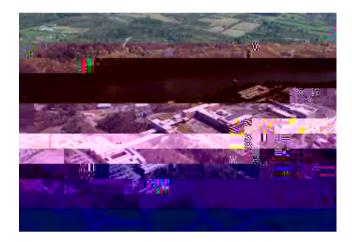
High-Potential Working Fluids for Next-Generation Binary ORC for EGS Supercritical ORC

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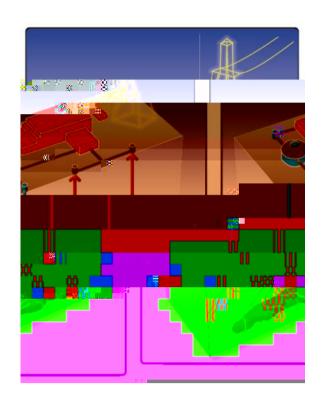


Find optimized working fluid/advanced cycle combination for EGS applications

Tradeoff between well cost & power conversion unit cost

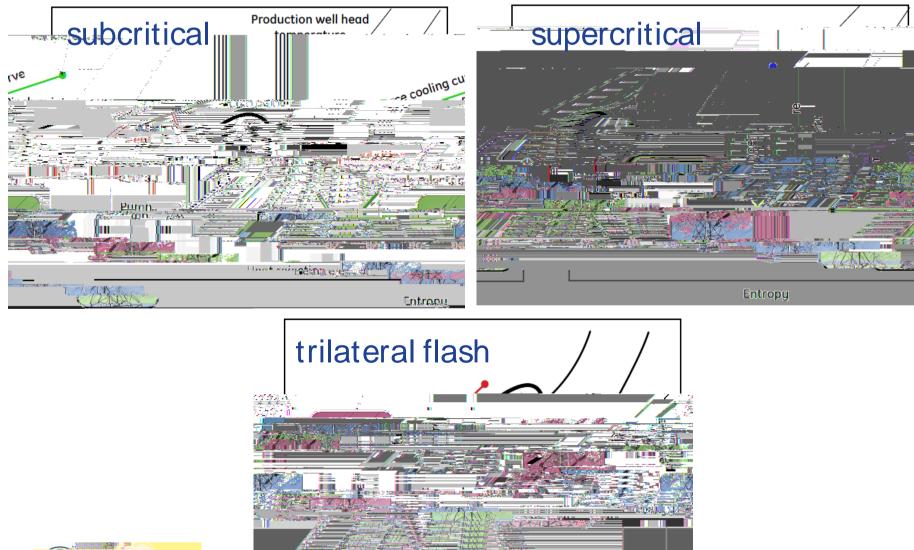
3 Phases:

- 1. Technical analysis
- 2. Techno-economic analysis
- 3. Build Pilot ORC





Organic Rankine Cycles



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Fluid Screening

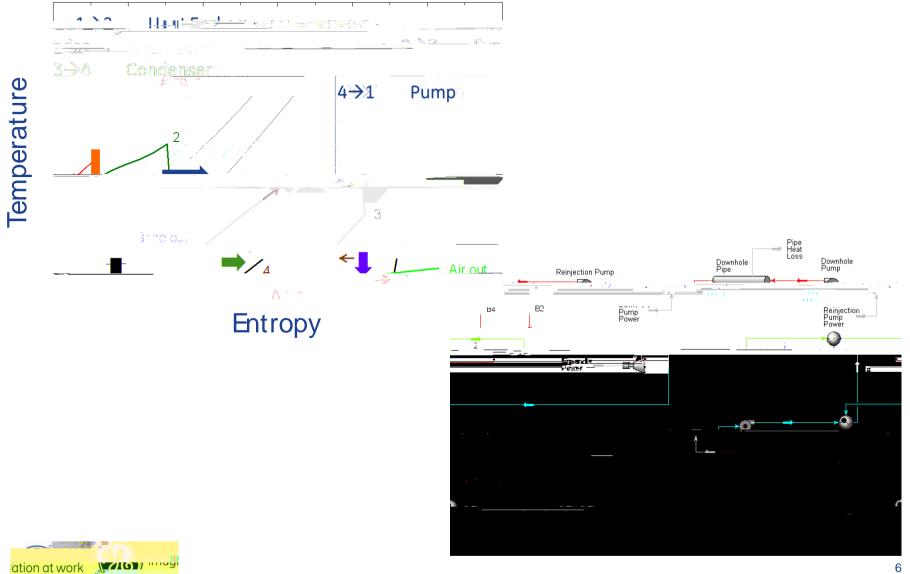
Screening criteria: T_{melt} < ambient temperature $T_{critical}$ > ambient temperature T_{boil} < 350 °C Global Warming Potential < 150 Low to no Ozone Depletion Potential Low toxicity

Ranking criteria: High density High thermal conductivity High molecular weight Number of atoms per molecule

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17,000+ available 35 high-potential

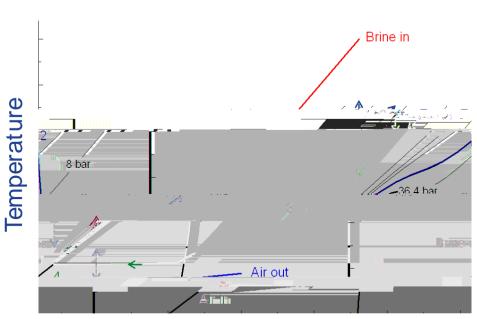
Supercritical ORC



Cycle Optimization

Optimization variables:

- o Brine out temperature
- o Working fluid



Entropy



Supercritical Cycle: Benefits and Challenges

Benefits:

Better match between resource cooling curve & working fluid heating curve

- Use existing expander technology
- Single primary heat exchanger

Challenges:

High pressures required

High pressure ratio in expander

Supercritical heat transfer

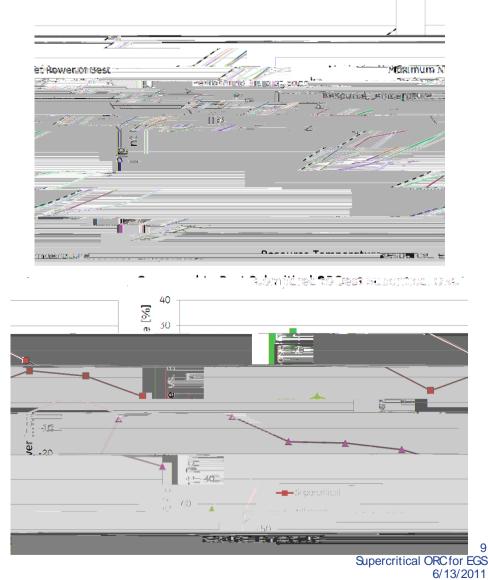
Uncertainty of properties in supercritical region



Net Power vs. Resource Temperature

No single best fluid for all resource temperatures

Best supercritical cycle beat best trilateral and subcritical cycle at given resource temperature





Summary

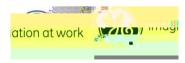
Down-selected 35 high-potential fluids (from 17,000+) Compared performance of high potential working fluid / advanced cycle combinations

No single best fluid for all resource temperatures

Outperform standard cycles on market Next phases:

Economic analysis & comparison

Pilot ORC



Thank you.

