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GEMS Conference 2024

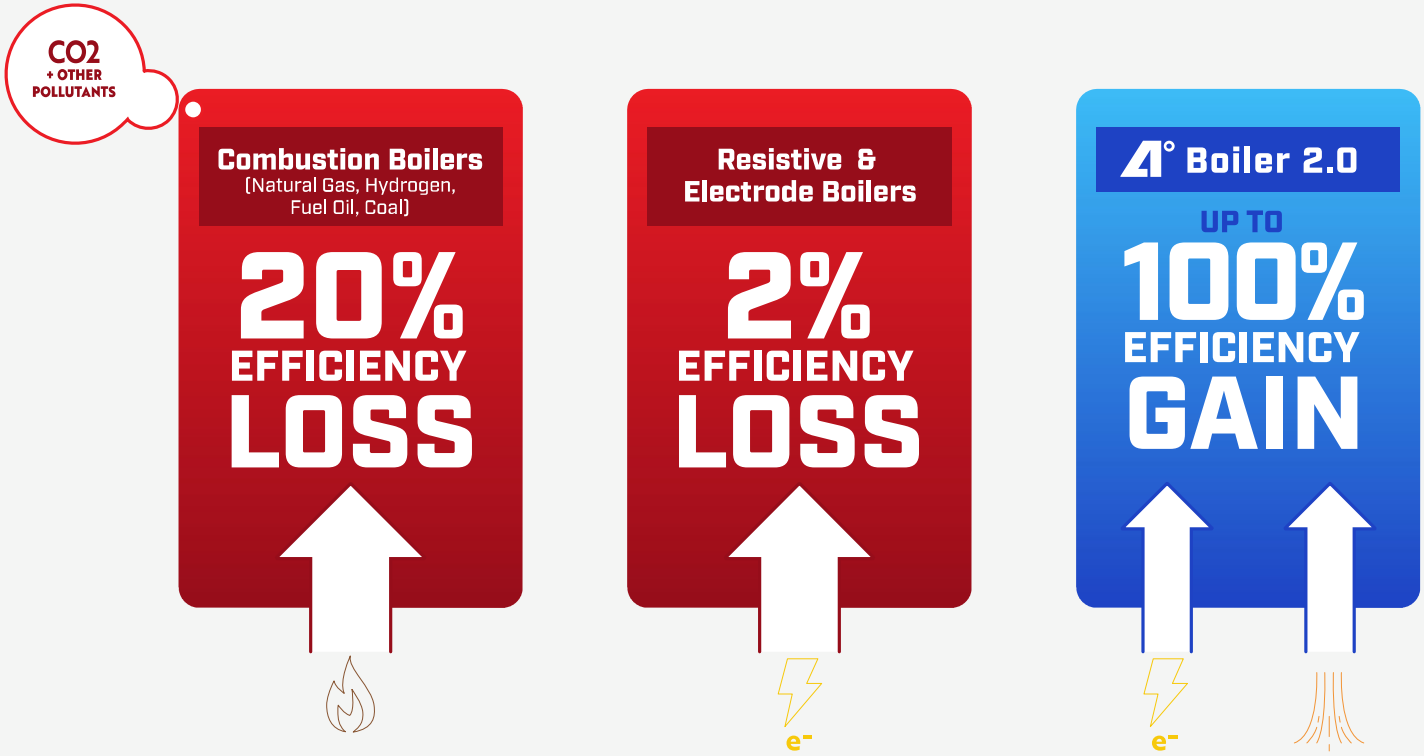
Delivering low-cost decarbonized steam for industry

AtmosZero replaces fossil-fueled industrial boilers with a drop-in electrified steam boiler with zero carbon emissions.

Eliminating Scope 1 boiler emissions on Day 1.

Redefining boiler room efficiency

2.0X more efficient than today's electric boilers and emissions free



The "Efficiency" Transition

Today, **Steam** accounts for:

50% of process heat used in industry

8% of global primary energy use

2.25 GT GHG emissions per year

There is a push for energy efficiency on unprecedented levels:

- "Compliance markets" are forming around the world, forcing energy efficiency in the name of Decarbonization
  - BERDO, LL97, ETS, Greenhouse Gas Pollution Pricing Act (GGPPA), Etc.
- Scopes 1 and 2 are in the focus: forcing energy reductions or new technologies to fill the energy gap.

However, the industry still needs Steam :

- Sterilization (105-135°C), Pasteurization (70-140°C), Brewing (100-160°C), Distillation (100-300°C), Drying (150-200°C), District energy (120-200°C), and more Industrial, Commercial and Residential uses.

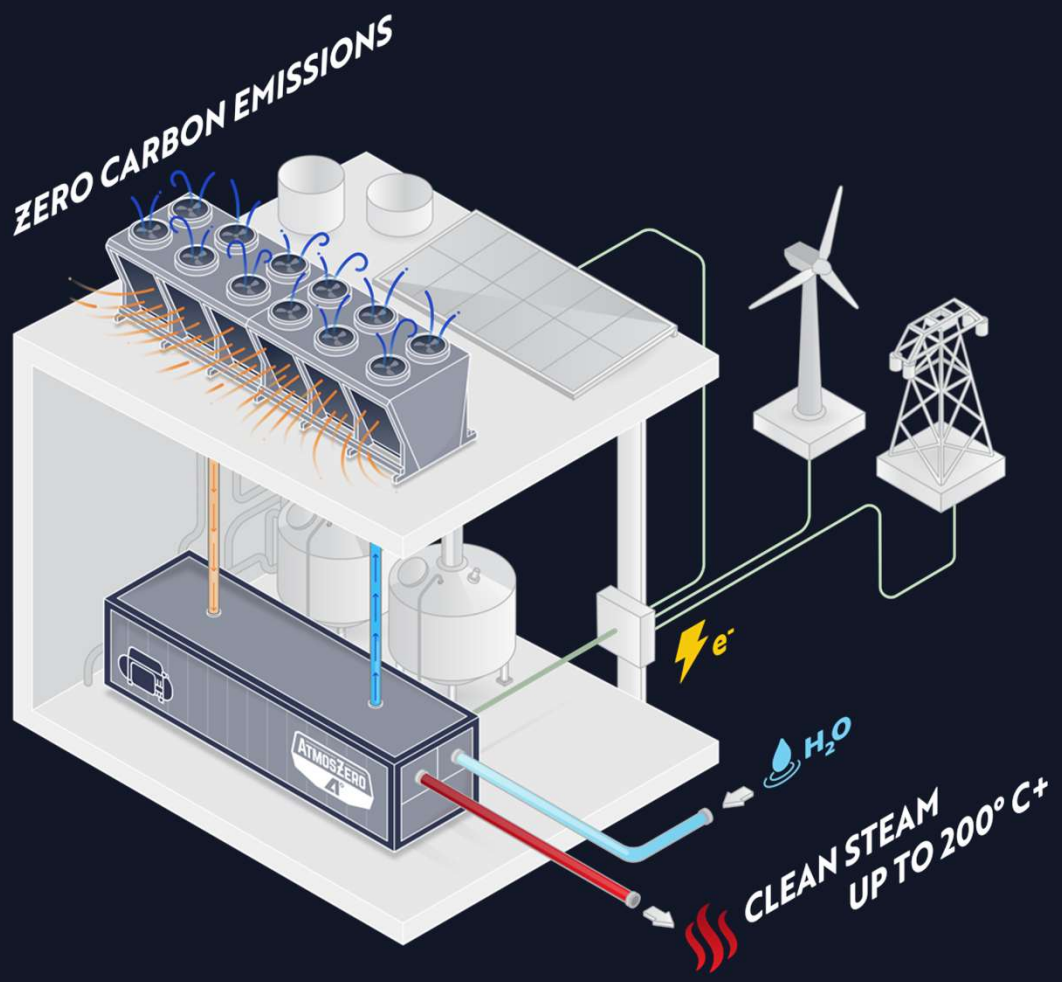
Low-temperature geothermal energy as a heat source for SGHPs could be a low-cost efficiency solution for many projects.

Introducing:

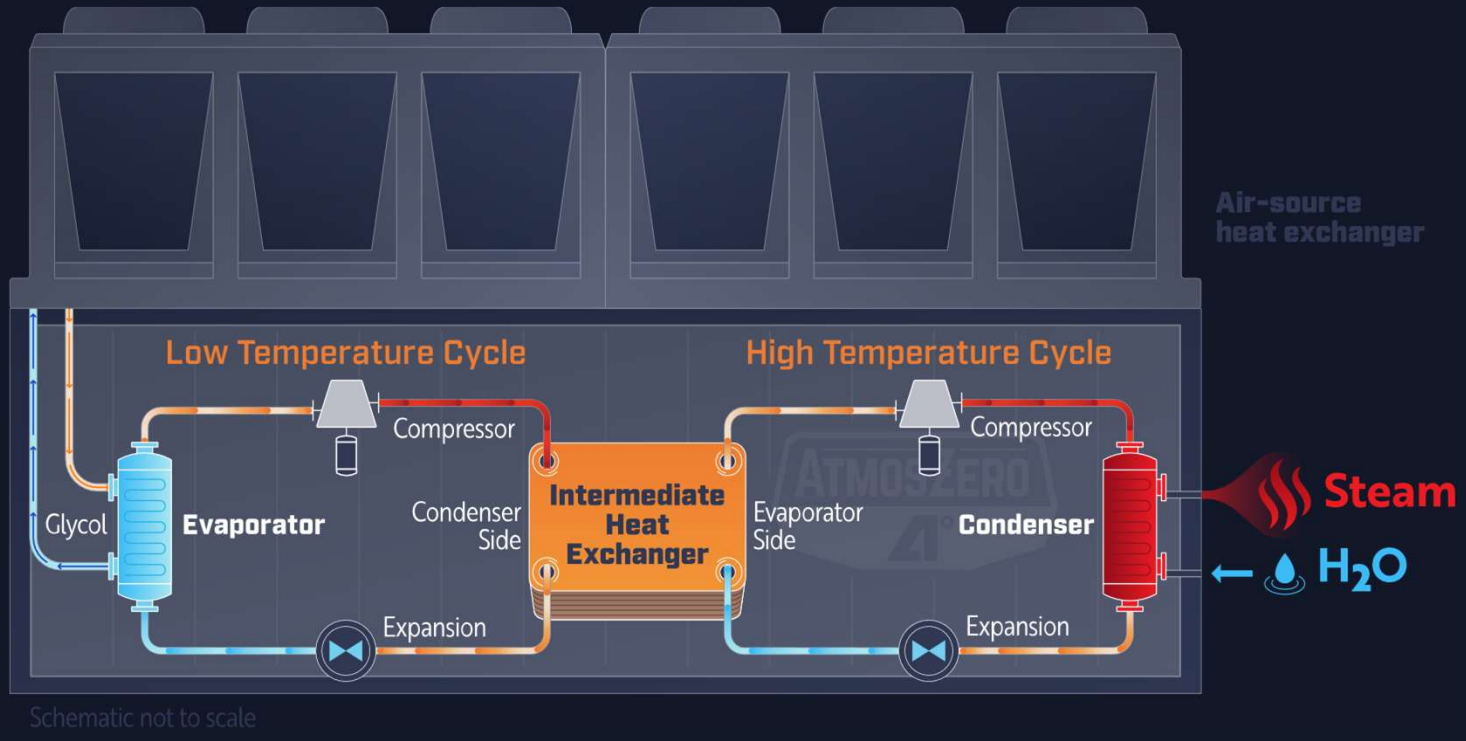
Boiler 2.0

- Modular Air-Sourced
- Steam Heat Pump
- No Waste Heat Required

Solves decarbonization barriers to adoption
- Operationally efficient
- Capital light



Boiler 2.0 Specifications



Nominal duty
650 kW thermal

Voltage; current
480 V 3-phase, 1000 Amp (FLA)

Output flow
Up to 2,200 lb/hr saturated steam

Output temperature/pressure
248 - 302 F°/ 30 - 70 psia

Heat source
Air or water

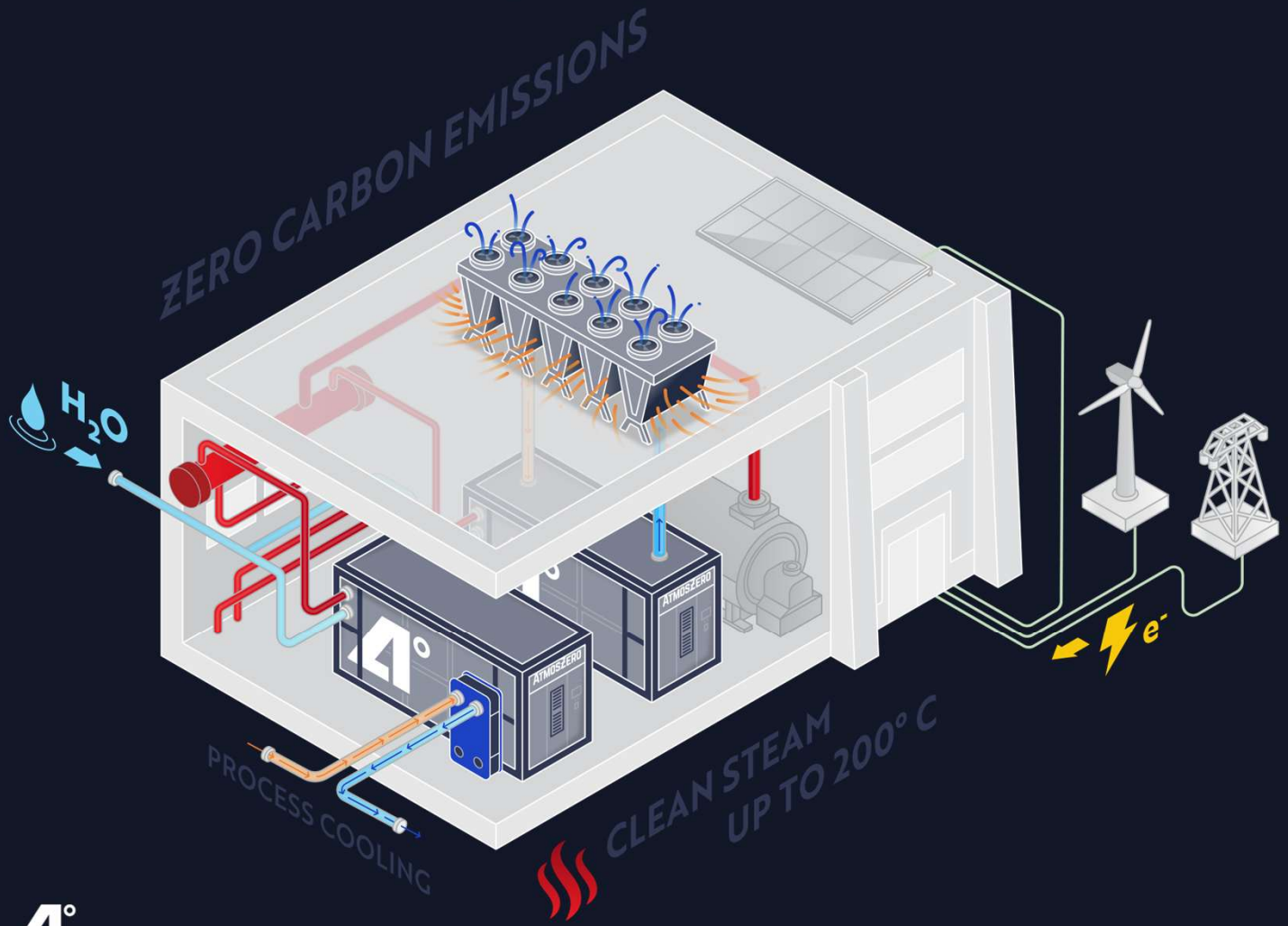
Inlet air temperature
-4°F to 104F

Footprint
8 x 20 feet

Refrigerant
Low GWP, low flammability, low toxicity

Noise
Sound pressure level 54 dB(A) at 10m

Boiler 2.0 Specifications



Nominal duty
650 kW thermal

Voltage; current
480 V 3-phase, 1000 Amp (FLA)

Output flow
Up to 2,200 lb/hr saturated steam

Output temperature/pressure
120 – 150 C / 2 - 4.8 bara

Heat source
Air or water

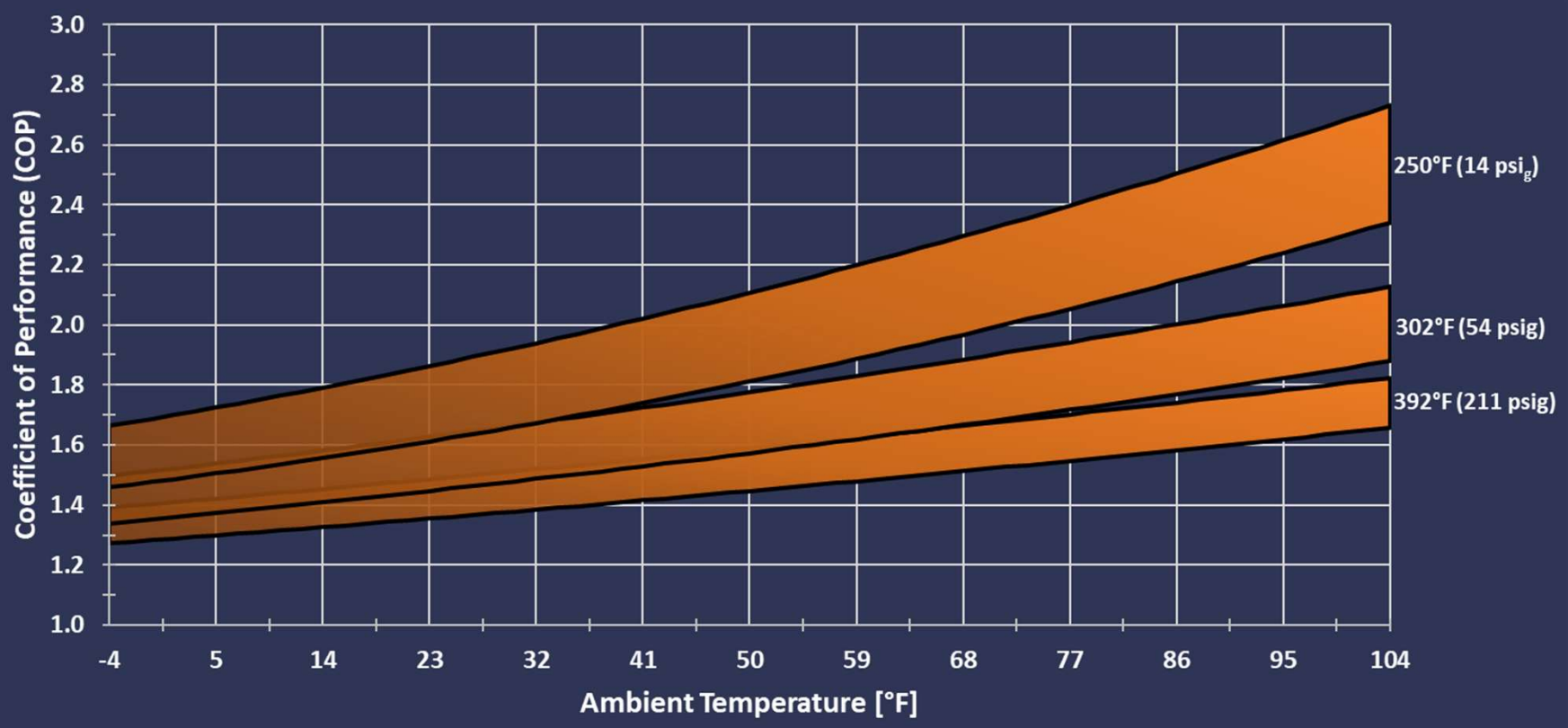
Inlet air temperature
-20 – 40C

Footprint
8 x 20 feet

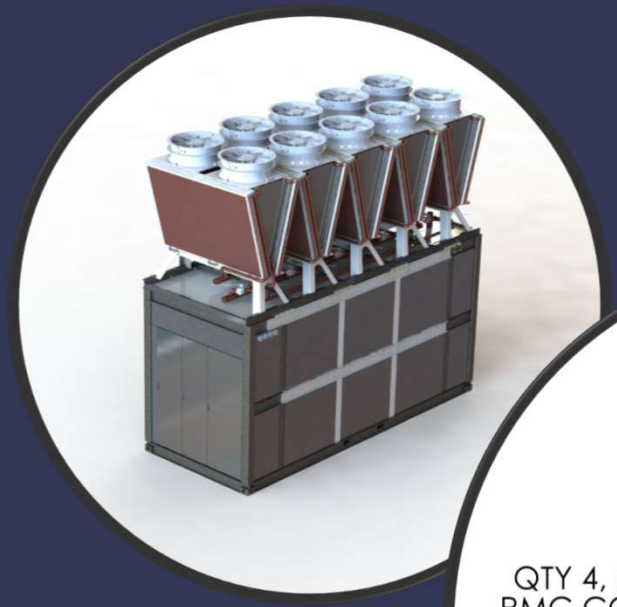
Refrigerant
Low GWP, low flammability, low toxicity

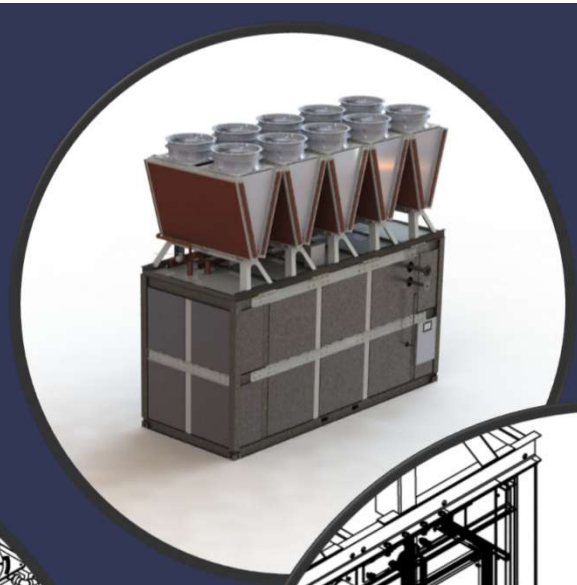
Noise
Sound pressure level 54 dB(A) at 10m

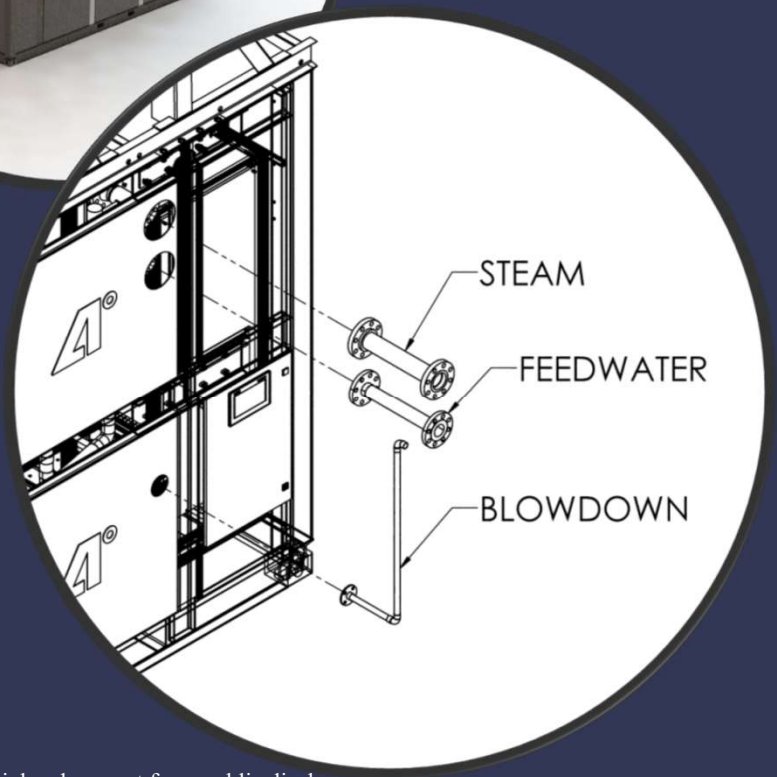
AtmosZero Air-Source to Steam Performance



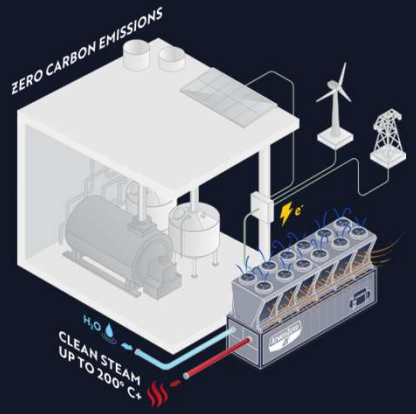
External Interfaces





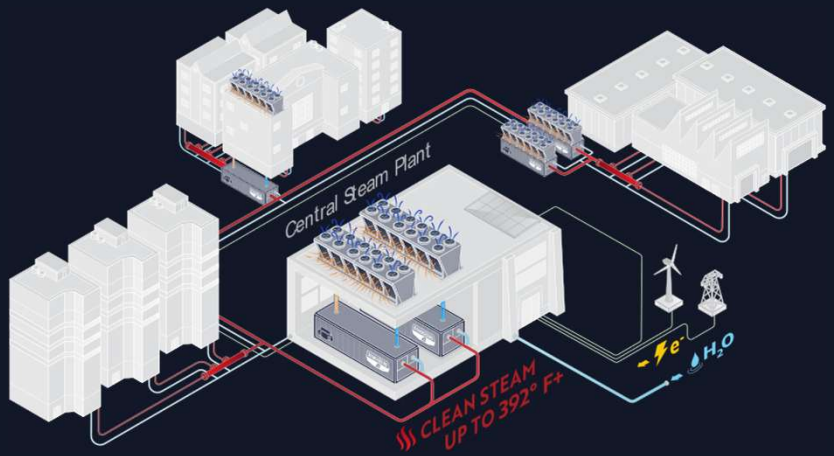


Boiler 2.0 Installation Options



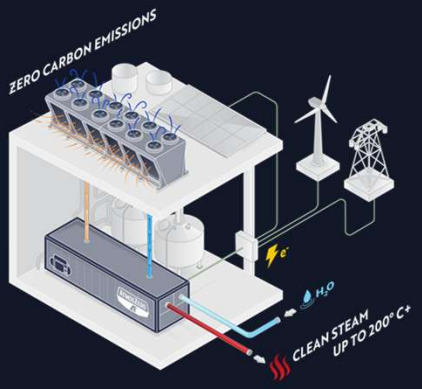
Outdoor Installation

Entire heat pump can be placed outdoors, with water & steam routed to/from the boiler room and steam headers.



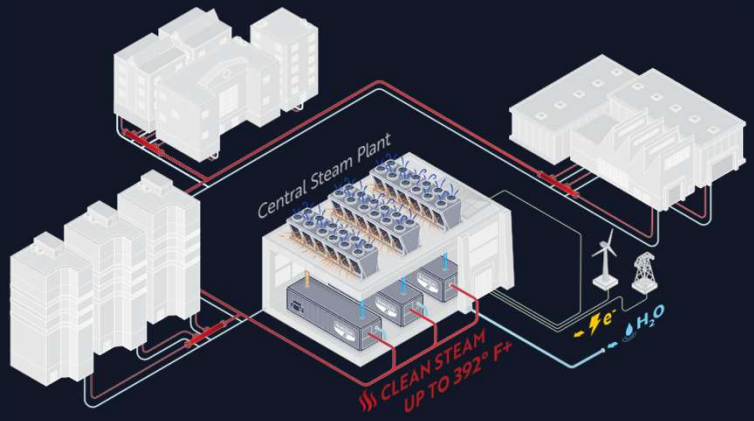
Distributed Steam Generation

The modular air-sourced heat pump can be deployed at various locations on-site, including at several different buildings on a campus.



Split Installation

Core heat pump can be placed indoors (e.g. in a boiler room or close to an end user) with air coils on a roof or other outdoor space. Glycol loop is used to couple the core heat pump and the air coils.



Central Steam Plant

The heat pump can be installed in a central steam plant, similar to how existing natural gas boilers operate today.

First Commercial Installation

PHASE 1 – The Pilot

Meet 1/3 of steam demand

- Replace one natural gas boiler in Fort Collins facility
- 165°C, 2200 lb/hour saturated steam
- In-field, in-revenue service. Q1’25.

Pilot

- NBB Pilot Location
- Preliminary Piping Routes (subject to minor change)
  - Electrical
  - Steam
  - Feedwater
  - Blowdown

Simple, emissions-free steam

Modular
Electrified boiler solution scales with you

Drop-in
Installs in days, delivers instant results

Flexible Heat Source
Reduces complexity, increases repeatability.

24-7
Consistent output for energy security and resilience

Boiler 2.0 is a product, not a project. Scalable for a global solution.

Driving the next industrial revolution

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