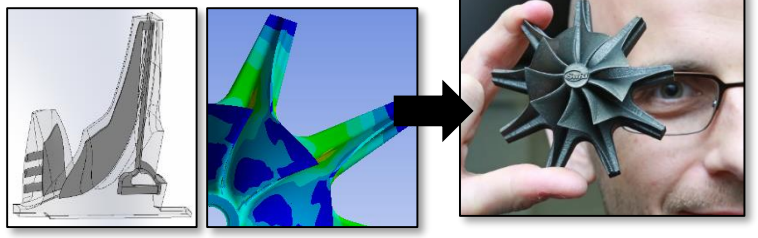
SwRI Machinery Department

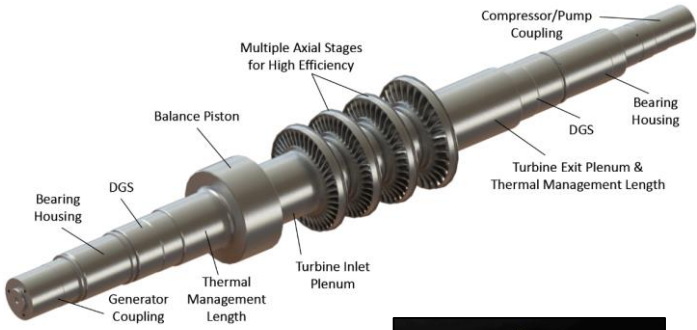
Applied Research centered around Rotating Machinery and associated systems for

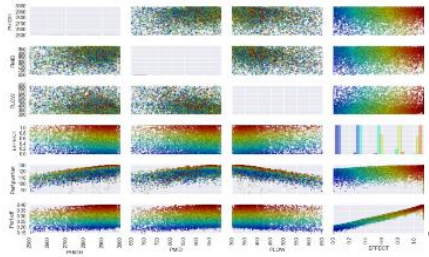
- Oil & Gas Compression Systems
- Aviation & Liquid Propulsion
- Power Generation
- Industrial Machinery

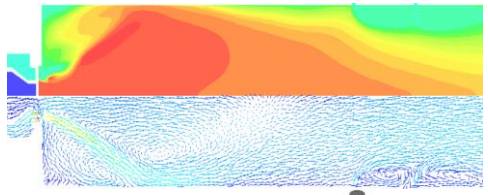
Expertise including developing technologies, prototype demonstration, and mature products and systems

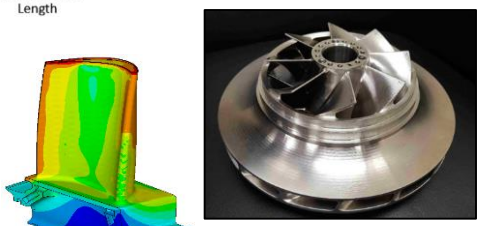
- >80 Staff
- 5 labs; open/closed-loop test facilities; powertrains up to 15 MW shaft power
- Field testing and troubleshooting
- Support OEMs in transitioning new technologies to products

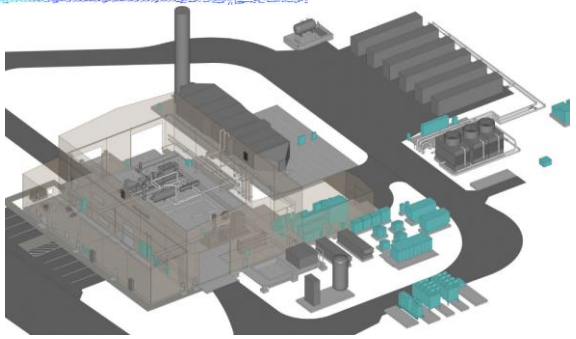


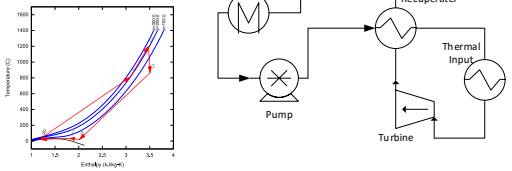


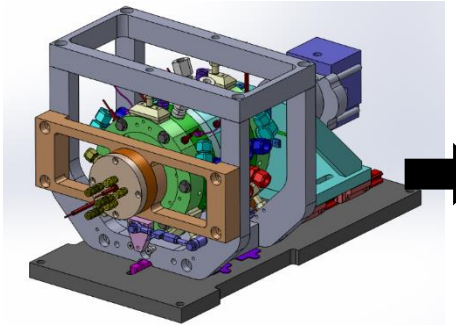


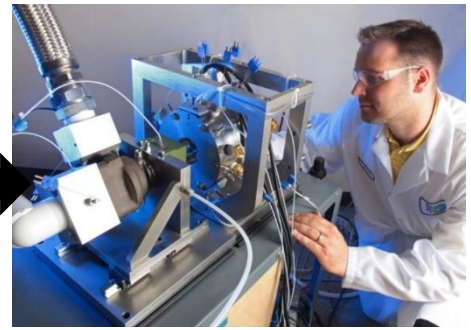


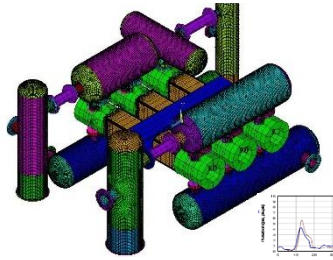


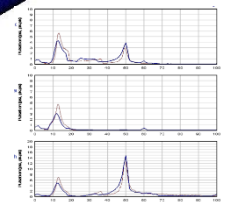






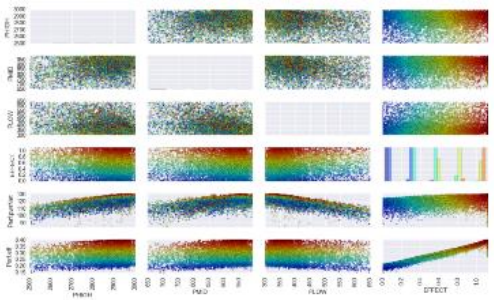


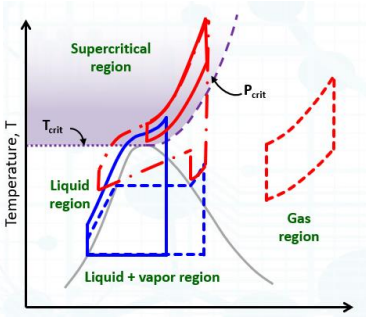


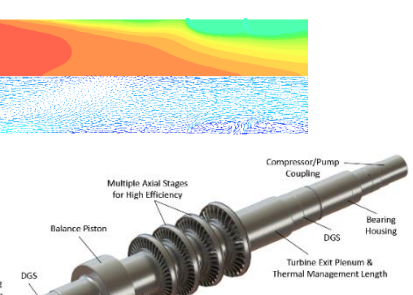


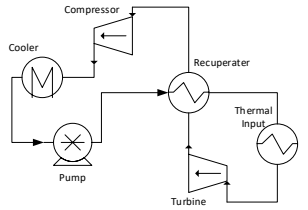
Machinery – Power Generation

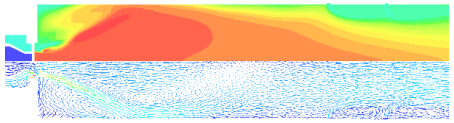
- Advanced power systems to improve efficiency & emissions performance
  - Net-zero generation from geothermal, nuclear, concentrating solar, wind, hydro
  - Advanced combustion
  - Long-duration energy storage
  - Carbon capture & sequestration
  - Thermodynamic analysis & optimization, techno-economics
- Component design and pilot-scale validation:
  - First-of-a-kind compressor, expander, combustor, heat exchanger designs
  - Up to 4000 psi, 1320 °F
  - 1, 3, and 10 MWe component test facilities
  - STEP Supercritical CO_2 pilot plant

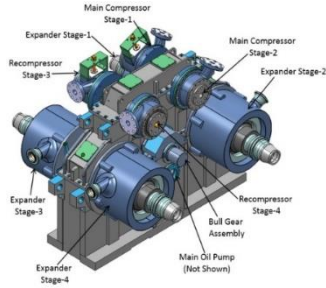


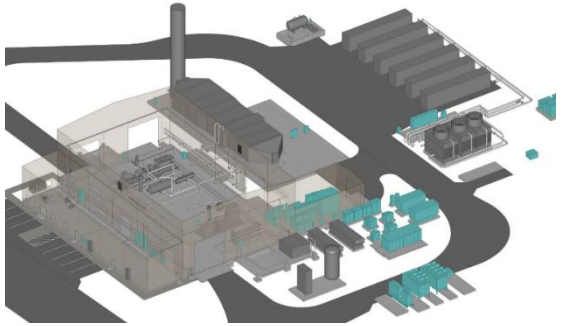






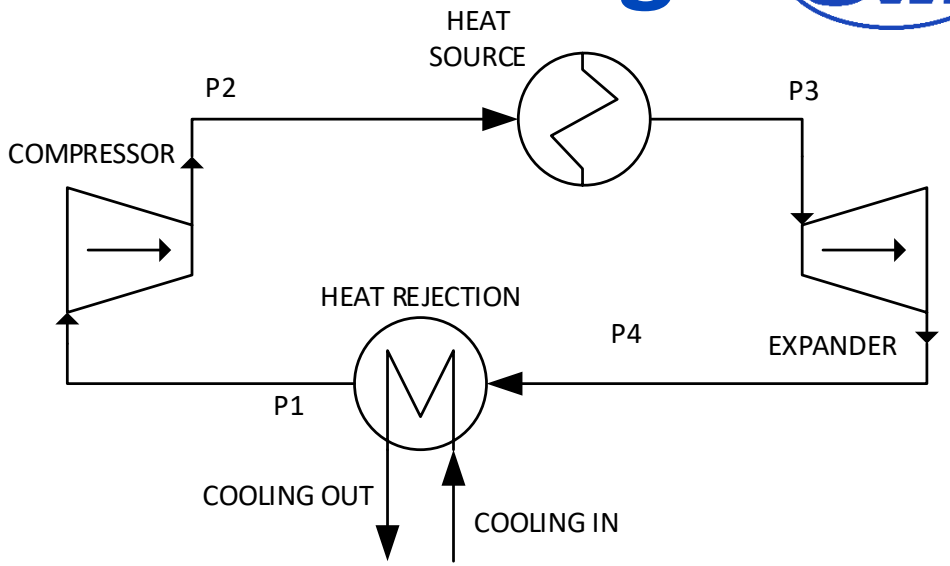


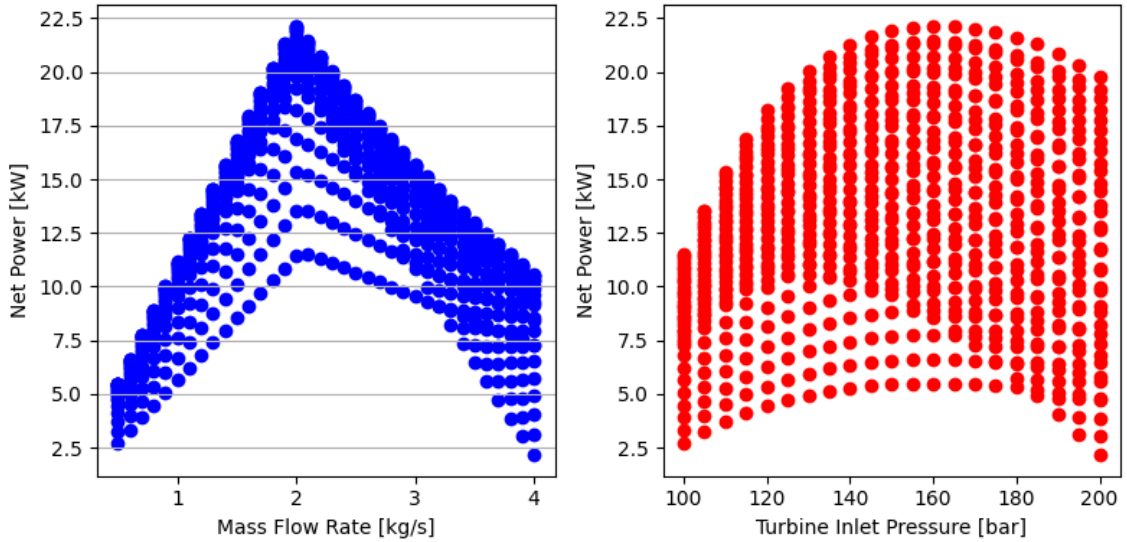




Geothermal - Thermodynamic Modelling

- ORC Cycles
  - Water-ORC binary cycles
  - Novel fluids for low-temperature
  - Coupling with improved subsurface modeling
- sCO2 Cycles
  - Thermo-siphons
  - Water-sCO_2 binary cycles
  - Coupling with improved subsurface modeling
  - sCO_2 mixtures

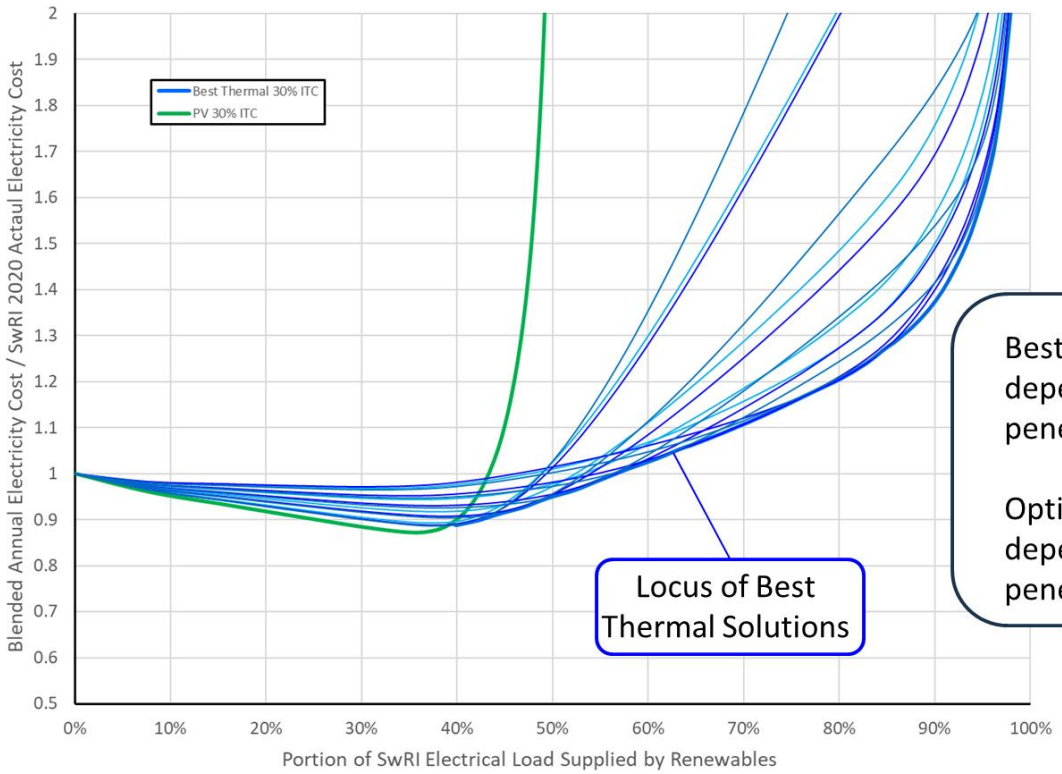




Cycle Analysis of the Simple sCO_2 Cycle for a heat recovery temperature of 150°C

Geothermal – Techno-economics and Dispatch Strategy

- Techno-economics
  - Estimates for capital costs, O&M costs and LCOE
  - Comparisons between ORC and sCO_2 systems
- Utility dispatch strategies
  - SwRI has developed a dispatch modeling code for micro-grids with high renewable penetration
  - Exploring adding geothermal as an additional technology



Best thermal storage size depends on desired renewable penetration

Optimal discharge duration depends on renewable penetration

Geothermal – Machinery Development

- Component design and pilot-scale validation:
  - First-of-kind sCO_2 thermosiphon system
  - Development of a low-temperature sCO_2 turbine for geothermal applications