Turn Up the Temperature: High Efficiency Modular Power Cycles

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Go Process Intensification

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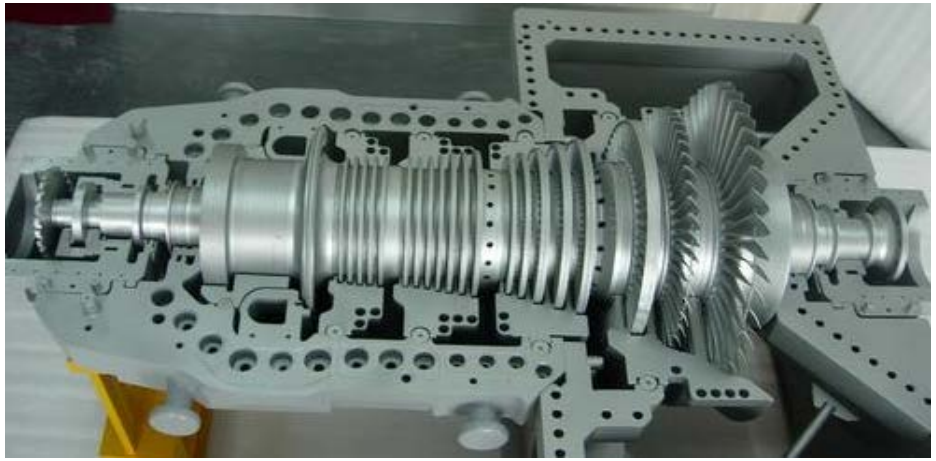
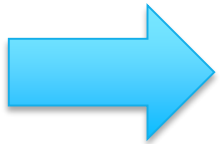
Demonstrated Potential



Steam turbine (50kW)



sCO2 (50kW)

Some Quick Guiding Principles

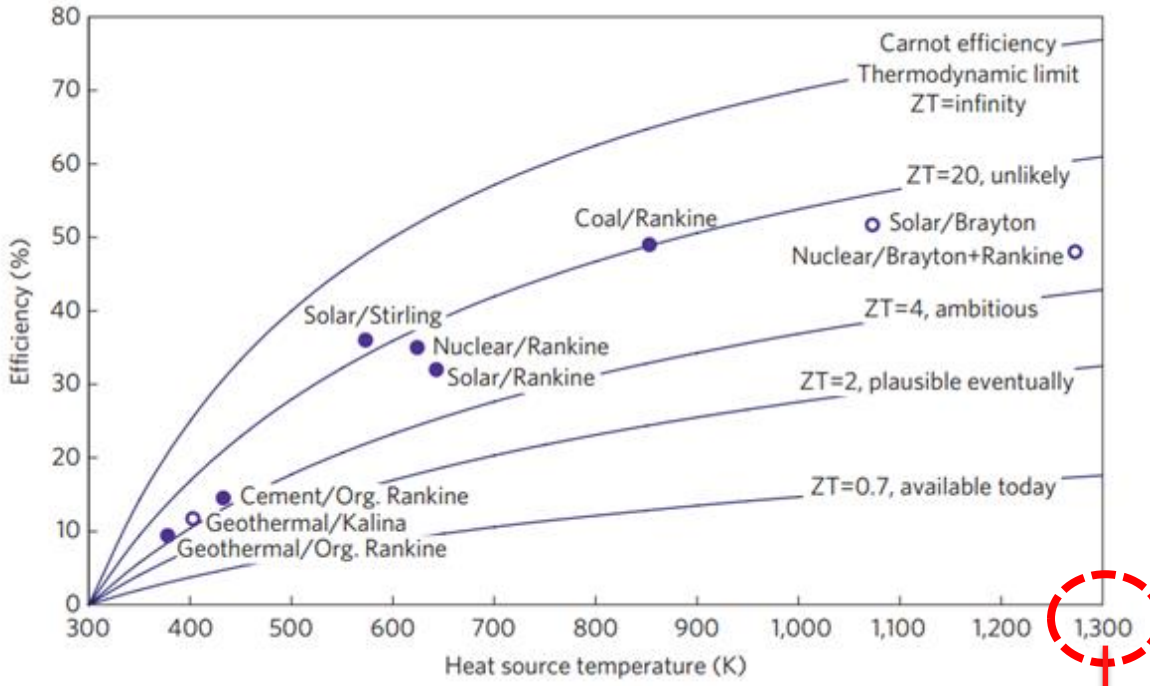
Why Higher Temperatures and Pressures?

- The higher the energy source temperature the higher the net work delivered and the efficiency.

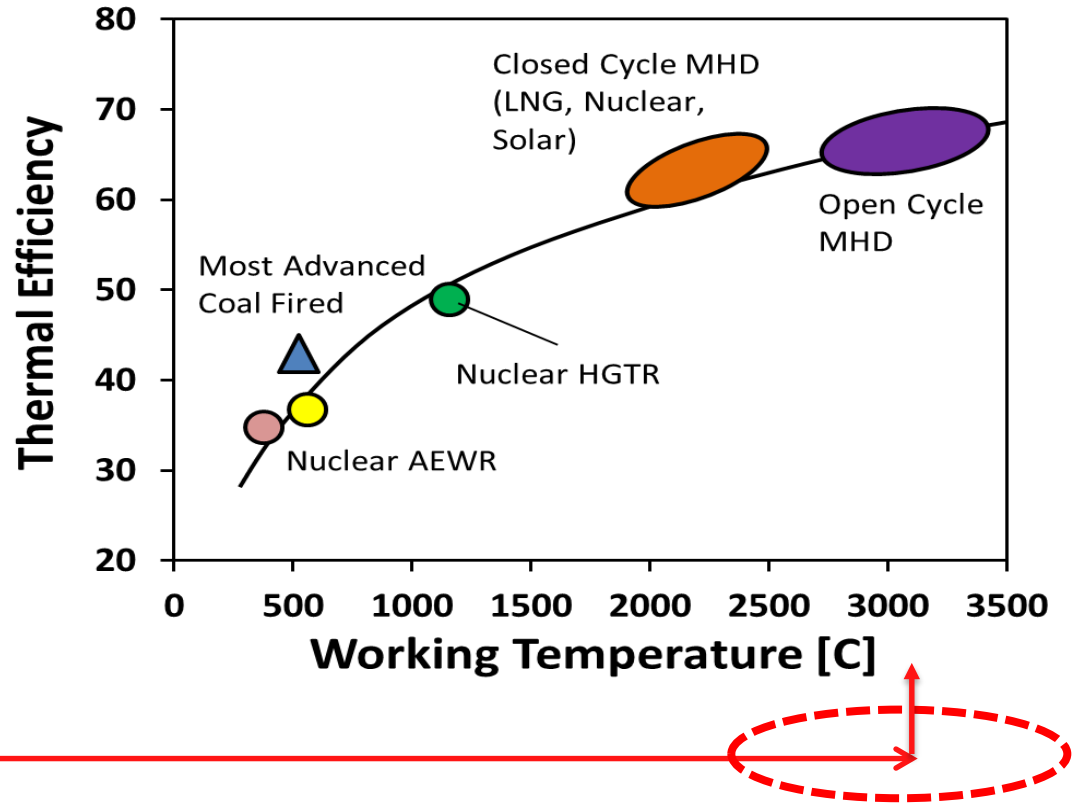
- Higher operating pressures allow use of super critical cycles, thus higher efficiencies and smaller system size

Much room for higher temperatures

[1]



[2]

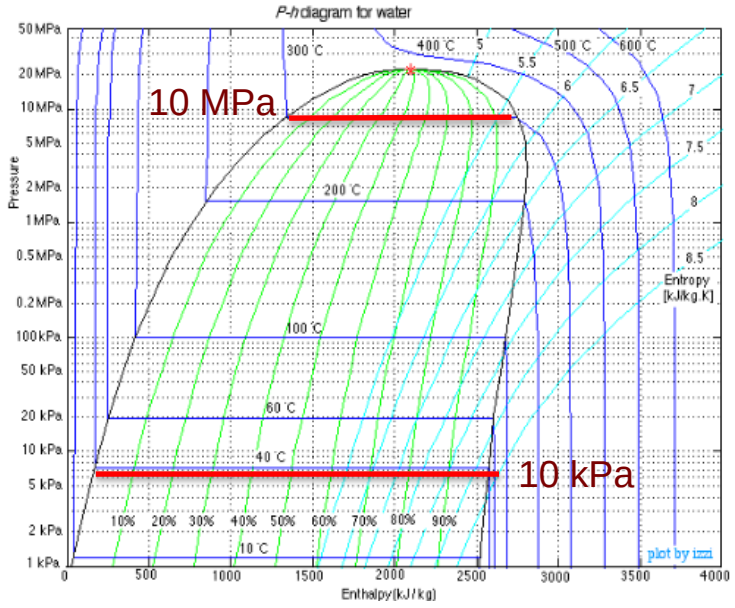


Significant boost in efficiency by increasing heat source temperature

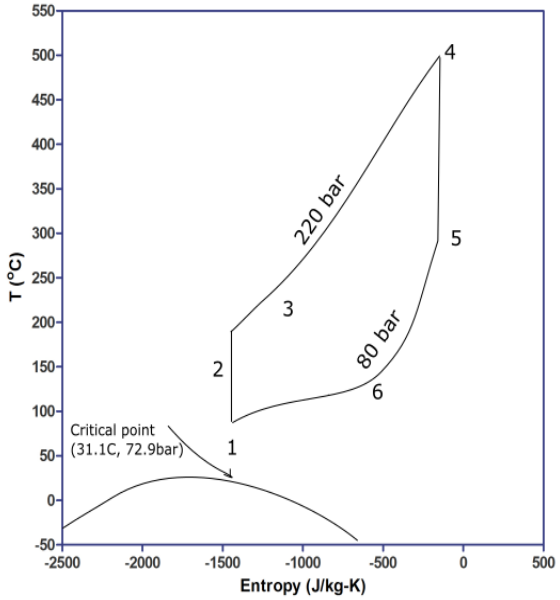
[1] Vining, Cronin B., “An inconvenient truth about thermoelectrics” Macmillian Publishers, 2009. (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.726.9712&rep=rep1&type=pdf)

[2] Adapted from Harada, Nobuhiro. "Magnetohydrodynamics for advanced power generation system." *The International Conference on Electrical Engineering, No. O-043*. 2008. (https://www.scribd.com/document/107173503/Mhd-power-generation)

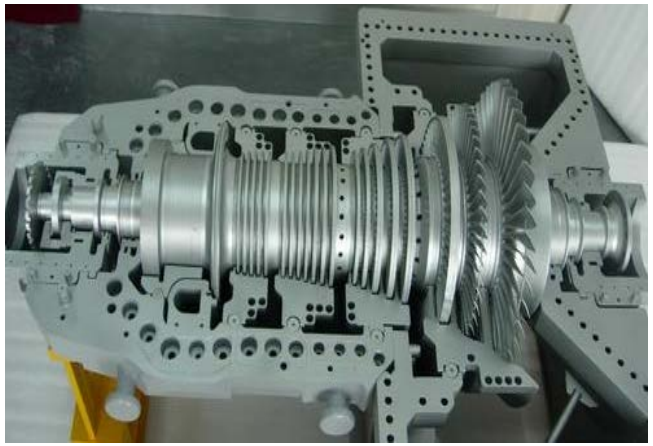
Higher Pressure



Water PR >100



sCO_2 PR ~ 3



Steam turbine (50kW)

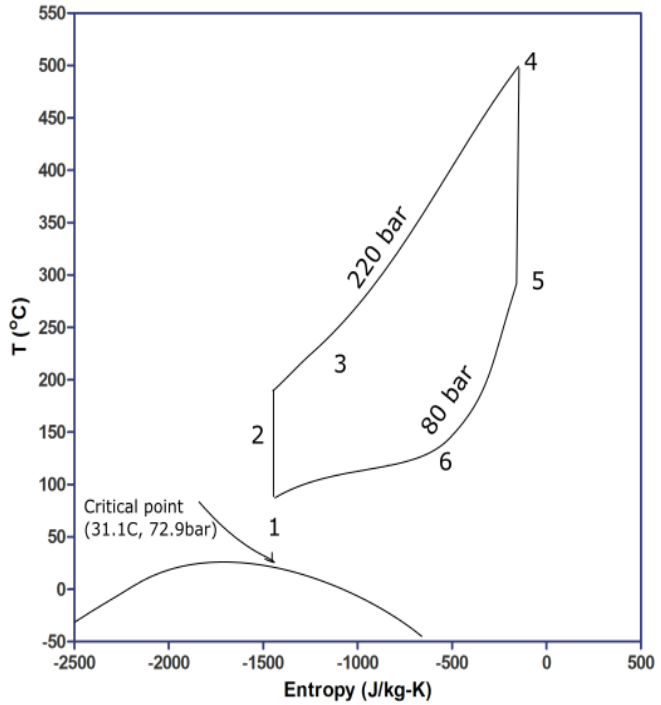
sCO2 (50kW)

Higher Pressures can enable use of super critical fluids and substantially reduce the size

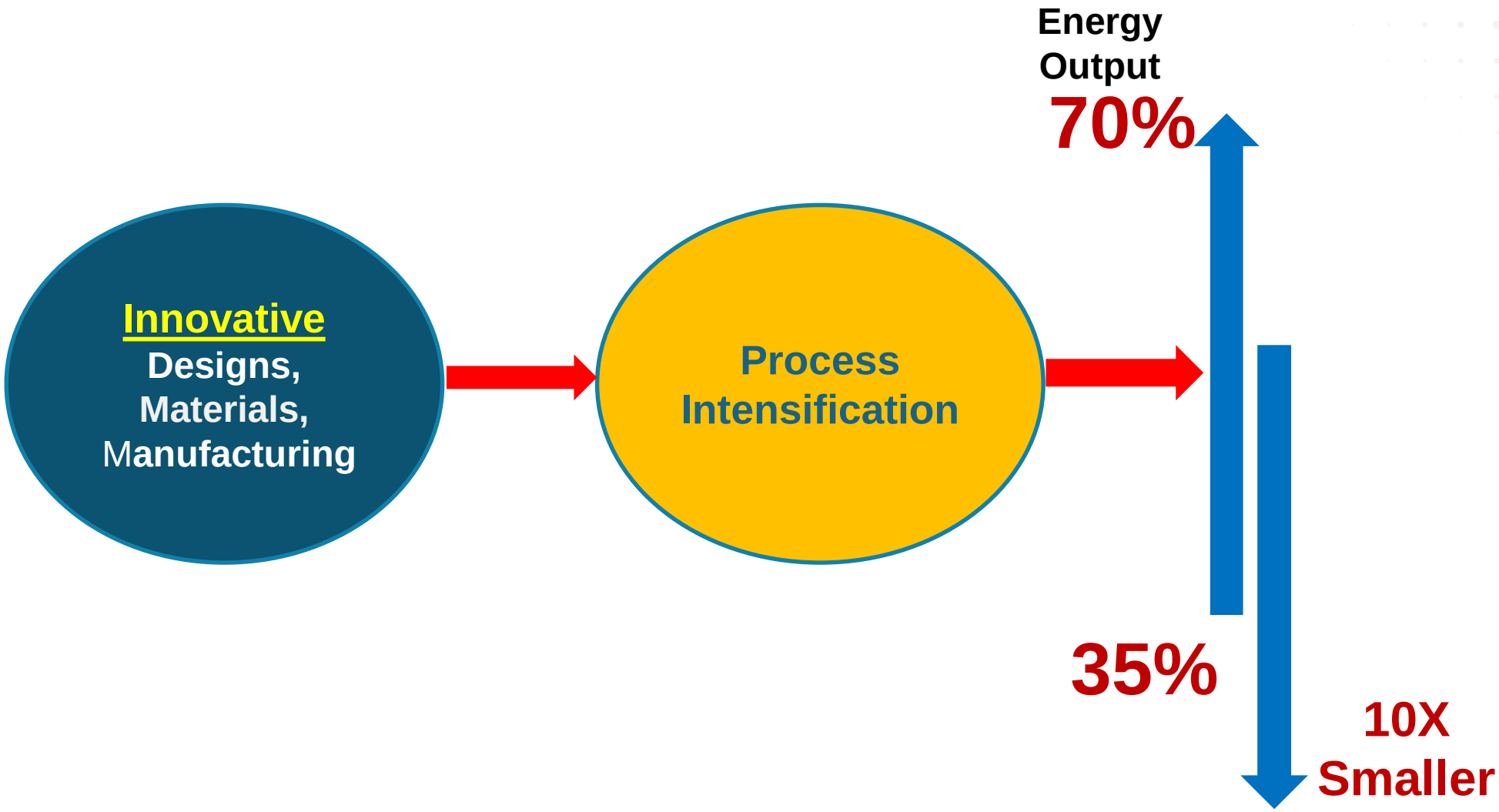
sCO2 vs. Rankine

Other Advantages:

- ✓ Thermally stable, low-hazard, low-cost working fluid
- ✓ Simple, direct, single pressure, single-phase heat exchangers
- ✓ Flexible cycle, can integrate with wide variety of heat sources



Opportunities and Challenges



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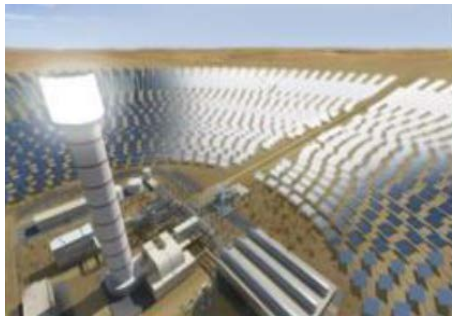
Industries that can benefit

- Potential heat sources across key Industries:

❖ **Oil and Gas:**

❖ **Marine**: Cruise Ships, LNG, Naval,…

❖ **Power Generation**:



❖ **Industrial**: Transportation, Cement, Air Separation, Process industries

Your thoughts?

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