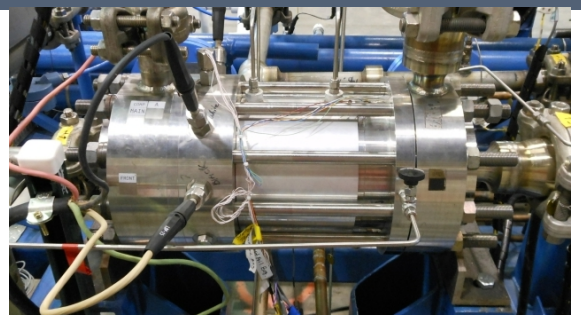
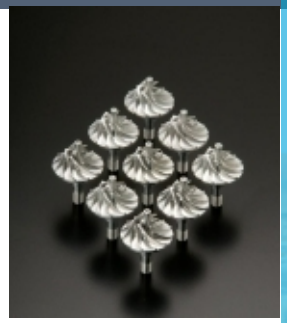
SAND2022-1914C

Sandia National Laboratories
From laboratory to large-scale sCO2 Brayton cycle development

Logan Rapp

Sandia National Laboratories

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sCO2 research at Sandia National Laboratories

Brayton Laboratory

National Solar Thermal Test Facility (NSTFF)

Current work at the Brayton Laboratory

Turbomachinery Testing

- 1MWe scale turbocompressor
- Retrofitting ~125kW TACs with “off-the-shelf” motor controllers
- Investigating RCBC control/operation strategies

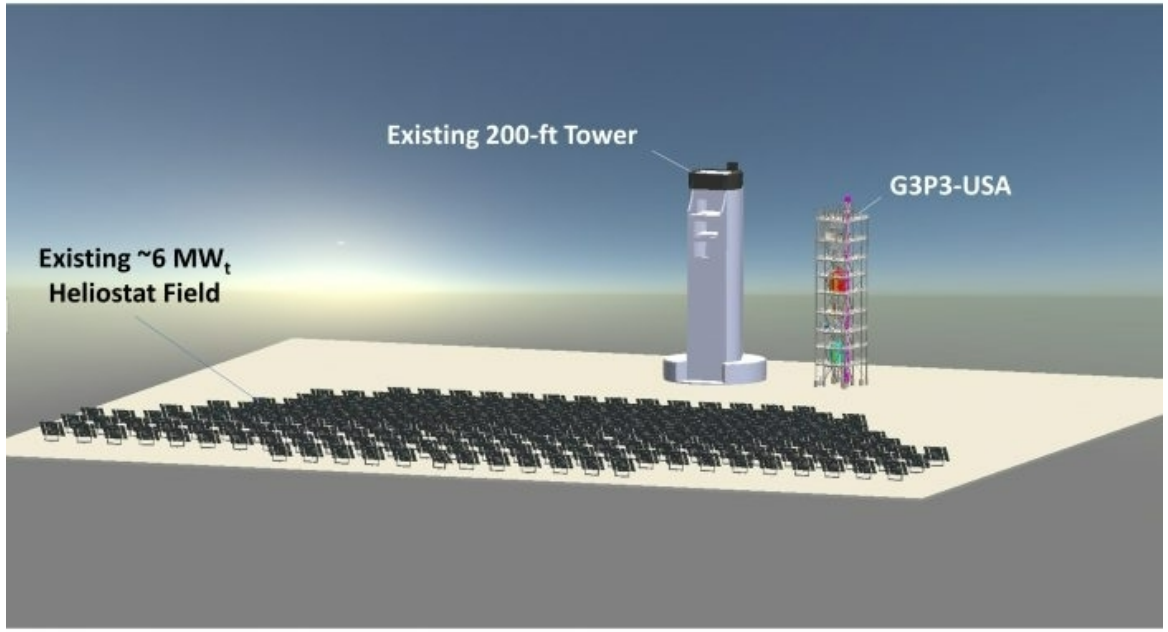
Bearings Testing

- Installing magnetic bearings in existing TACS
- Installing porous media bearings in existing TACS
- Evaluating gas-foil bearing performance in turbocompressor

Seals Testing

- Dry-gas seals for 10MW, 700C turbine inlet
- Evaluating pressure activated leaf seals

sCO2 related work at NSTFF



Gen 3 Particle Pilot Plant (G3P3)

- $6MW_{th}$ storage
- $1MW_{th}$ particle-to-sCO2 HX
- sCO2 loop, but no turbomachinery for initial testing
- Temperatures of 725C & Pressures of 4060 psi (280 bar)
- Air cooled (sCO2 to air cooler)

TESTBED: Integrated Thermal Energy Storage and Brayton Cycle Equipment Demonstration

- Awarded to Heliogen, Sandia is a sub
  - Focus on 550-630C temperature range

Evaluating Microchannel Heat Exchanger Lifetime for Concentrating Solar Power Applications

- SETO Lab call project
- Investigating thermal fatigue in PCHES

Pumped Thermal Energy Storage (PTES) project

- Construction and testing of PTES system
- Storage to CO2 HX

Future work

Construction of new testing loop (depending on funding)

- ~700C & 250 bar temperature/pressure limits
  - At least 1 x 350 kWe turbo-generator
- RCBC demonstration with retrofitted TACs
  - Focus on motor controllers and control strategies
- Bearing selection and impact on cycle efficiency
- Identifying value proposition for sCO2 Brayton cycles

Thank you