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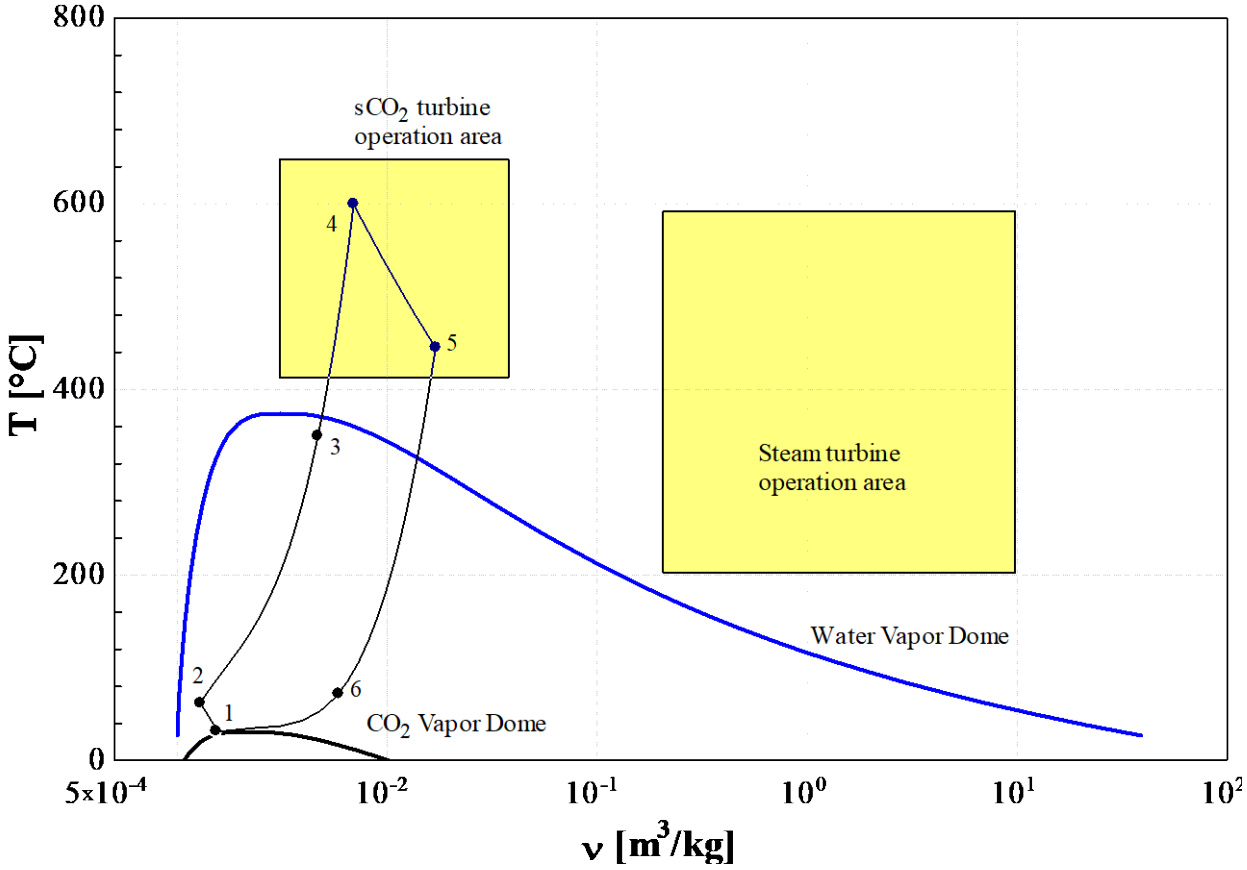
Project: Additive Manufactured Supercritical CO2 Heat to Power Solution

Advisors: Dr. Greg Nellis, Dr. Mark Anderson
Sponsor: US DOE Advanced Manufacturing Office

SCL
THL Thermal Hydraulics Laboratory
Raytheon Technologies
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy
ADVANCED MANUFACTURING OFFICE

Background

- The expansion of Combined Heat and Power (CHP) requires the development of conversion systems that provide a higher ratio of electrical to thermal output while maintaining high efficiency
- The Supercritical CO2 power cycle is an enabling technology in this regard due to its potential for extremely high efficiency at low cost
- Preliminary analysis has shown a need for a turbine inlet temperature of approximately 1300°C, prompting the need for turbine-generator cooling system development and additively manufactured turbine material development



Thermal Hydraulics Laboratory

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Project Goals

- Develop power cycle model based on the chosen industrial power profiles in cooperation with Raytheon Technologies team; this model will be capable of incorporating the impact of technical advancements made during this project and will therefore include a 2nd order model of the turbine
- Develop model space thermo-physical boundaries for pressure, temperature, flow, and transients in order to enable instrumentation and hardware selection
- Design and build UW power cycle testbed develop data acquisition system and other support systems required for test of additive manufactured sCO2 turbine
- Perform first stage run-up of system level demonstration test facility to demonstration pressure, flow capabilities and readiness to accept test unit