Advanced Compressors for CO2-Based Power Cycles and Energy Storage Systems

CFD optimization yields compressor efficiency exceeding 91% and facilitates economical energy storage systems

1. Impact
High efficiency drives greater project economics and mitigates risk for FOAK sCO2 axial compressor. LCOS improves by 3.5%. CAPEX reduced by 20%.

2. Project Goal
Demonstrate design methodology. Improve compressor efficiency. Build, demonstrate and validate at 10MW test facility. Derisk first article

3. Method(s)
Optimization of compressor aero design performed using CFD. Method validated by building 10MW scale compressor and quantifying performance.

4. Outcome(s)
Design complete with 5 point improvement over radial compressor. Operation expected mid 2022.

5. Conclusion/Risks
Axial compressors at large scale can significantly improve efficiency, and reduce overall system cost. Operation in the test cell derisks technology for future adaptation

6. Team
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Visuals
Figure 1 illustrates the optimized airfoil geometry for the rotor, the three-stage test compressor, and the test loop.

Figure 1. Axial compressor and test loop