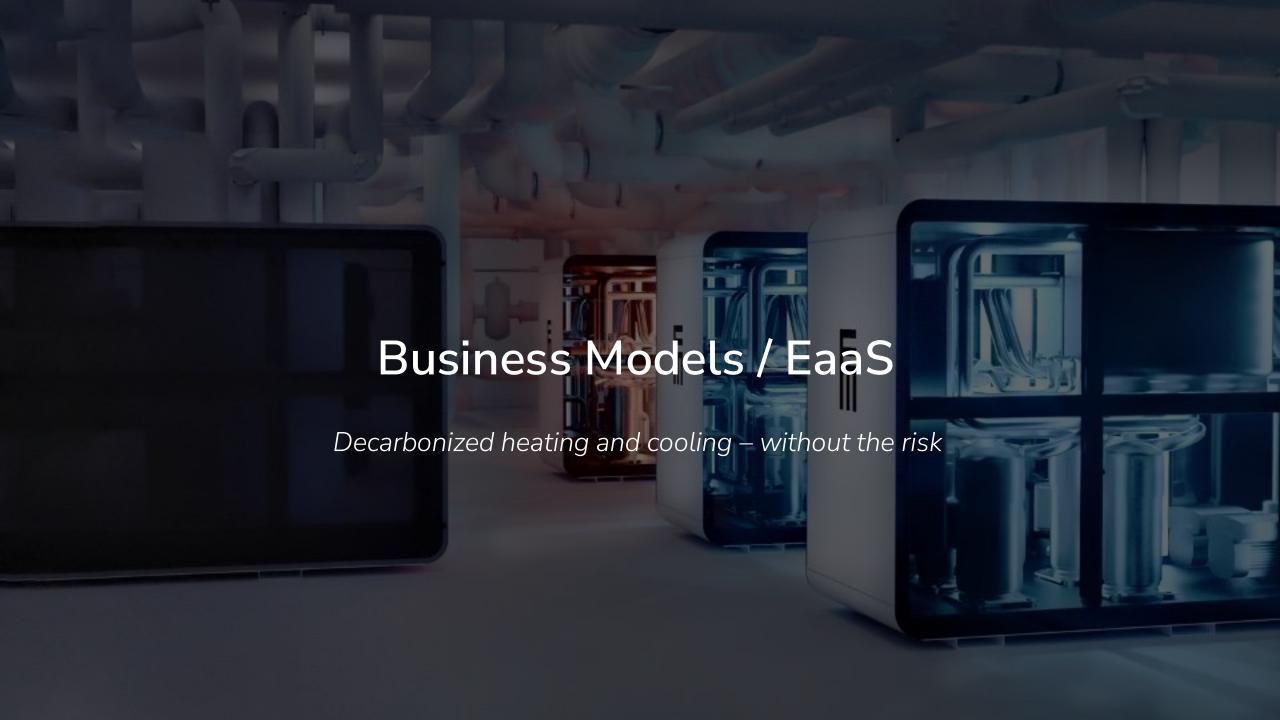
ATES

Drilling the wells:

In order to access the aquifers and create an ATES system, a drilling rig is employed to construct wells at a depth of ~150 meters.

The drilling rigs and method are identical to that used for constructing regular wells for extracting drinking water.





Energy Machines Business Models



Turnkey

Own your integrated energy system

Customer responsibility

- ✓ Capital investment
- ✓ Energy consumption costs
- ✓ Service
 *Potentially contracted to Energy Machines separately
- ✓ Operational risk

Energy Machines

- ✓ Design
- ✓ Installation



Energy-as-a-Service (EaaS)

Decarbonized heating and cooling – without financial or operational risks

Customer responsibility

✓ Energy consumption costs

Energy Machines

- ✓ Capital investment
- ✓ Design
- ✓ Installation
- ✓ Service
- ✓ Operational risk
- ✓ Continuous system optimization



Energy Machines Business Models



Energy-as-a-Service (EaaS)

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EaaS simplified:



Green energy



No (or very low) CAPEX



Same or lower OPEX as the alternative solution



No operational risk







BTES – Borehole Thermal Energy Storage

Grundtvighus

Location: Copenhagen, Denmark

Sector: Hotel

Building built: 1908 Floor area: 110,000 ft² This listed historic building in central Copenhagen will be the first in the city equipped with a borehole-based geothermal energy system

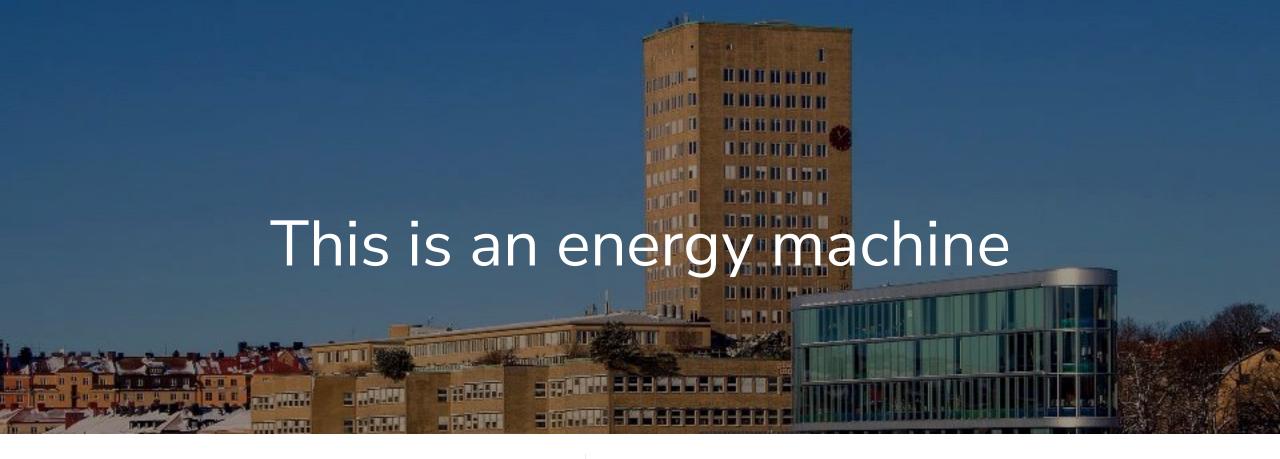
No connection to district energy providers

84% energy reduction 97% reduction in operating costs On track for DGNB Platinum









BTES – Borehole Thermal Energy Storage

Bonnierhuset

Location: Stockholm, Sweden

Sector: Office

Building built: 1949 Floor area: 550,000 ft² The largest geothermal installation in central Stockholm 27,670 borehole meters drilled beneath the parking garage 100% green electricity is used to drill boreholes 100% of cooling demand, 92% of heating demand

82% reduction in CO₂ (245 CO₂e/year to 45 CO₂e/year) 80% reduction in purchased energy (124 kWh/m² to 28 kWh/m²)











Bonnierhuset, Stockholm, Sweden

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Bonnierhuset, Stockholm, Sweden







BTES – Borehole Thermal Energy Storage

Ripple Residence

Location: Copenhagen, Denmark

Sector: **Residential** Floor area: **141,000 ft**²

100% of heating and cooling needs covered by BTES solution 20 boreholes x 250 meters deep No connection to district energy providers Partially powered by rooftop PV solar (132 MWh/year electricity production)

Extremely low LCA footprint $< 5 \text{ kg CO}_2/\text{m}^2/\text{year}$ On track for DGNB Gold











Installation of ground collector pipework



BTES + Thermal Network/Grid

Norrlands University Hospital

Location: Umeå, Sweden

Sector: Hospital

Building built: 1907-1957

Floor area: **3.7M ft**²

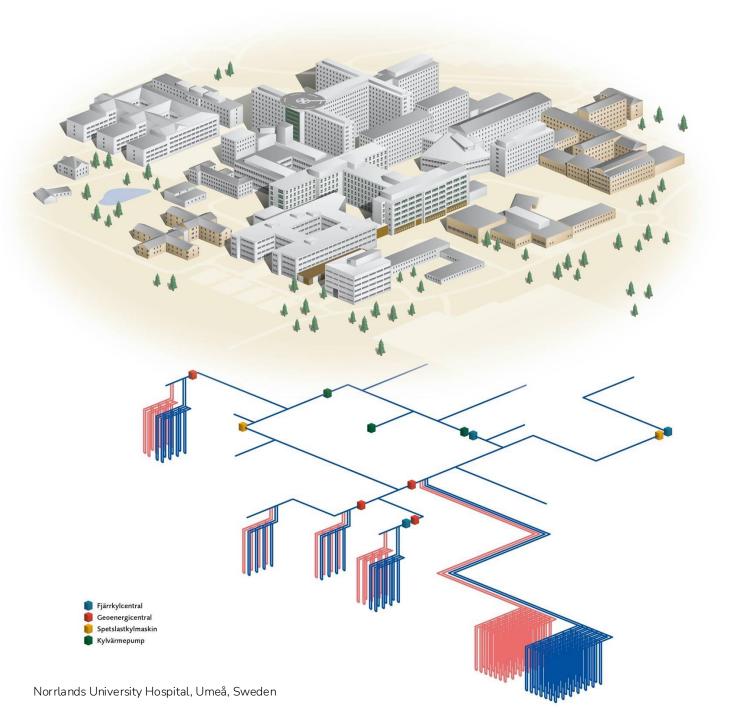
Hospital campus with multiple buildings One of the world's largest geothermal borehole installations 209 boreholes x 200m depth

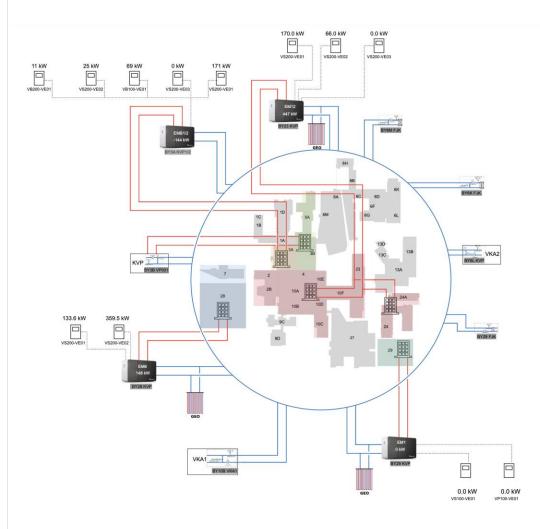
Thermal network/grid system where energy is shared and moved between hospital buildings (10 heat pumps across 4 buildings)

Energy from buildings with energy surplus → buildings with energy defecit

95% of cooling needs covered by solution 950.000€ yearly OPEX reduction













ATES – Aquifer Thermal Energy Storage

Europe's Largest Logistics Center

Location: Horsens, Denmark

Sector: **Logistics**

Building built: 2026 (Expected)

Floor area: 3.2M ft²

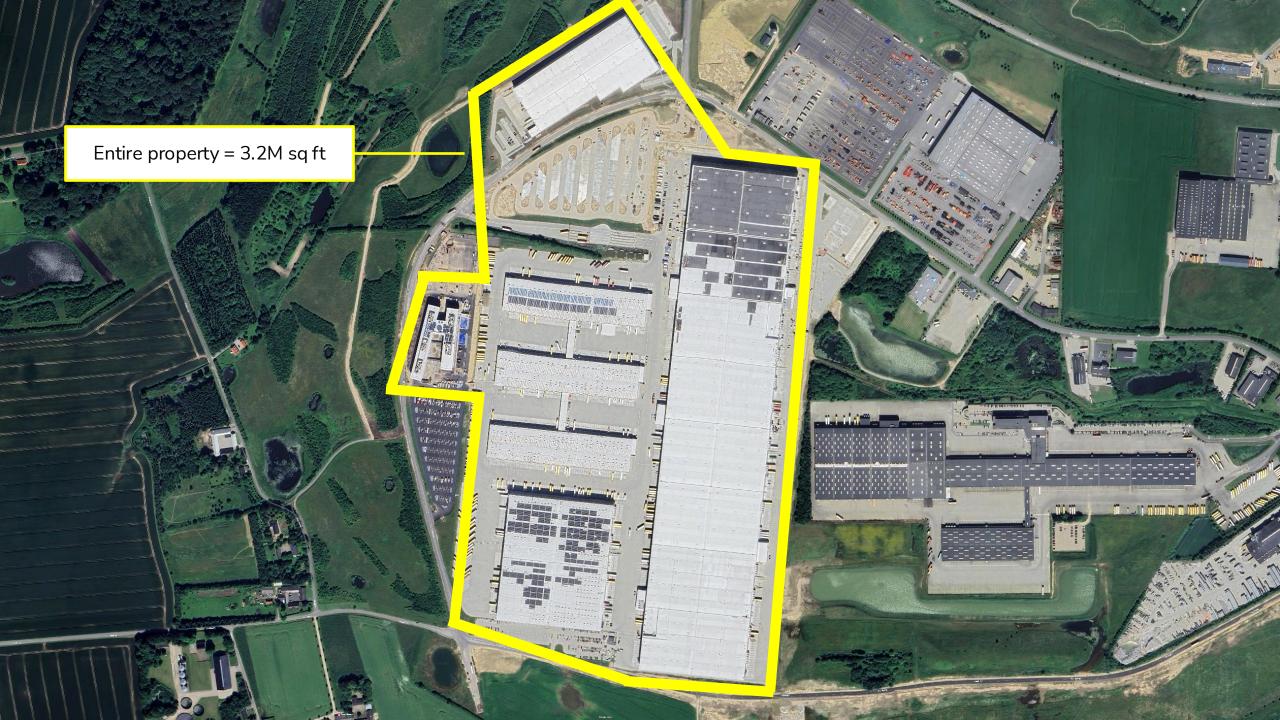
Aquifer-based geothermal solution integrated with seven Danfoss Turbocor® heat pumps provides heating and cooling for Europe's largest logistics center for trucks

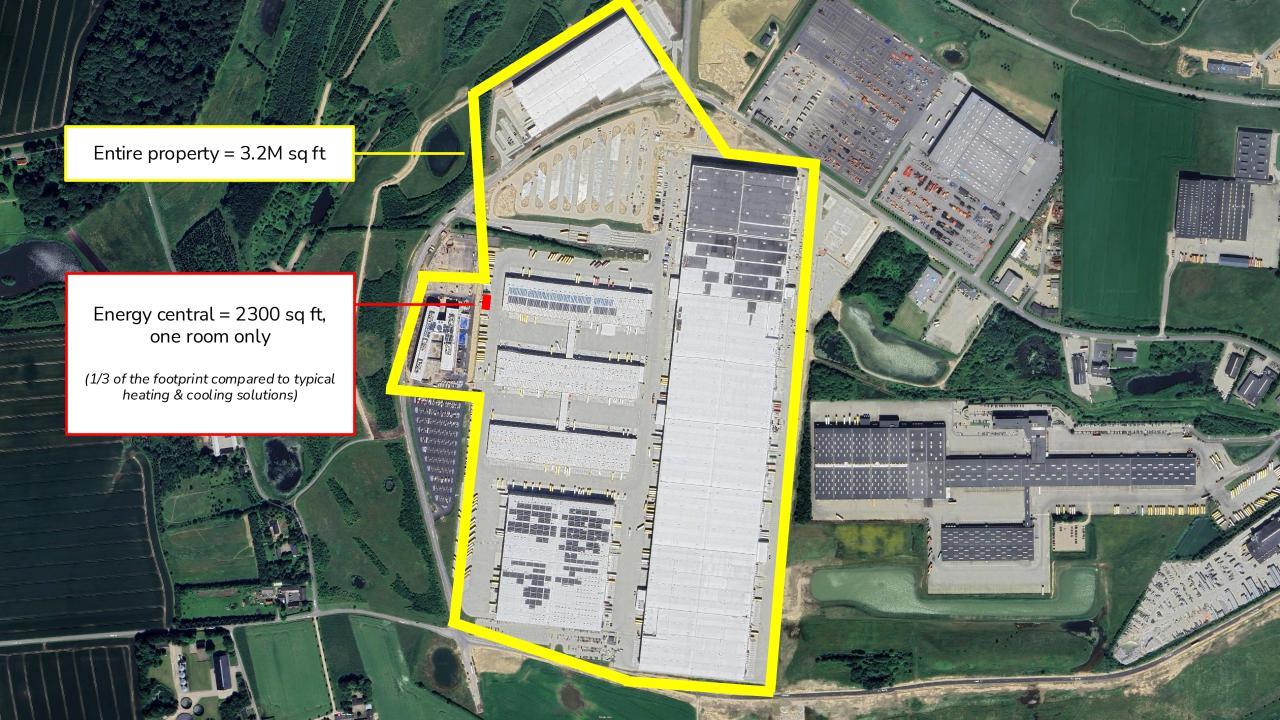
Heating capacity: 4.9 MW Cooling capacity: 2.2 MW

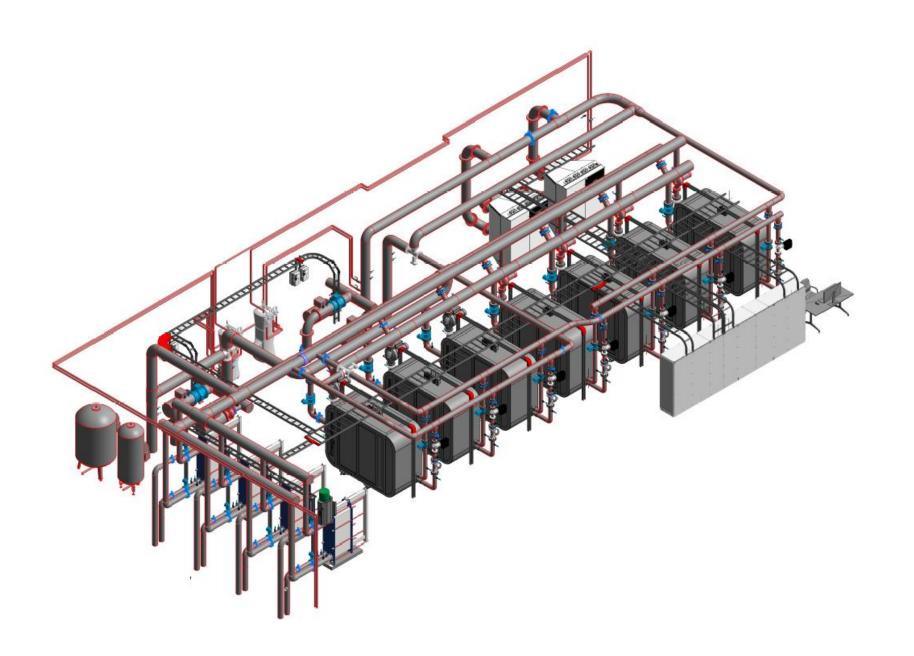
COP heating: 4 COP cooling: 50















ATES – Aquifer Thermal Energy Storage

Bispebjerg Hospital

Location: Copenhagen, Denmark

Sector: **Hospital**Building built: **1913**Floor area: **860,000** ft²

Denmark's largest aquifer-based geothermal installation Energy surplus is fed to a neighboring hospital building

Heating capacity: 4.7 MW Cooling capacity: 5.3 MW

1100 tons CO₂ saved annually 487,000€ yearly OPEX reduction



Concealed in-ground pumphouse



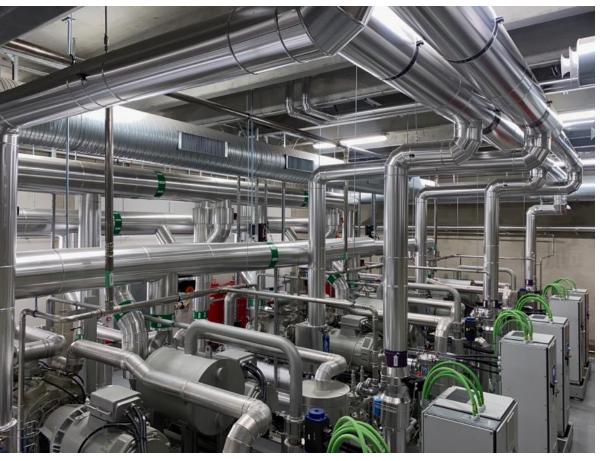


Above-ground pumphouse





ATES well commissioning scenarios









Waste Heat / BTES

IKEA

Location: Gothenburg, Sweden

Sector: Retail

Building built: 2022 Floor area: 450,000 ft² One of eight IKEA projects in Energy Machines' portfolio

The firm's most sustainable store globally

Energy Positive: With solar integration, the property produces an

18% energy surplus





Waste Heat-to-District Heating

Sønderjylland Hospital

Location: **Sønderborg**, **Denmark**

Sector: **Hospital**

 2×1.3 MW Danfoss Turbocor® heat pumps replace existing oil burners and chillers, while providing both the hospital and city's district heating network with highly efficient clean energy for heating and cooling

The energy source is waste heat from process cooling from hospital operations (MRI scanners, refrigeration, space cooling, etc.), which is more heat than is needed for the hospital itself

Surplus heat is fed into the district heating network – further extending the decarbonization impact to the local community (~ 1000 homes)

Energy reduction: 12,500 MWh/year











Waste Heat-to-District Heating

Wastewater-to-District Heating

Location: **Denmark** Sector: **District Heating** Waste heat from the city's wastewater treatment plant provides 34.000 MWh/year of heat to the district heating grid, heating ~ 2000 households

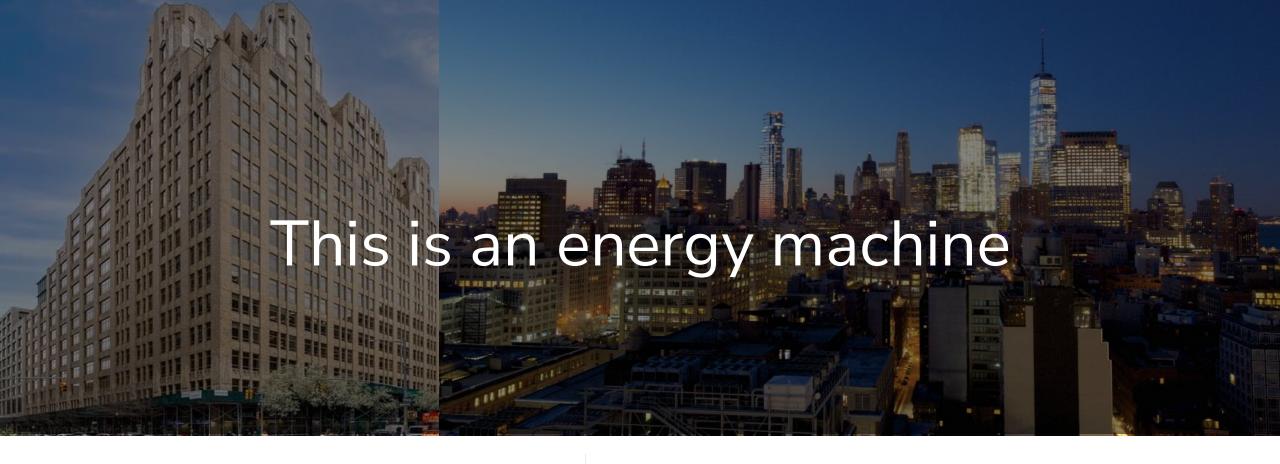
Energy-as-a-Service

Heating capacity: 4.5 MW

Purchased electricity to power the heat pump: 8400 MWh

Annual COP: 4.05





Waste Heat / Thermal Network

345 Hudson NY

Location: New York City, USA

Sector: Office

Building built: **1931** Floor area: **1M ft**² Winner of NYSERDA's Empire Building Challenge for low-carbon retrofits in NYC Historic high-rise office building

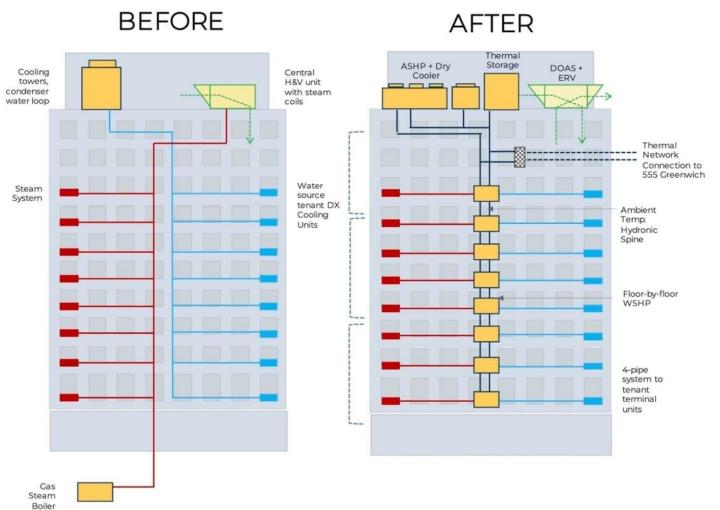
Heating and cooling are recycled throughout the 17-story building through a water-source heat pump thermal network

Heat pumps are placed on different floors

COP > 9

40% reduction in purchased energy (in the form of electricity) 90% reduction in CO2 by 2032

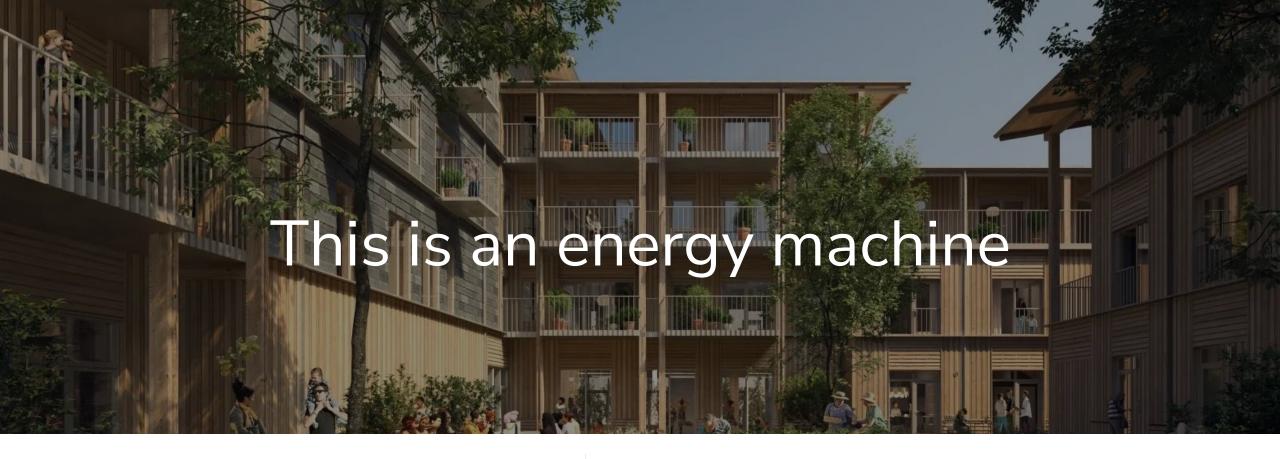












PTES – Pile Thermal Energy Storage

Home.Earth Nærheden

Location: **Hedehusene**, **Denmark**

Sector: Residential / Office

Building built: 2025 Floor area: 145,000 ft² PTES - Energy Pile Thermal Energy Storage system + PVT Solar for flagship residential/office property

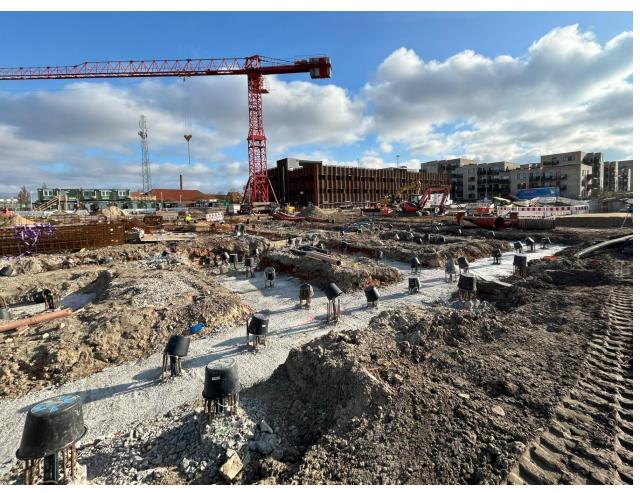
Heating delivery: 900 MWh (100% of demand)

Cooling delivery: 200 MWh (100% of demand)

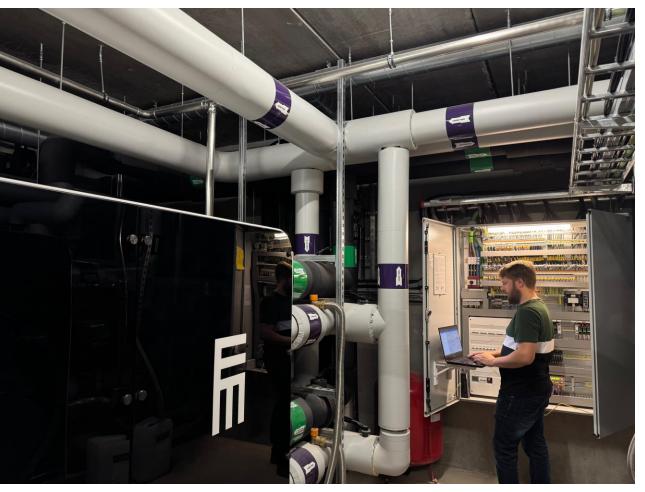
Set to achieve DGNB Gold and Planet

LCA footprint $< 4.7 \text{ kg CO2/m}^2/\text{year} - 60\%$ lower than Danish building requirements and the lowest ever recorded in a Danish multistory building

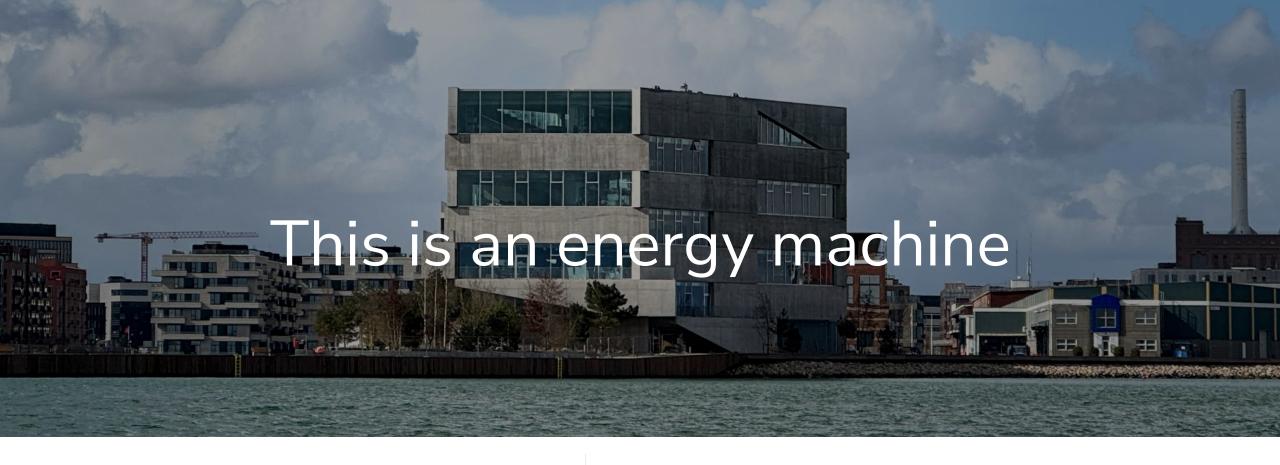












PTES – Pile Thermal Energy Storage

BIG – Bjarke Ingels Group HQ

Location: Copenhagen, Denmark

Sector: Office

Building built: 2023 Floor area: 50,000 ft² 222 energy piles x 14m depth

Heat pump made visible from building exterior to signal the property as

operating with green energy

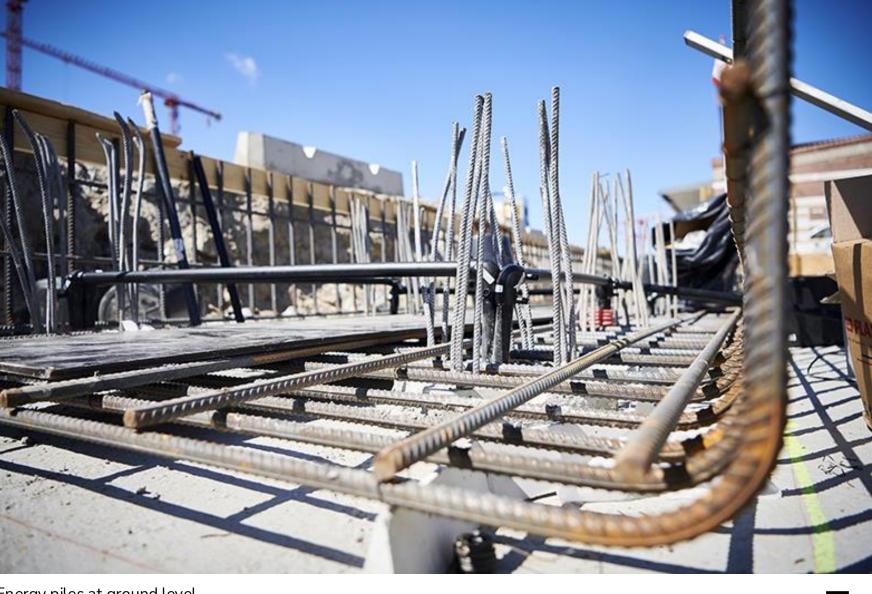
Heating capacity: 110 kW; Cooling capacity: 85 kW

Delivers 132 MWh/year heating and 60 MWh/year cooling

Set to achieve DGNB Gold (as required by the land seller)

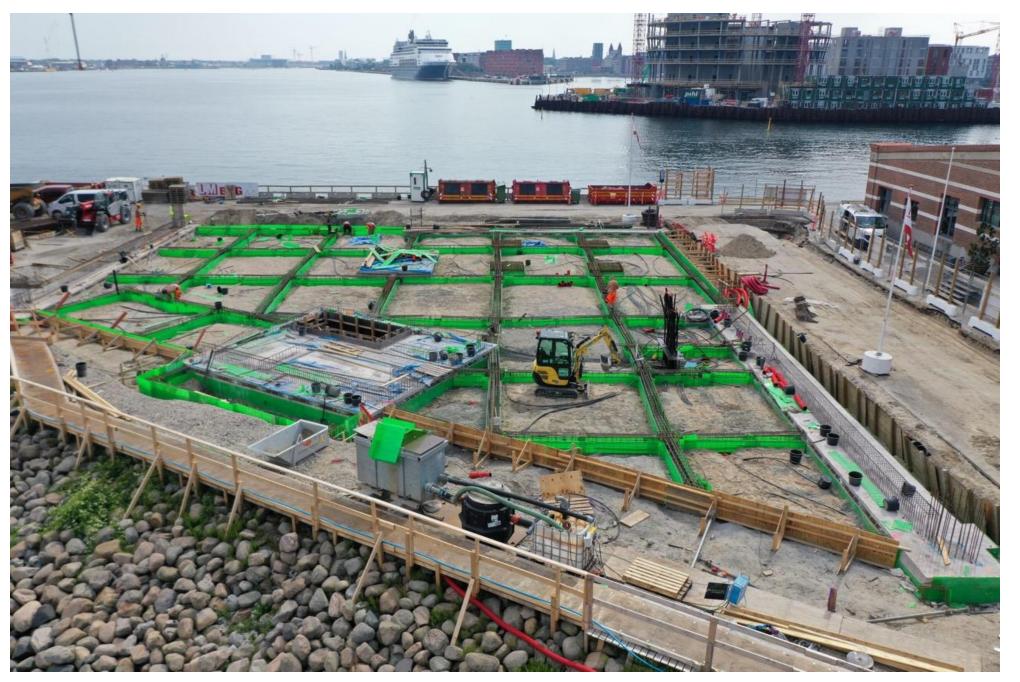






One energy pile (before connection)

Energy piles at ground level

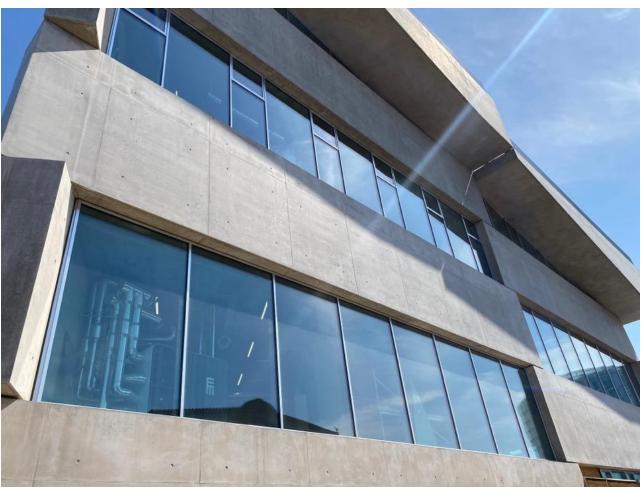


Pipe connection from energy piles to central pipe manifold





Pipe manifold; Each pipe represents 10 piles



Building exterior with Energy Machines $^{\text{TM}}$ heat pump

Energy Machines[™] heat pump

