

Echogen has developed a platform sCO<sub>2</sub>\* technology to reduce industrial CO<sub>2</sub> emissions and enable the transition to 100% renewable energy

### Waste Heat Recovery and primary cycle

Skid based solution to utilize high temperature waste heat to produce electricity or mechanical drive. Ideal for cement, steel, powergen applications as a replacement to the HRSG

### Industrial Heating

High efficiency heat pump technology to electrify low and medium temperature industrial applications

### Long Duration Energy Storage

Pumped thermal energy storage (PTES) to enable baseloading renewable energy resources at the Utility scale

\*sCO<sub>2</sub> – Supercritical CO<sub>2</sub>



8 MW EPS100 Waste Heat Recovery System

# Our Solution: **ECHOGEN** Pumped Thermal Energy

## Cost-Effective

**~65%** LCOS compared to li-ion batteries

Low-cost materials for storage media

## Ultra Long-Life

Targeting **60** years of life lifespan with unlimited cycles

No performance degradation

## Safe & Sustainable

**100%** non-toxic with no hazardous materials

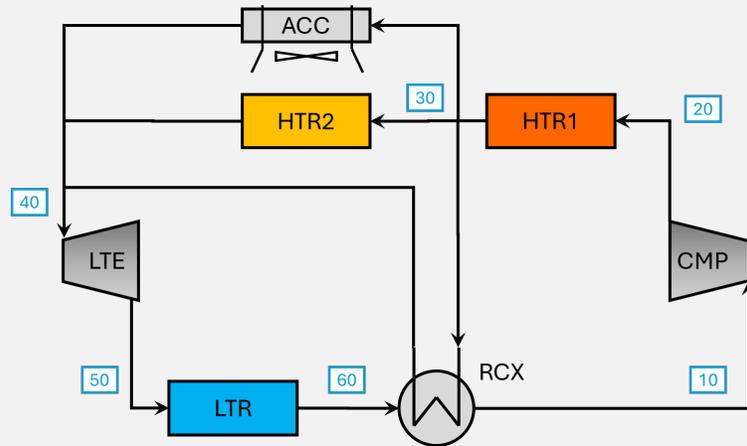
Fully recyclable at end of life.

**License Partner: Westinghouse Electric Company**

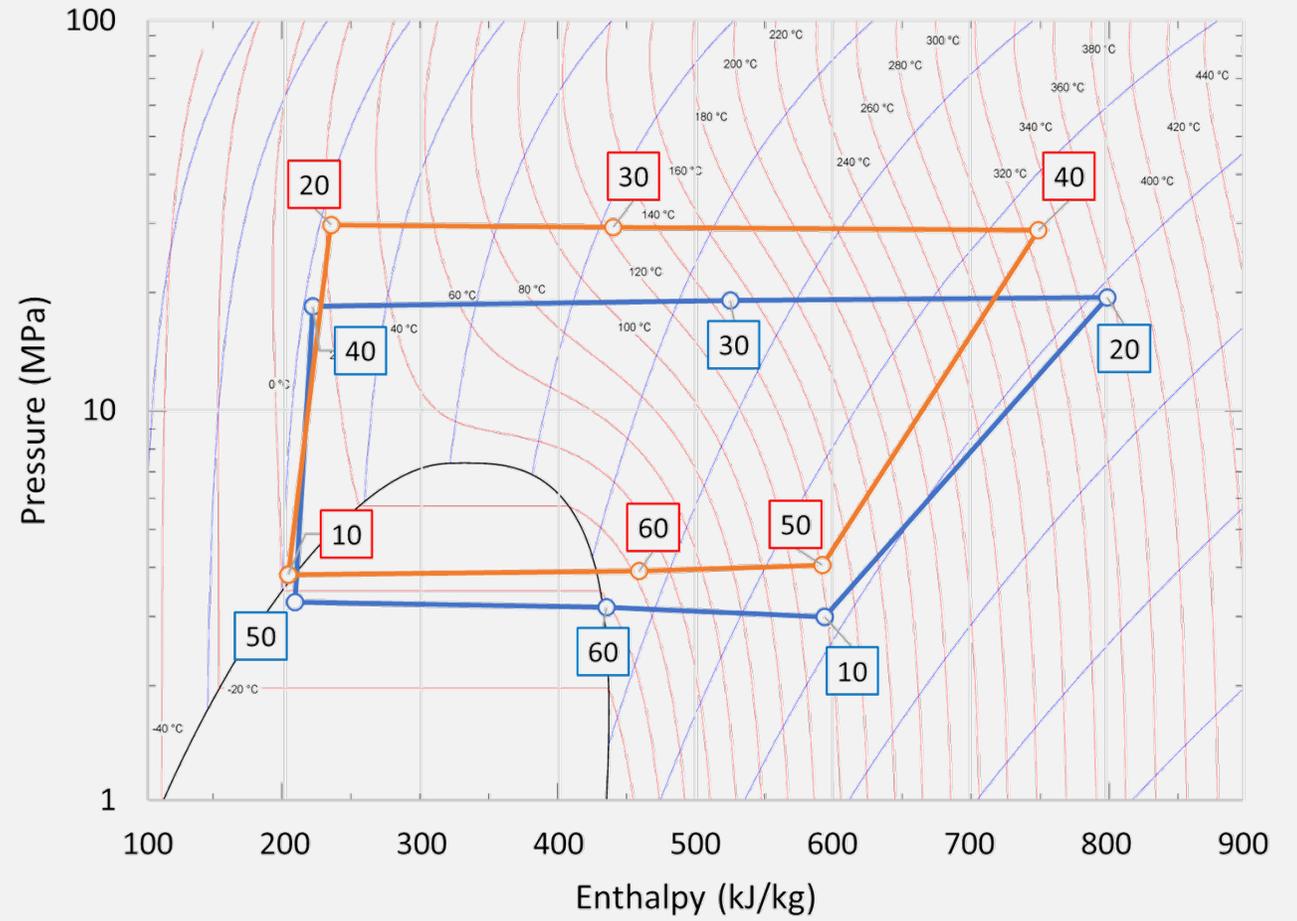
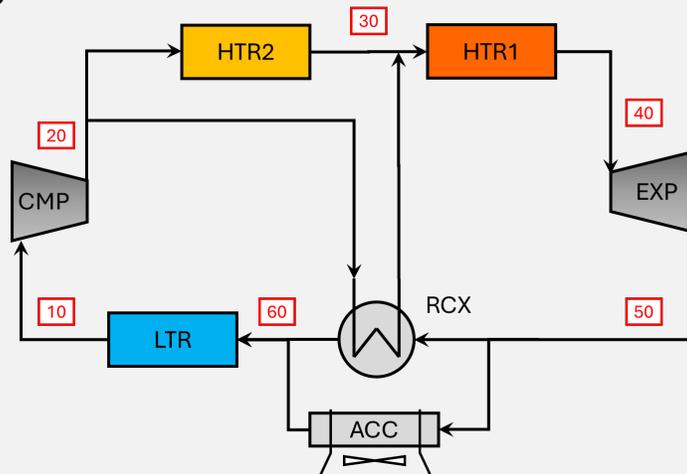
# Pumped Thermal Energy Storage basics



Charging



Generating



# Combining Innovation and Proven Technology



## Systems

### Generation

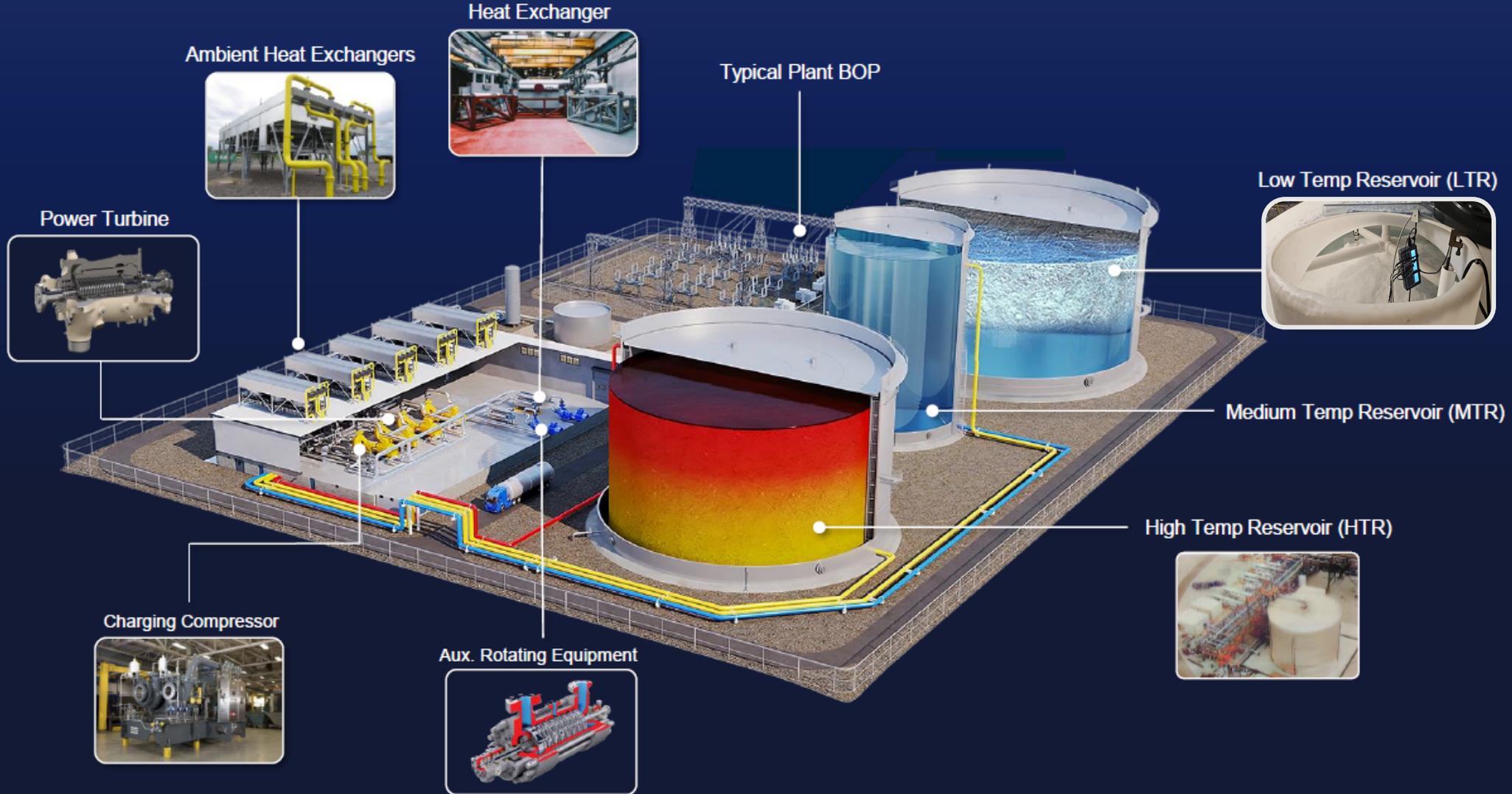


The EPS100 is a commercially available generating system with over 330 hours of operation

### Heat Pump



Large pilot scale system used to validate models



Heat Exchanger



Ambient Heat Exchangers



Typical Plant BOP

Power Turbine



Low Temp Reservoir (LTR)



Medium Temp Reservoir (MTR)

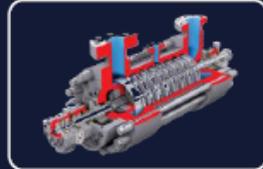
High Temp Reservoir (HTR)



Charging Compressor

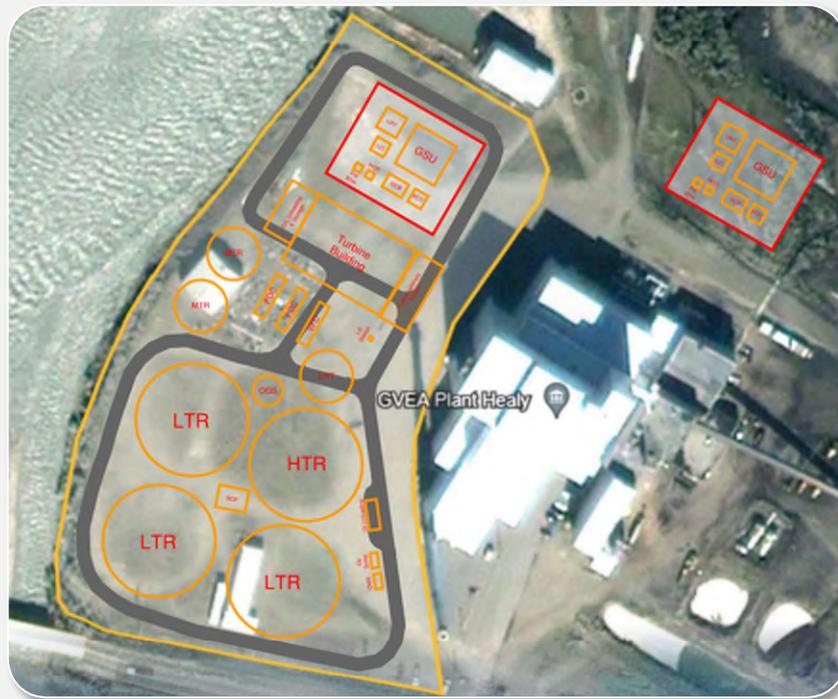


Aux. Rotating Equipment





# POLAR Project in Healy, AK - One of the largest planned installations of long-duration energy storage in the United States



- Prime recipient: Westinghouse Electric Company
- US DOE awards project to deploy 50MW, 24-hour (1.2 GWh) long-duration energy storage
- Bolsters energy security for the region
- Mitigates transmission system limitations, balances load
- Enables future integration of renewable energy
- Air quality and electricity pricing benefits to community
- Leverages existing utility staff skillsets



# International PTES Deployment



## Vodohospodárska Výstavba (VVB)

- MOU signed in Washington, D.C. in 2025
- Feasibility study and use case analysis completed
- Use case to store and utilize significant unused hydroelectric power → 200MW PTES system
- Expected COD 2030

## Africa

- Late-stage discussions to deploy first PTES project in Africa
- Expected 50MW PTES system with COD 2030



**Typical Project Timeline**

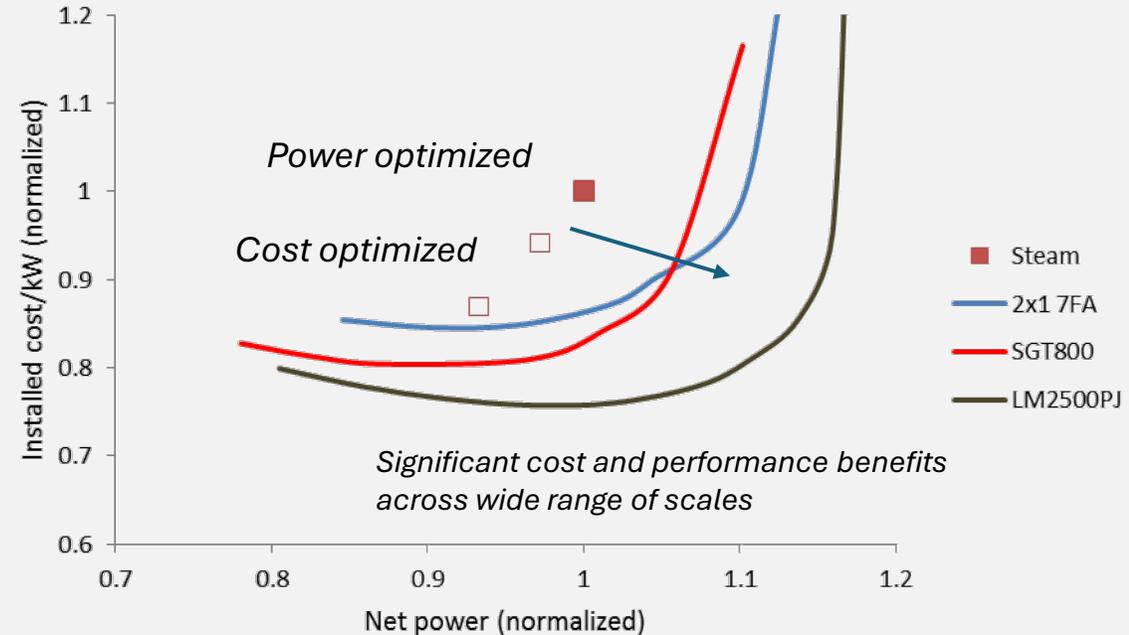
Year 1				Year 2				Year 3			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<i>Feed</i>											
		<i>Detailed Design</i>									
				<i>Procurement &amp; Construction</i>							
								<i>Commissioning</i> ★			
										<i>Delivery</i> ★	

# CCGT and WHR development and commercialization



EPS100 during factory test

Held, T. J., 2015, "Supercritical CO<sub>2</sub> Cycles for Gas Turbine Combined Cycle Power Plants," Power Gen International, Las Vegas, NV.

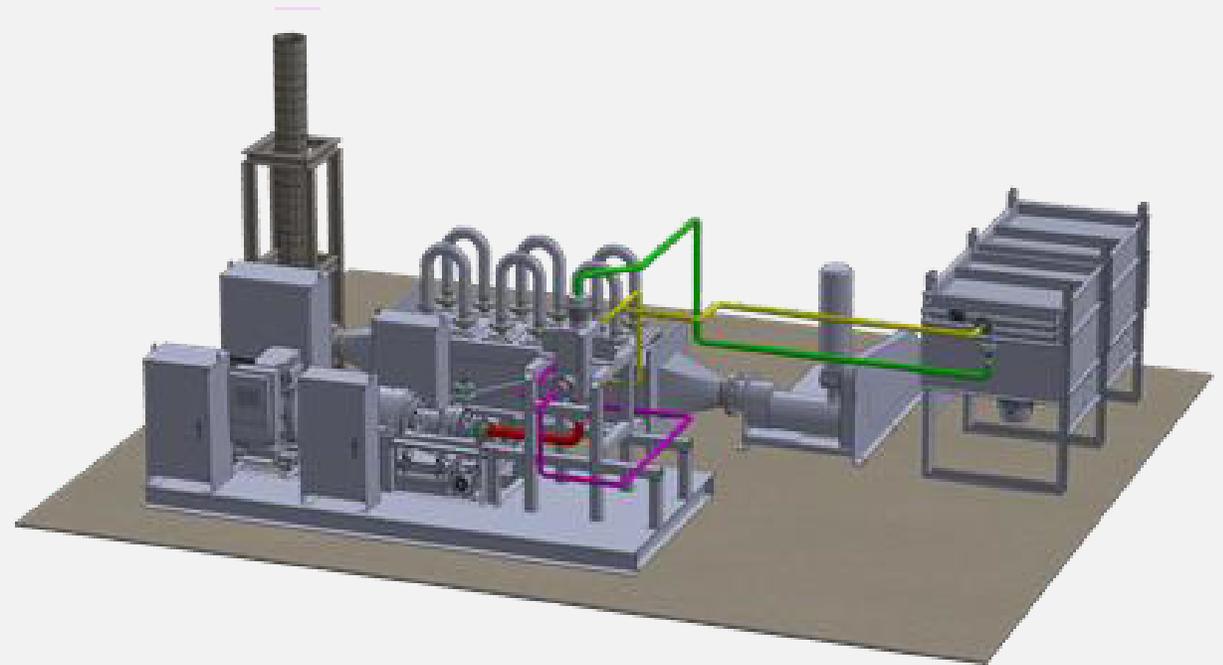


- Large increase in interest for advanced nuclear cycles as well



# High temperature sCO<sub>2</sub> heat pump

- 500 kW, 300°C air-source heat pump pilot project awarded by DOE/IEDO last year
- Awaiting DOE project approvals
- Commercialization discussions in process with food/beverage potential customers





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