



SynchroStor

Update on Novel Compressor/Expander Technology for Energy Storage and Industrial Decarbonization

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Lead Mechanical Engineer



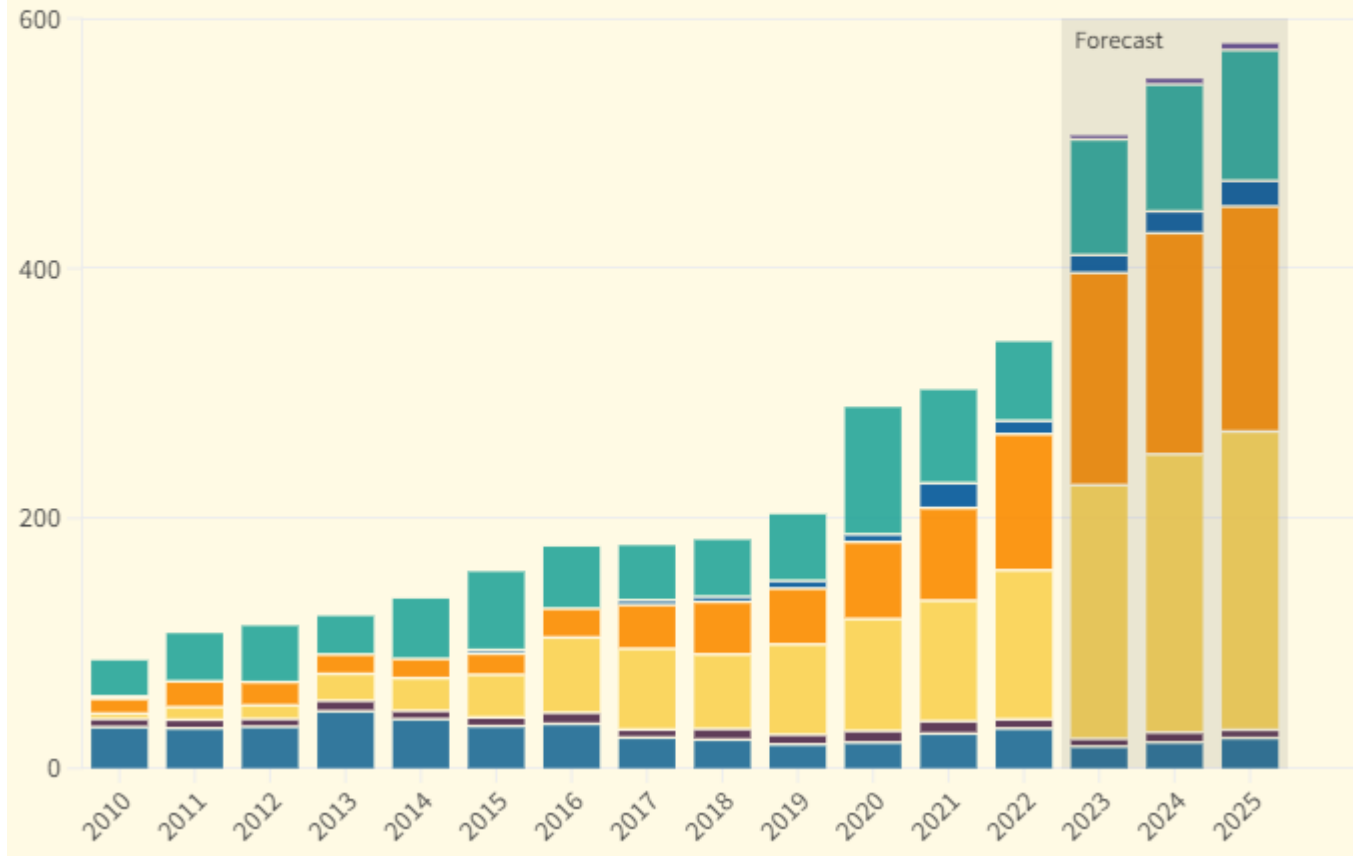
- Company founded in 2017 as a spinout from the University of Edinburgh to develop **PTES** hardware
- Currently working on a \$12million contract funded by the UK government to build a 1MW – 10MWh technology demonstrator
- 26 employees + 10 contractors. Small but agile R&D team, with all test and prototyping facilities onsite



The world built more clean energy last year than ever before

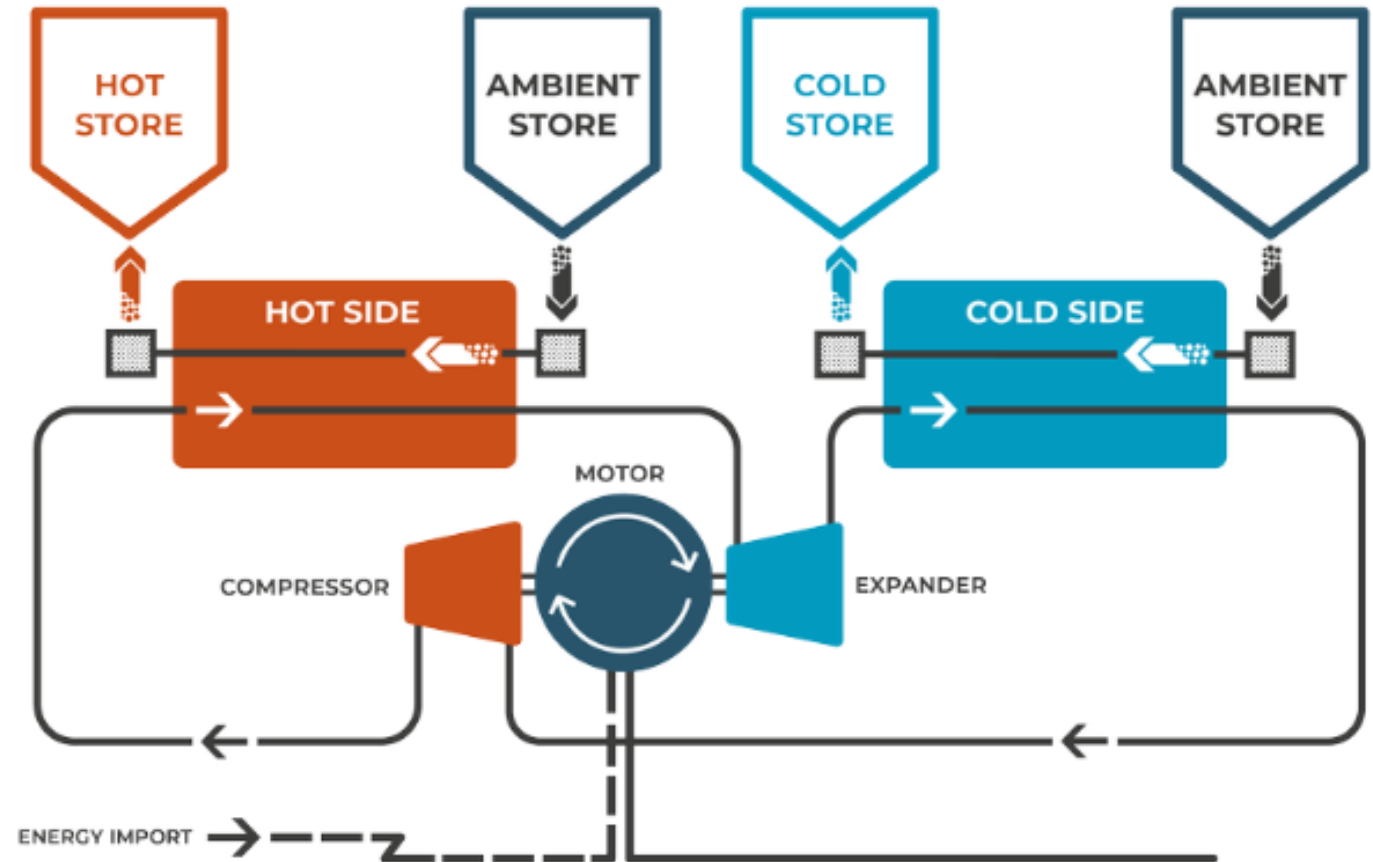
Global annual net capacity additions by technology, in gigawatts

Hydro Bioenergy Utility-scale solar PV Distributed solar PV Offshore wind Onshore wind
Renewables dedicated to H2 production



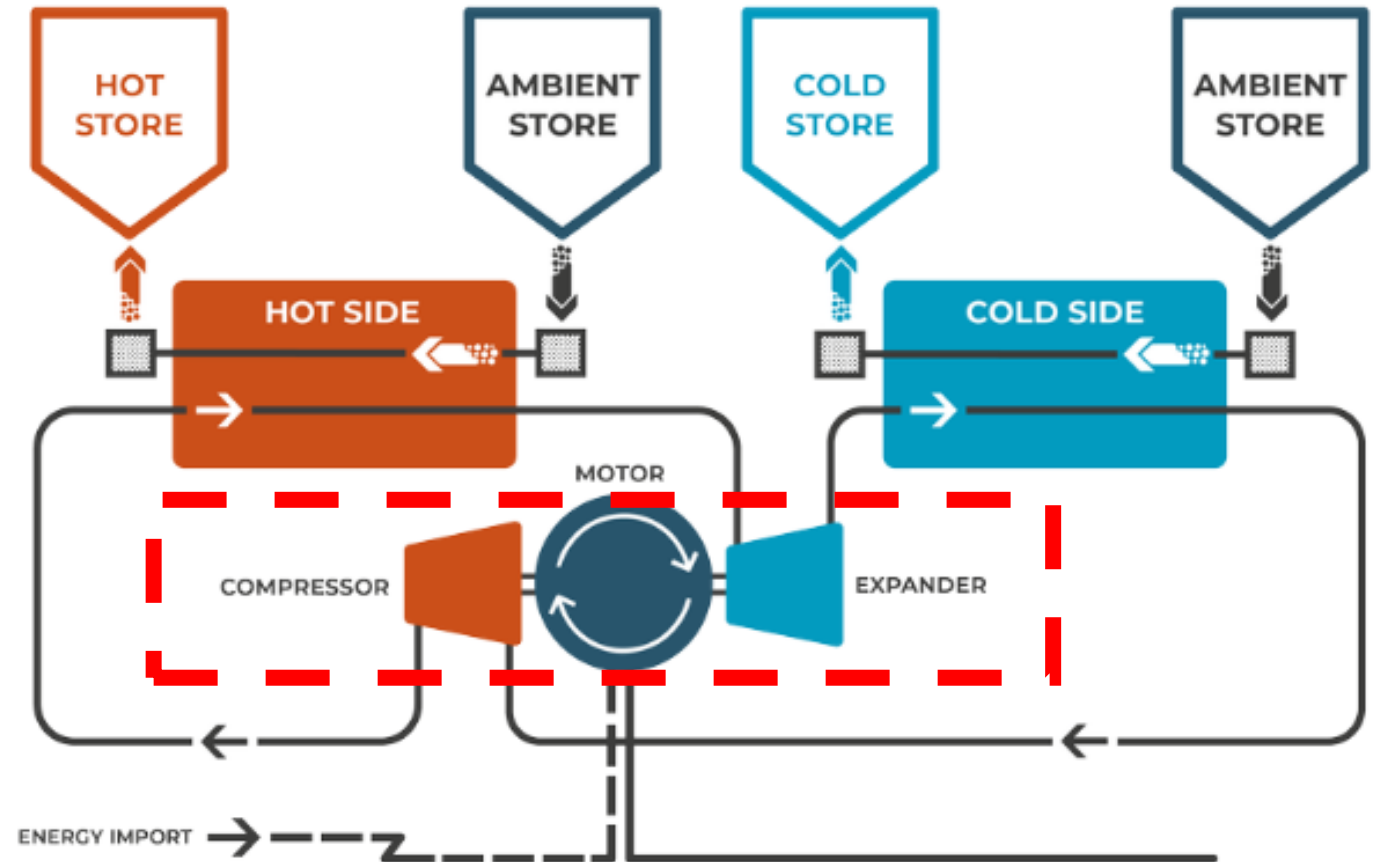
How does Synchrostor propose to do this:

- 1) Scalable from one -> tens of MW**
- 2) Decoupled power and storage**
- 3) Power dense, efficient, versatile and modular power plant**



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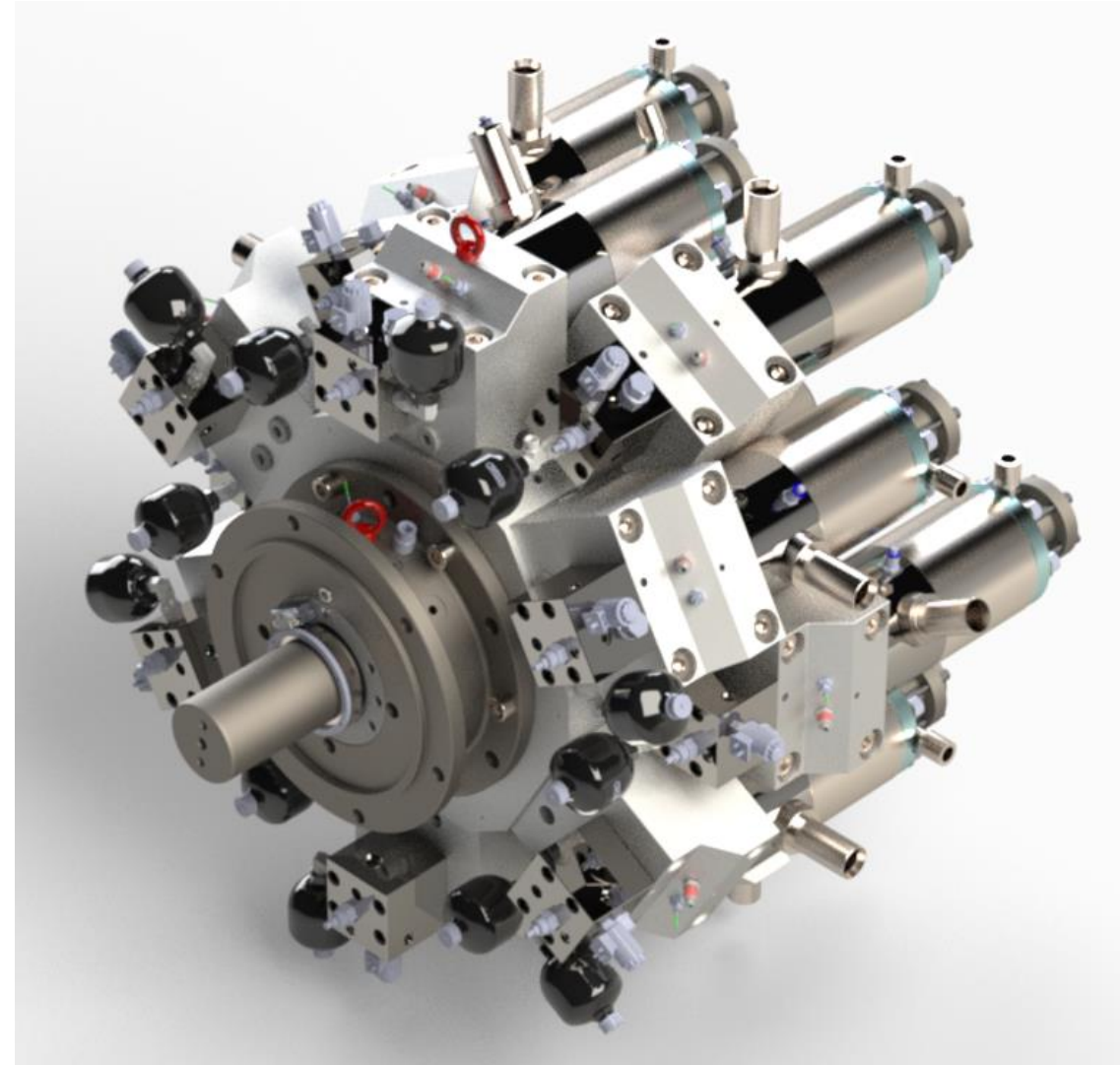


Power Density
Efficiency
Versatility
Modularity

“Supercharged System”

- High mass flowrate in small package
- High pressure ratio (single stage Pr 10) and temperature lift (process dependent down to -150°C on the cold side and up to $+450^{\circ}\text{C}$ on the hot side)

**Process dependent up to 1.5MWth in
a single 12 cylinder unit.**



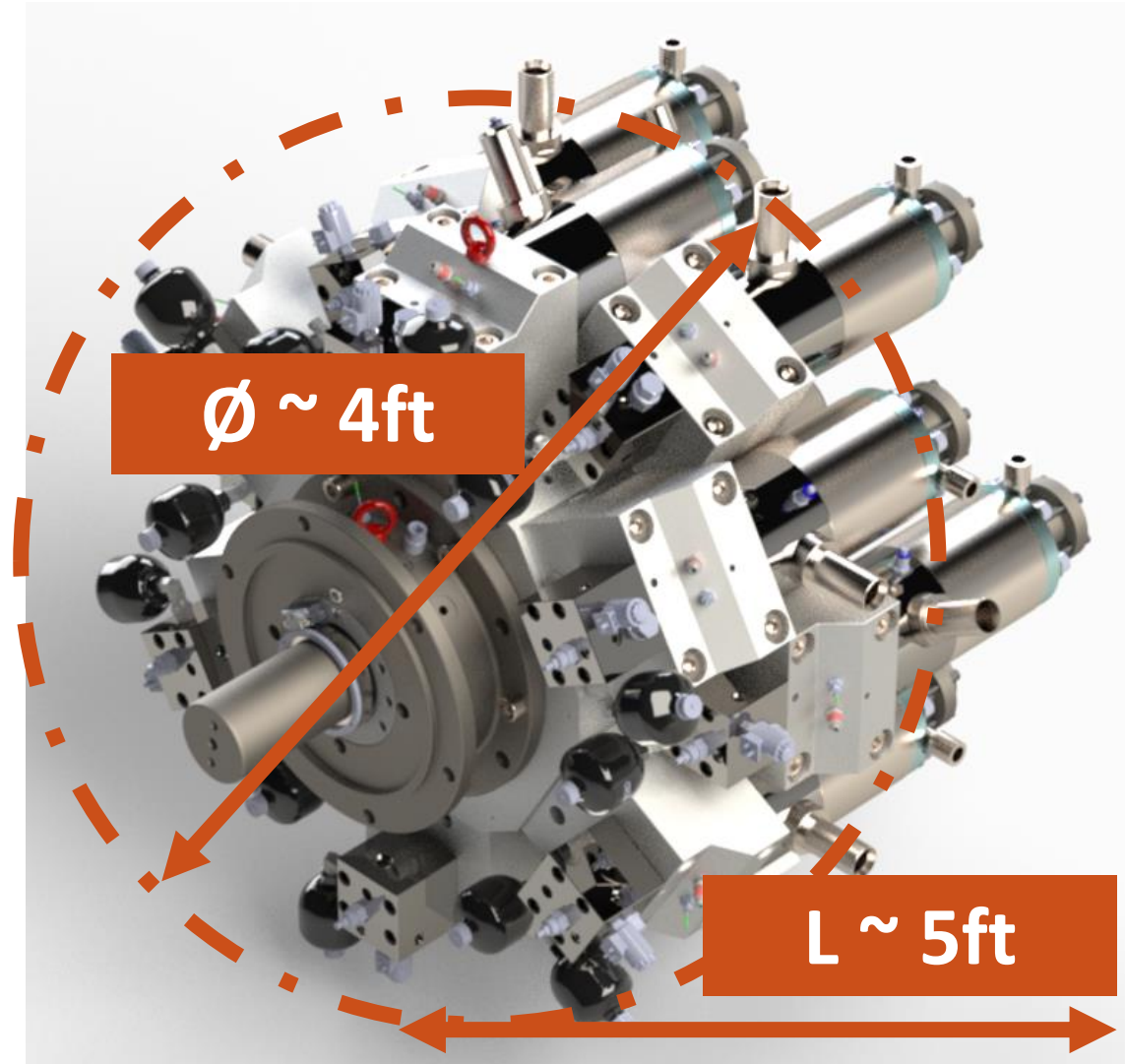
12 Cylinder Compressor/Expander

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12 Cylinder Compressor/Expander

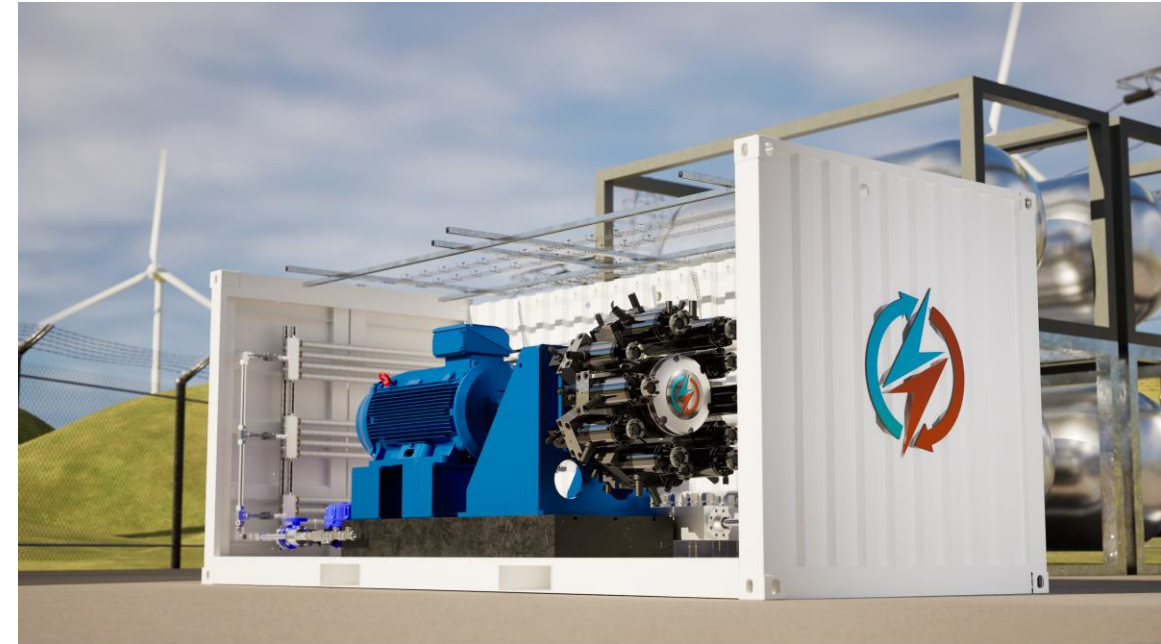
Power Density
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Direct Active Valve Control

- Compression or expansion in a single machine
- Wide range of operating conditions
- Active displacement or pressure control
- Fast switching (Each cylinder can switch between operating modes in 1 shaft revolution ~ 60ms @ 1000RPM)

High Efficiency

- High isentropic efficiency (85%+)
- High mechanical efficiency (95%+)
- Low parasitic losses at part load



Containerized Compressor/Expander

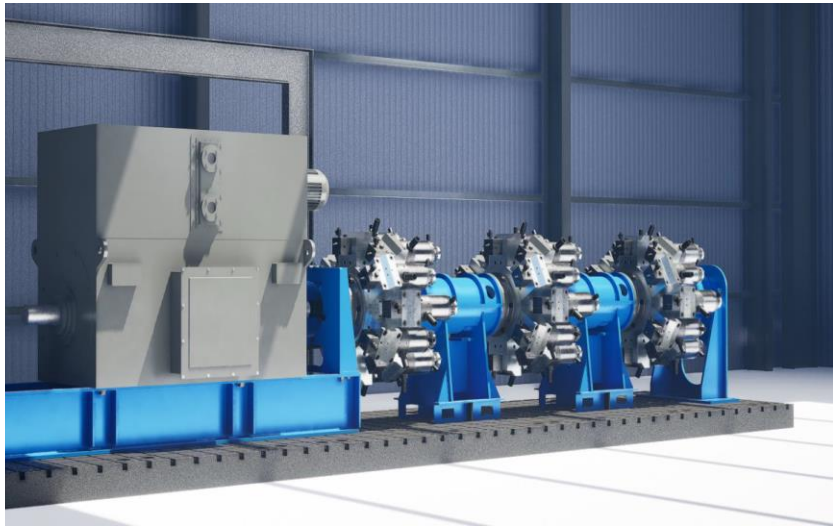
Flexible - single unit with efficient operation at any power level

Power Density
Efficiency
Versatility
Modularity

Fundamentally modular and scalable

Ground up scalable design

- Multicylinder approach truly enables economies of scale
- Machines can be stacked for higher power



Stacked Compressor/Expanders on single shaft



Compressor/Expander powerpack in 40 ft shipping container

2MWe - 20MWh storage plant

Digital Compressor/Expander – Test Performance

Compression



PR 10+

Expansion



Maximum Pressure



180 Bar

Maximum Temperature



440°C

Isentropic Eff



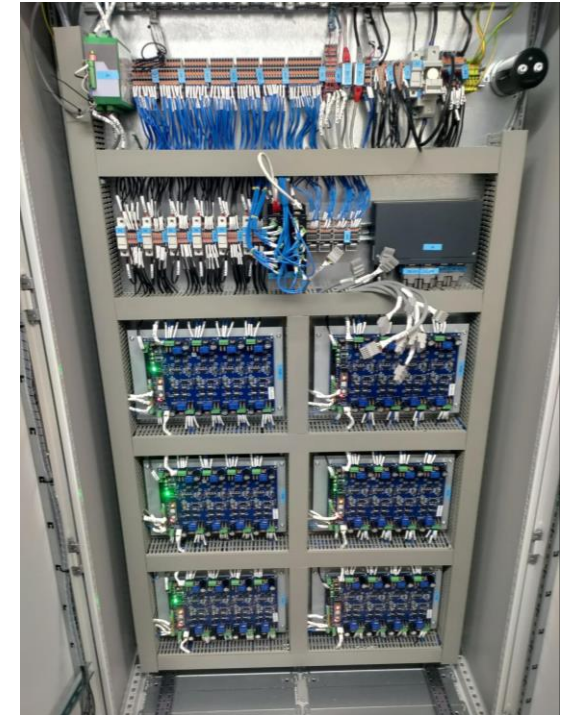
80%+



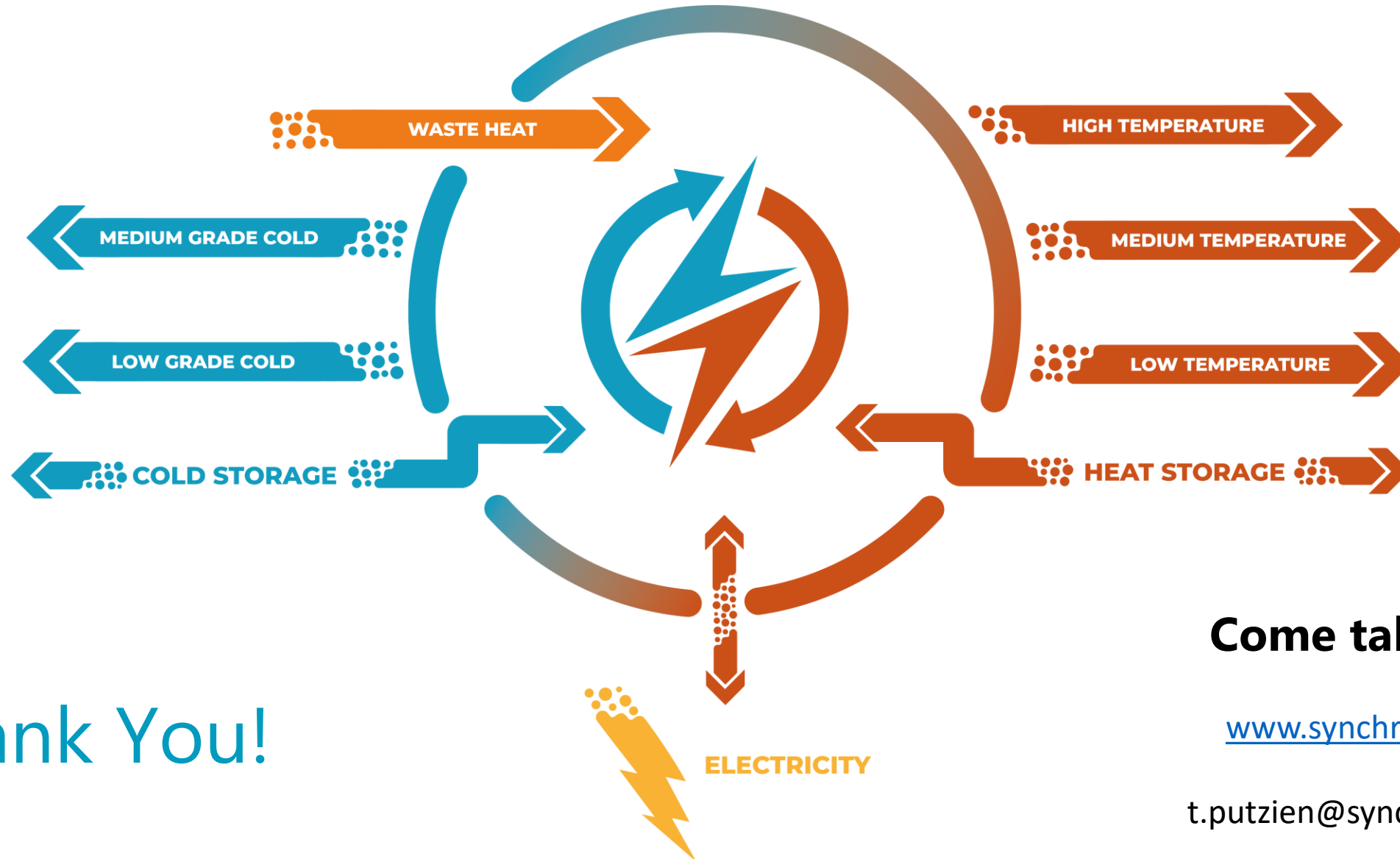
Prototype test rig ~60kWe
Running for ~1 year



Multicylinder rig
~300kWe
In commission



Compressor/Expander
controller



Thank You!

Come talk to me

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