March 2018/Supercritical CO2 Symposium, Pittsburgh PA

COMMERCIALIZATION CHALLENGES FOR A PLATFORM TECHNOLOGY

Situation Assessment

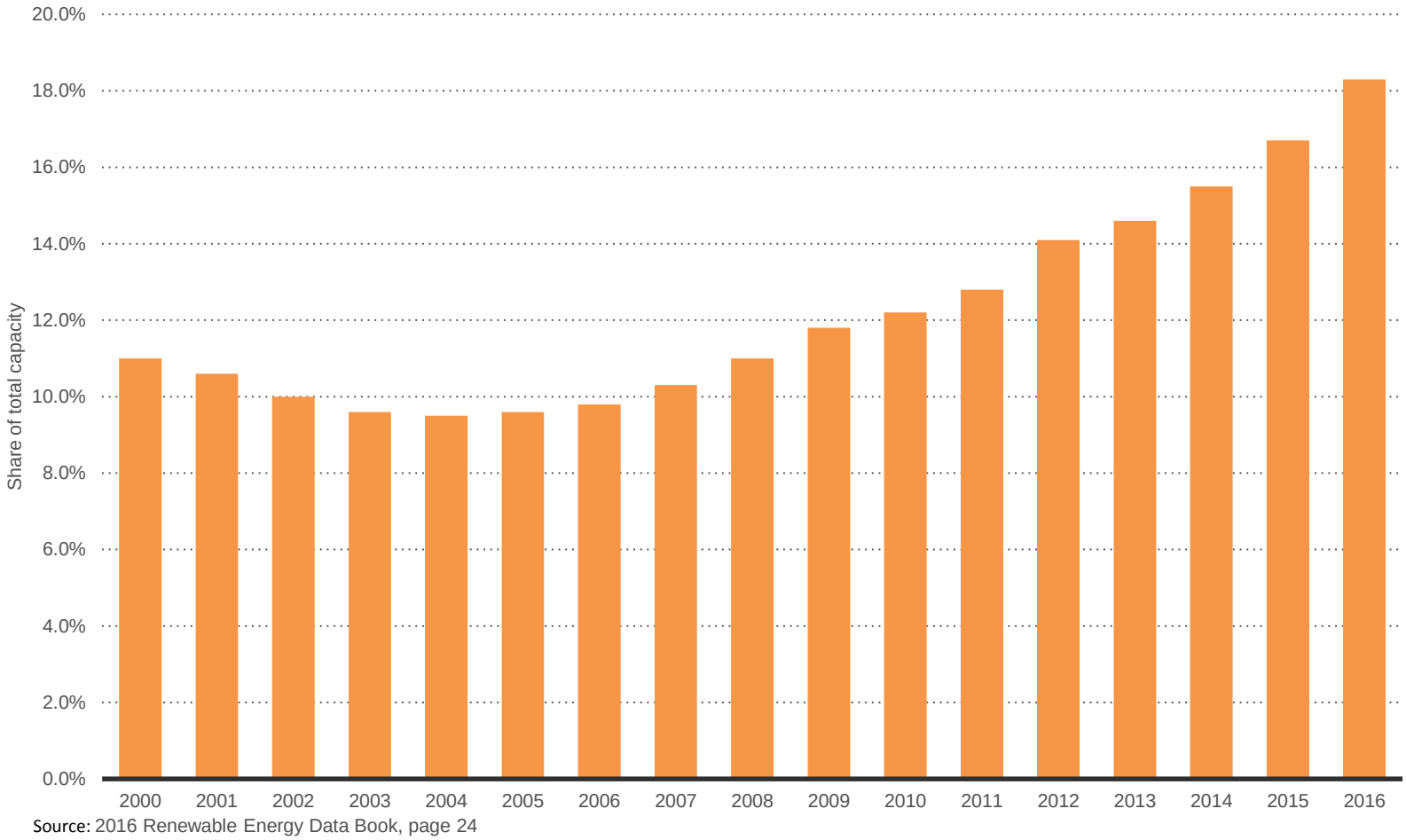
Problem: Market economics and growth in cheaper renewables are currently limiting the opportunity for WHR

- Currently natural gas and electric prices are too low
- The growing penetration of cheap renewable power further exacerbates the problem

Yet these dynamics also create opportunities for……..

- Other applications of sCO_2 that are less reliant on natural gas and/or water supply e.g. nuclear, CSP, primary cycles or
- Economic, reliable, long-life, electrical energy storage with low capital cost, lower replacement costs, proven reliability and low environmental impact

Renewable electricity capacity as a percentage of total U.S. electricity generating capacity



Source: 2016 Renewable Energy Data Book, page 24

Renewables are increasing: energy storage will become more essential

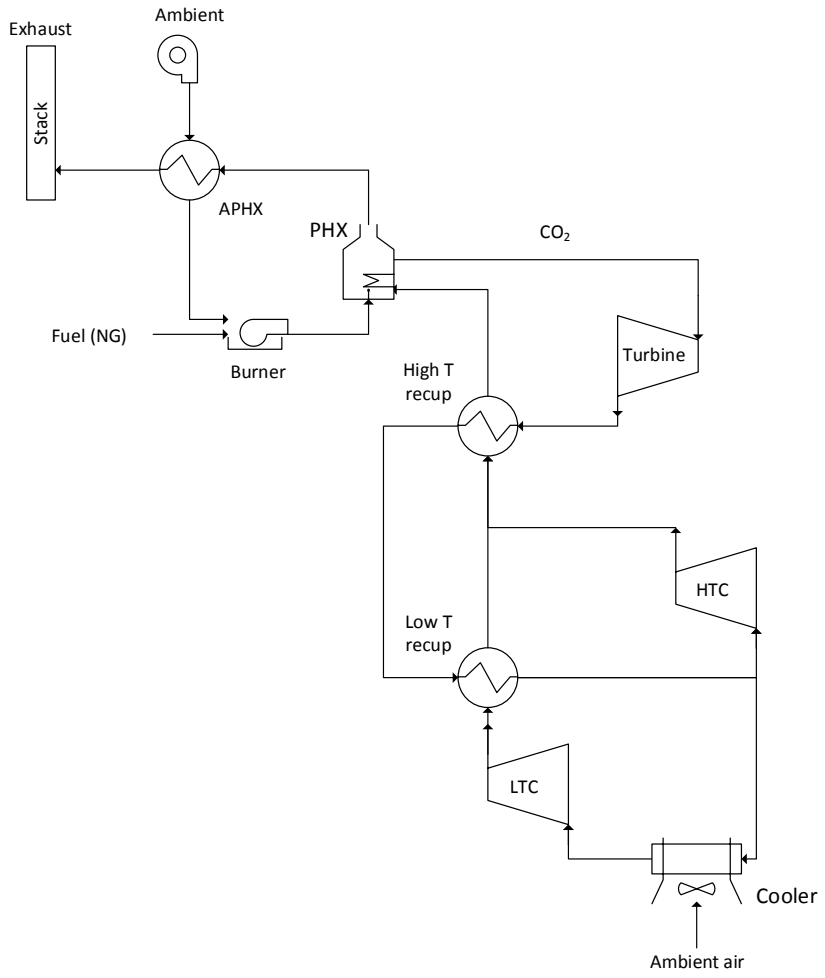
Accelerating commercial deployments

Solution: Provide early commercial demonstration to accumulate 1000's of hours of operation on commercial sCO2 engines

- Recompression cycle represents best option to advance the cause:
  - Primary power cycle at 550-650°C
  - Utilize proven technology from Echogen's current engines to minimize technical, budget and schedule risks
- 1000's of hours = commercial bankability, accelerates adoption of articles 2 thru 10
- Partnerships across the industry spectrum are critical to the acceleration effort
- Supercritical Power from Renewable Industrial and Nuclear Technologies (SPRINT)

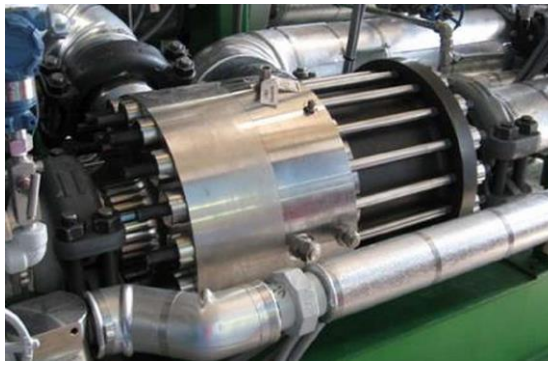
SPRINT 10MWe Operating Plant

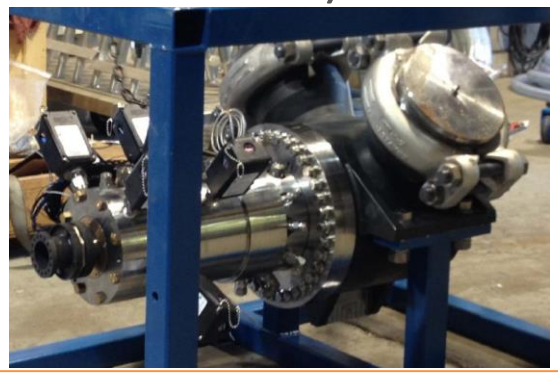
- Prove commercial viability of various applications, Nuclear, CSP, large Industrial and Energy Storage
- Utilize proven technology from EPS100 to minimize technical, budget and schedule risks
- Most of baseline cycle equipment is common to RCB
- Demonstrate SS & transient load & operating conditions
- Capable of 24-hour operations and “extended” test campaigns



SPRINT leverages EPS100 technology

- Turbine-driven compressors
  - LT compressor = EPS100 turbopump
    - Modify for higher turbine inlet temperature (600°C vs 350°C original design)
  - HT compressor = new design, based on EPS100 TP
    - 2-stage compressor
- EPS100 power turbine
  - Current design target = 485°C
  - Case material = Inconel 718 (<5% strength reduction)
  - 84-85% efficiency (vs 80-81% for comparably-sized axial turbine)





Looking for Partnerships

- Industry consortiums such as EPRI
- Three host sites being considered that have infrastructure in place and therefore quicker to demonstration
- Other key partners being negotiated/pursued
  - EPC/facility design
  - Equipment OEMs
  - National labs for intellectual leadership
  - End users in nuclear, CSP, oil & gas, powergen and energy storage

SPRINT summary

- SPRINT introduces high-efficiency sCO_2 power cycle for CSP, nuclear and energy storage applications
- Risk management by leveraging Echogen's 10 years of development and operation of sCO_2 power cycles
- Utilization of existing technology provides accelerated deployment opportunity
- Gets a "bankable system" proven in 24-28 months

SPRINT and STEP go hand-in-hand

- STEP critical for bold component-focused Nextgen R&D
  - Motor-driven compressors
  - >700°C turbine inlet temperature
  - 3+ years to data
- SPRINT designed for rapid introduction of production configuration system
  - Turbine-driven compressors
  - ~625°C turbine inlet temperature
  - 2 years to operational experience
- Complementary programs with the common goal
  - Successful rollout of sCO_2 technology to the market

Appendix