Carleton University Brayton Cycle Loop (CUBCL) Design

Mechanical and Aerospace Engineering
4th Year Project – 2017/18
S-CO₂ Power Cycles

- Supercritical working fluids
  - \( P, T > \) critical values
  - Properties change dramatically near critical point
- High density near critical point
  - Reduced compressor work, compact turbomachinery
- Good efficiency potential
- Near-ambient critical temperature
  - Availability of sinks/sources
S-CO$_2$ Power Cycles

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  - P, T > critical values
  - Properties change dramatically near critical point
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S-CO₂ Power Cycles

Solar

Military: Fix Base & Marine

ARRA Geothermal

Waste Heat: Bottoming Cycle to a Gas Turbine

Supercritical CO₂ Brayton Cycle

SNL Solar Tower

Nuclear (Gas, Sodium, Water)

DOE-NE Gen IV

Carbon Capture & Sequestration CCS+EOR Fossil Oxy-Combustion

SNL has Funding or Research Agreements with most Agencies Representing these Heat Sources

[Energy Storage & Heat Transport & CCHE]

Clean Coal & Natural Gas Power Systems

Wright, 2011
Project History

- 2006-11: 100 MW_e plant
- 2001-12: 10 MW_e plant
- 2012-16: 250 kW_th pilot-scale, 10 MW_e plant
- 2016-17: hiatus
2017-18 Project

- 250 kW\text{th} pilot-scale facility
  - Continue work
    - Finish design work (e.g. piping, electrical, turbomachinery integration)
    - Facility installation
    - Commissioning, testing (future)
    - Dynamic modelling and simulation
    - Model validation (future)

- 10 MW\text{e} US DOE project support
  - Preliminary thermodynamic, aerodynamic, structural/mechanical design
  - Modify dynamic model for 10 MW\text{e} facility
Questions?

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