

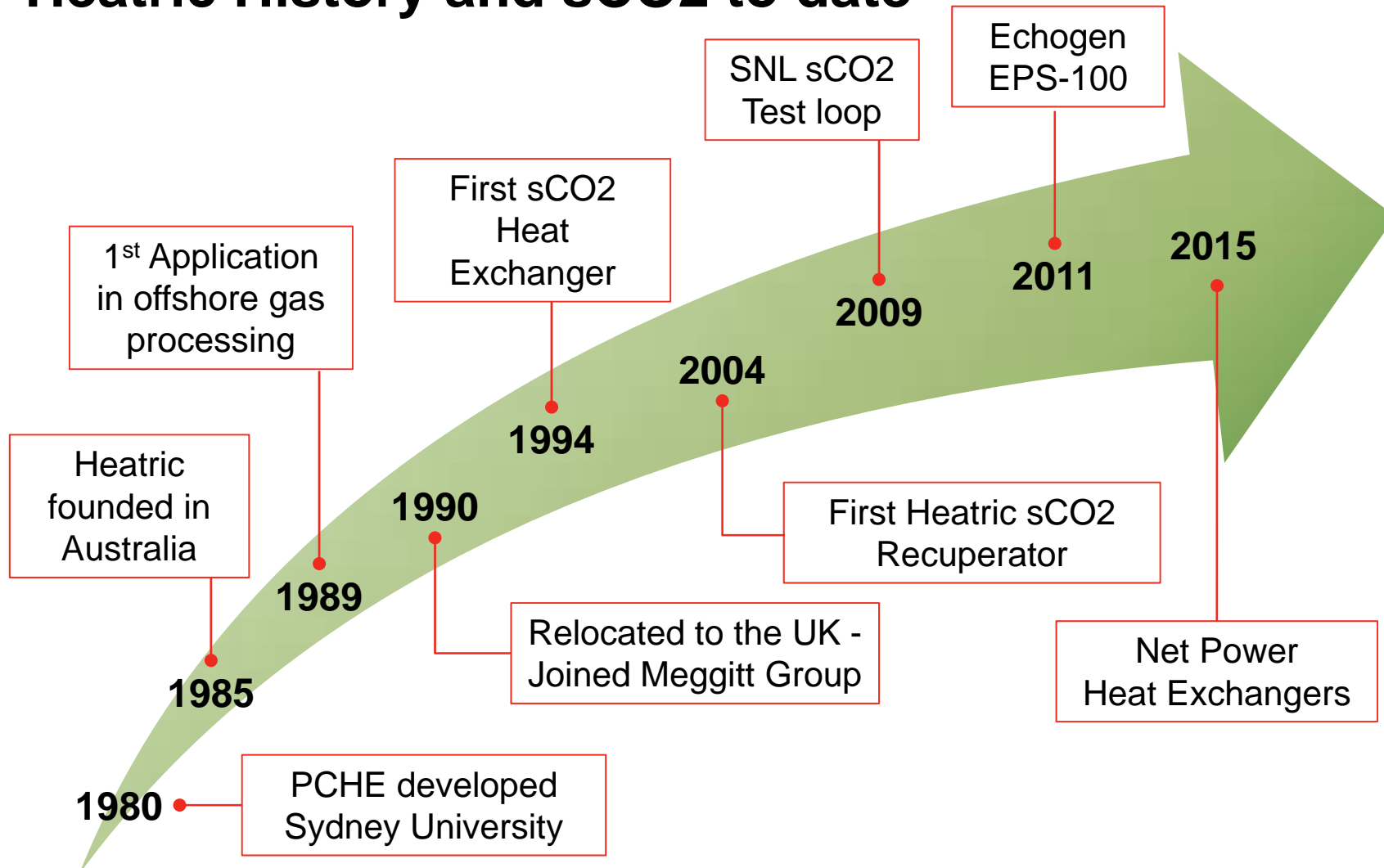
# Industry Panel Session

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Tuesday 29 March 2016 – San-Antonio

5<sup>th</sup> international Supercritical CO<sub>2</sub> Power Cycles Symposium

## Heatric History and sCO<sub>2</sub> to date



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## sCO2 cycles Heat Exchangers

### Rankine

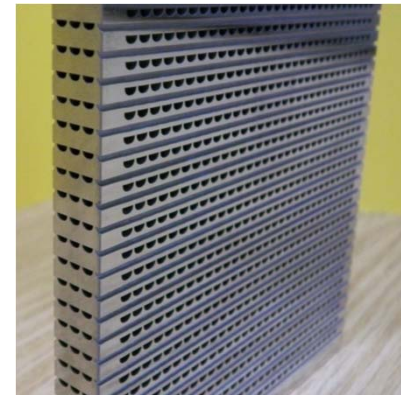
- Evaporator
- Recuperator
- Condensers

### Brayton

- IHX?
- Recuperator(s)
- Cooler(s)

### Existing Technology

- ASME 'U' qualified
- Proven performance in sCO2 test loops since 2004 (TIT, SNL, Echogen, GE, KAERI)
- Proven performances in many other Brayton cycles (Nitrogen, Air, Helium).
- 304 / 304L / 316 / 316L / Duplex / Ti  
Grade 2 / 6 Moly / 617
- Scalable
- Modular
- Mature



## sCO<sub>2</sub> cycles Heat Exchangers

### Rankine

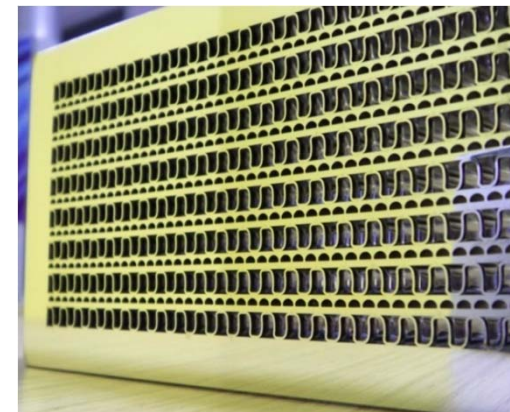
- Evaporator
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### Brayton

- IHX?
- Recuperator(s)
- Cooler(s)

### IHX needs development

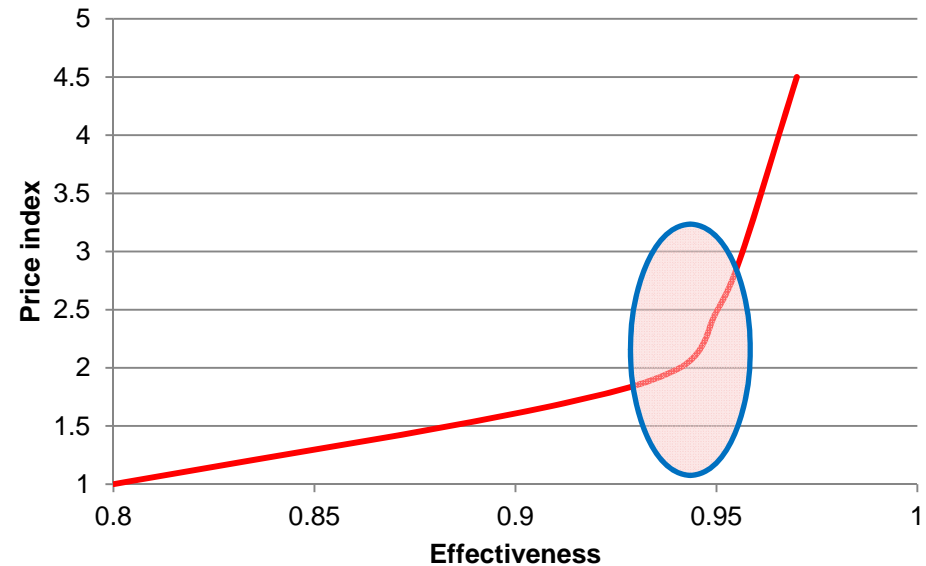
- High temperature section (material)
- Most likely hybrid to address
  - Low pressure and pressure drop on the hot side
  - High pressure on the sCO<sub>2</sub> side



## sCO<sub>2</sub> Heat Exchangers - Cost optimization

### Temperature Approach

- Highly recuperative cycle
- Close temperature approach required
- Care must be exercise when optimising cycles
- 0.94 Eff to 0.98 Eff will double heat exchanger size



## sCO<sub>2</sub> Heat Exchangers - Cost optimization

### Commercially available materials

- 316 – 550°C
- 316L - 649°C
- >649°C – higher grade alloys (HR 120 – 617?)
- High grade alloys expensive
- Even 617 do not come in all product forms

### New Materials

- Must be strong, corrosion resistant, cheap, code qualified and available in many product form;
- A very large list of material is currently being investigated:
- Which one can answer all these requirements now?

## Cycle Commercialization

- Heat exchangers are readily available for commercialisation (Heatric)
- Need to bring cycle designer and product manufacturers together to optimise cycle cost (STEP)
- Need to develop supply chain to reduce cost bringing material suppliers on-board
- Need to bring Utilities to the community to reduce the perception of risk associated with any new technology
- Need to bring the whole community together: this cycle looks driven by the US but what about Asia?

Heatric

Thank you



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