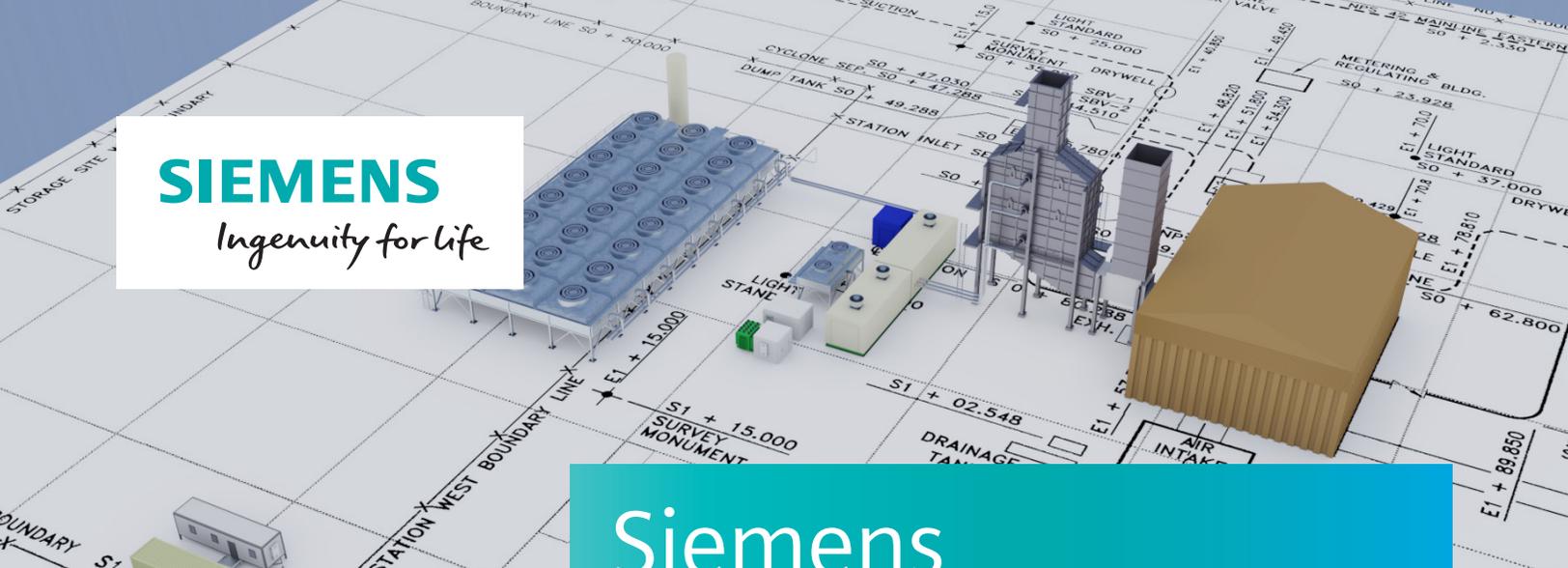




SIEMENS

Ingenuity for life



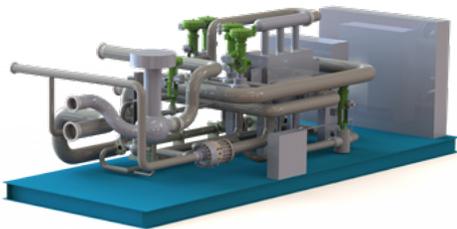
Siemens

Waste Heat to Power System

The Siemens Waste Heat to Power System is an advanced Rankine Cycle for usable [waste] heat recovery. Our patented technology, licensed under Echogen® Intellectual Property, operates over a broad range of heat sources to extract a significant amount of energy and convert it into higher value, usable power.

We use industrial-grade CO₂ as the working fluid, which allows our system to deliver reliable power from a more compact, flexible, and low-cost thermal engine. Power output can be optimized for a large range of heat sources depending on the application.

Our solution's economic, emission-free power will enable fuel-intensive operations to lower the cost of energy, meet higher environmental standards, and improve bottom-line performance.



ENVIRONMENTAL SOLUTION

Cleaner Fossil Fuels | Oil to Gas transition | Decarbonization

Benefits



Economic

Generates power at a competitive installed cost, reducing overall cost of electricity



Small Footprint

Single pressure; reduced tie-in points; compact, yielding a smaller skid-based system for ease of installation



Clean

Produces fuel-free, emission-free electricity to meet environmental regulations



Safe

Working fluid is environmentally benign, non-toxic and non-flammable



Air or Water-Cooled

No water required for operation



Low Maintenance

System is fully automated and designed to enable remote supervision



Technical Support

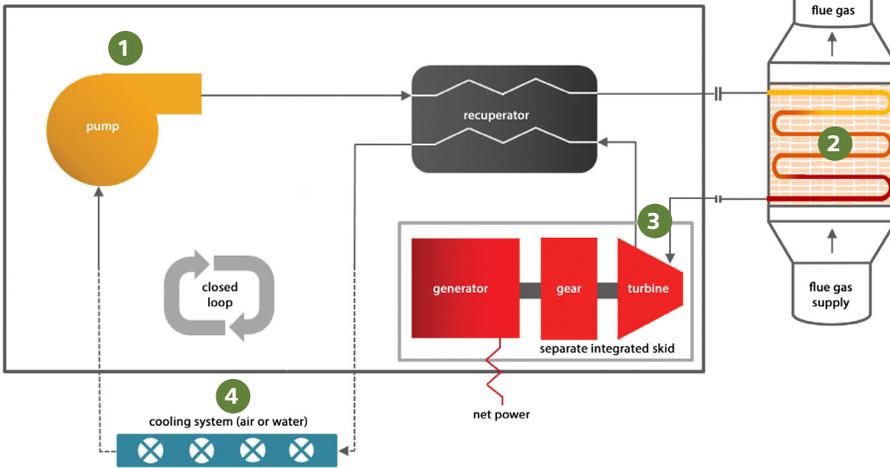
Global support available with Siemens service plans



Long Product Lifetime

High-quality manufacturing and non-corrosive fluids extend the integrity and life of system components

CO₂ Heat Recovery Cycle



1. CO₂ is pumped while heat is transferred
2. CO₂ moves to the supercritical region where it behaves more like a gas while maintaining a high density as liquids
3. CO₂ is expanded in a turbine driving a generator in turn generating electricity
4. The low pressure CO₂ is cooled down returning it to its original state (stage 1)

Component Design

Generator	4 pole, Brushless synchronous, 13.8 kV*
Turbomachinery	CO ₂ pump and turbo-expander
Diverter Valve Option	Fully actuated operation, Flow modulation

* Additional voltage and frequency specifications available

Electrical Output

Generator Output**	9 MWe (nominal)
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**Gross power

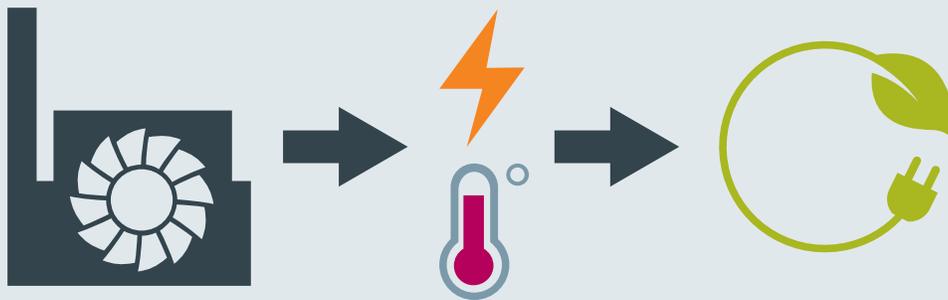
System

Working Fluid	CO ₂ , industrial-grade
Controls	PLC based
Remote Monitoring	LAN/WAN
Operation	Designed for remote control
Package	Skid-based

Reference Conditions

Ambient Temperature (ISO)	15 °C	59 °F
Humidity (ISO)	60 %	60 %
Waste Heat Supply Temperature	532 °C	990 °F
Waste Heat Flow Rate	68 kg/s	540,644 lb/hr
Waste Heat Input	33,000 kW	114 MMBTU/h

Convert waste heat into emissions-free power; improve plant efficiency and generate carbon offsets.



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Siemens Energy, Inc.
Houston, TX 77079 USA
Tel: (Int'l +1) 281-509-8000

For more information, please contact
our Customer Support Center.
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
(Charges depending on provider)
E-mail: support.energy@siemens.com

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