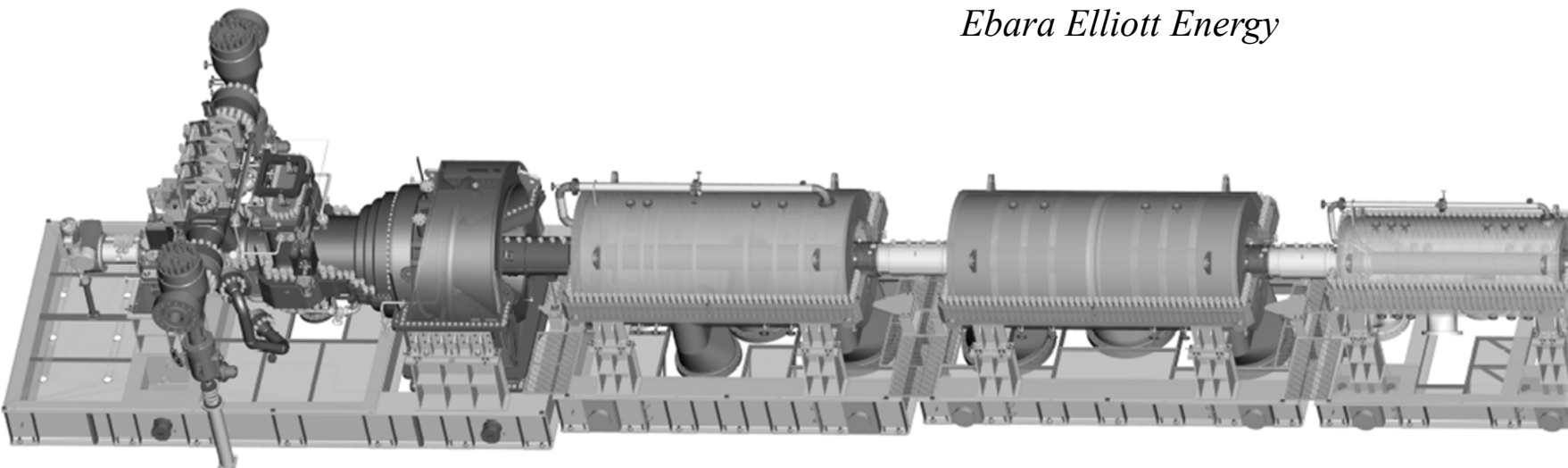
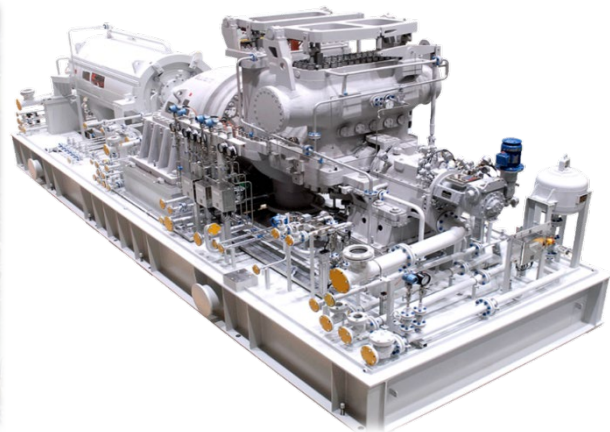
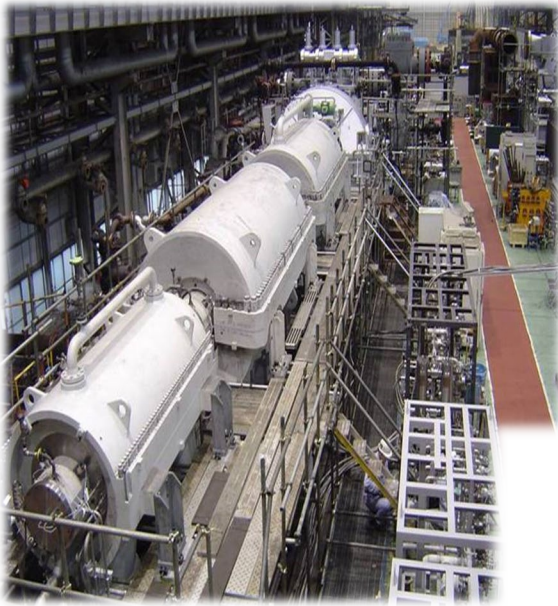


Compression For Carbon Capture

*Klaus Brun, Ph.D.
Global Director R&D
Ebara Elliott Energy*





6-9 February, 2024 | Goa | India

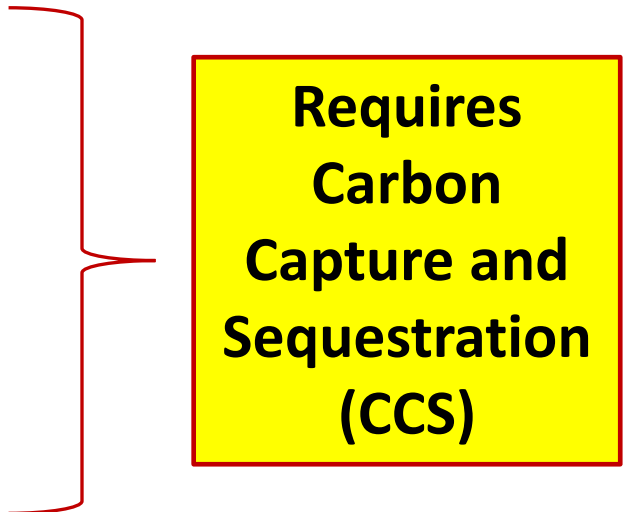


EBARA ELLIOTT ENERGY



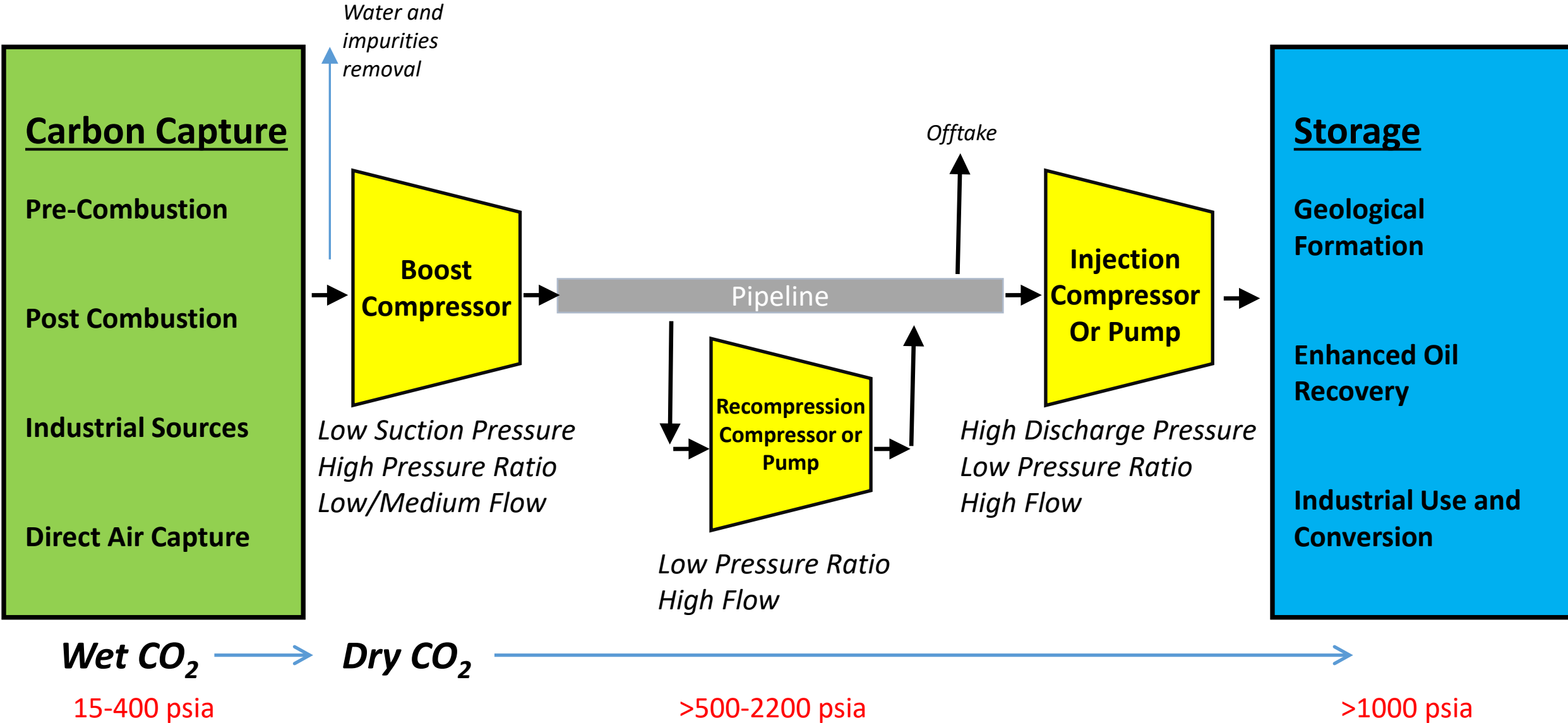
Carbon-Free or Decarbonized Energy Pathways

- Green (wind/solar/hydro/geothermal/wave) and nuclear electricity direct
 - Centralized or distributed
 - Requires storage or peakers for load following
- Green and nuclear (red) hydrogen (electrolysis and pipeline transport)
- Fossil fuel (blue) hydrogen (mostly from natural gas)
 - Produced at fossil production site
 - Produced at end-use site (pre-combustion carbon capture)
- Fossil plant post combustion (flue gas) carbon capture
- Fossil fueled oxy cycle plants



**Requires
Carbon
Capture and
Sequestration
(CCS)**

Carbon Capture and Sequestration Value Chain

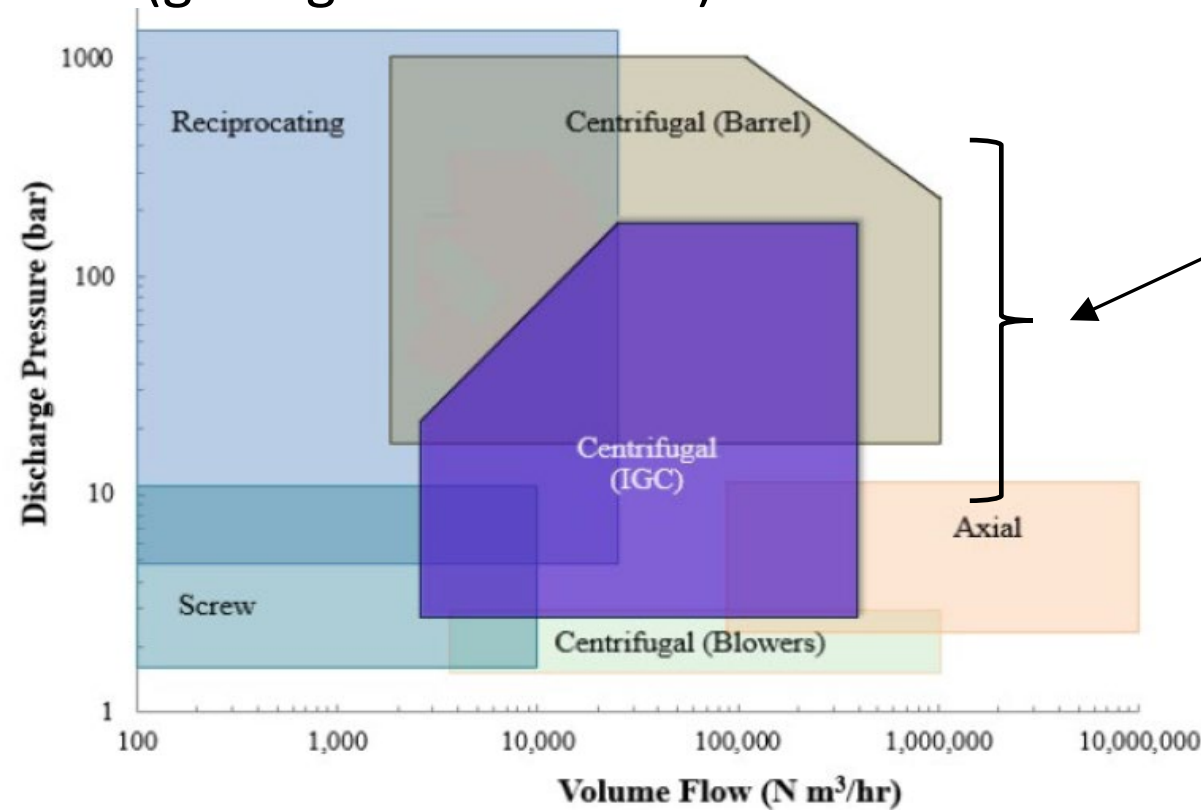


Carbon Dioxide Compression

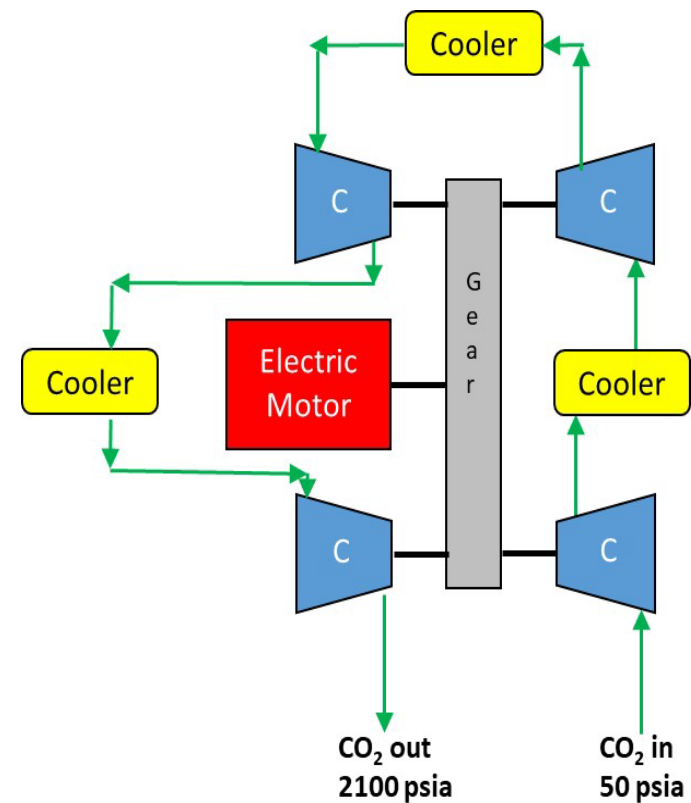
Compression Applications:

- Pipeline re-compression/re-pumping (2100 psi)
- Steam reformer to Pipeline Pressure (2100 psi)
- Gasifier to Pipeline Pressure
- Flue Gas to Pipeline Pressure
- Boost into sequestration (geological formation)

PR 1.2-1.6
PR 40-70
PR 5-20
PR 100-130
PR 1.2-500

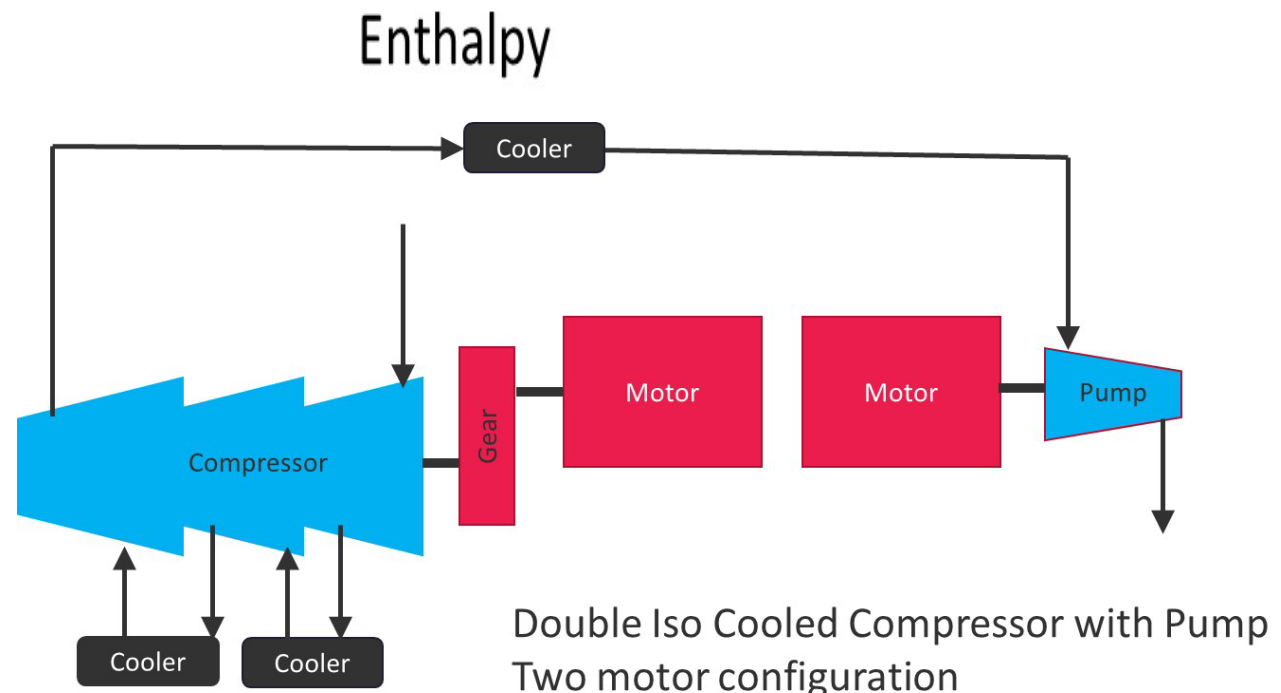
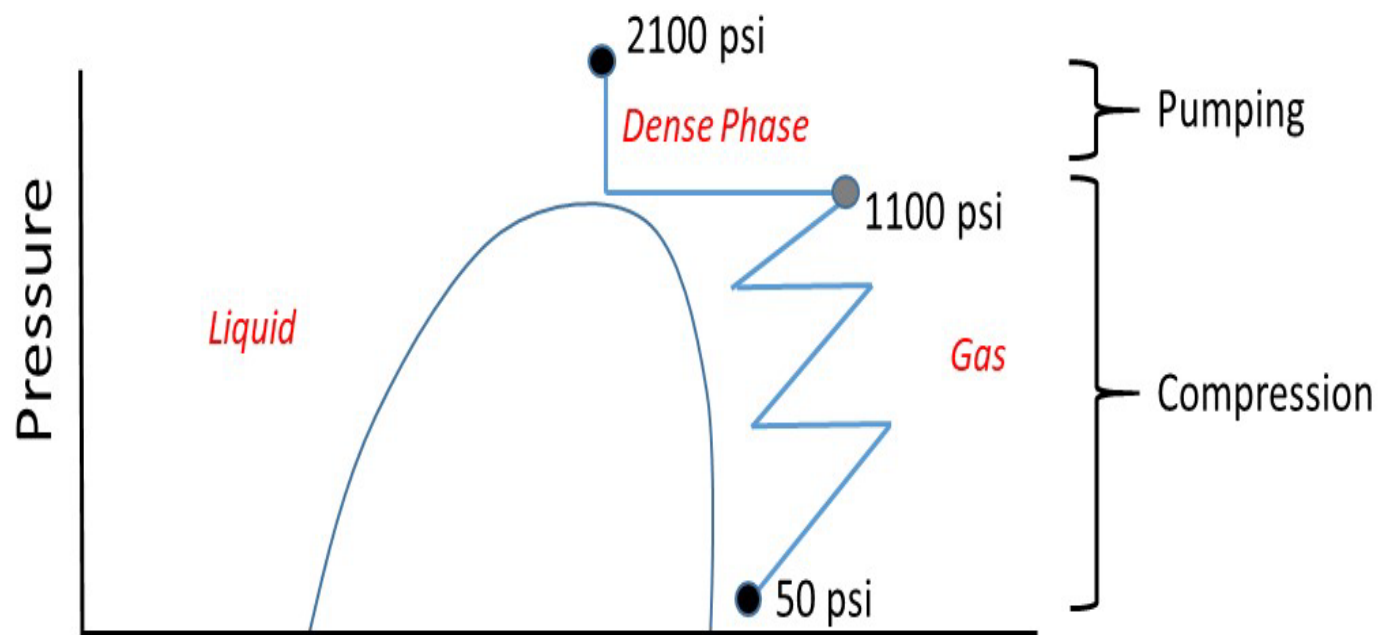


Compression Solutions



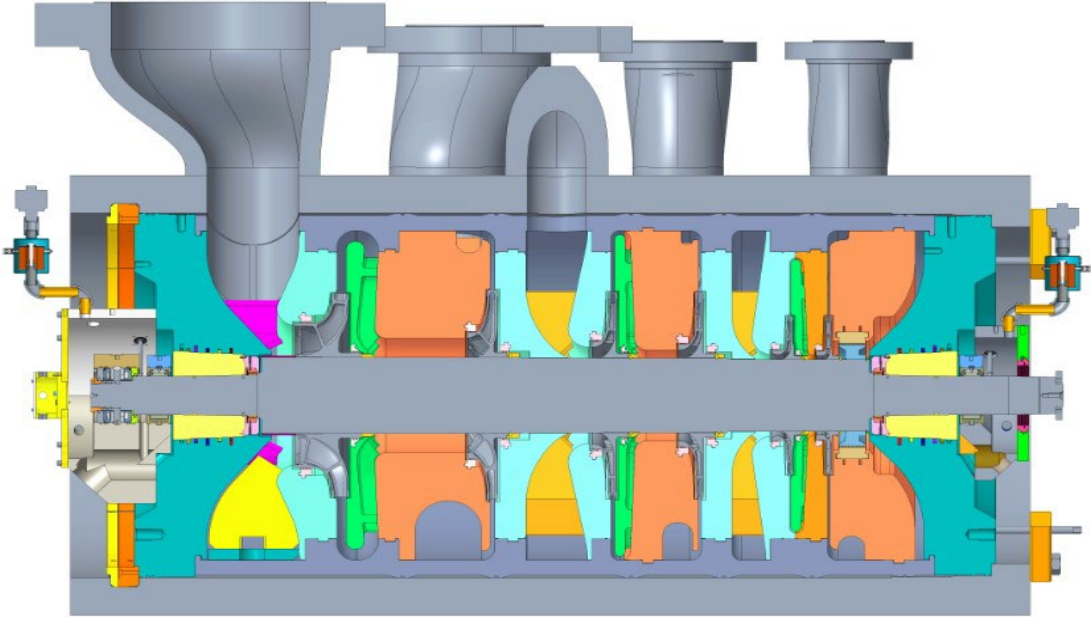
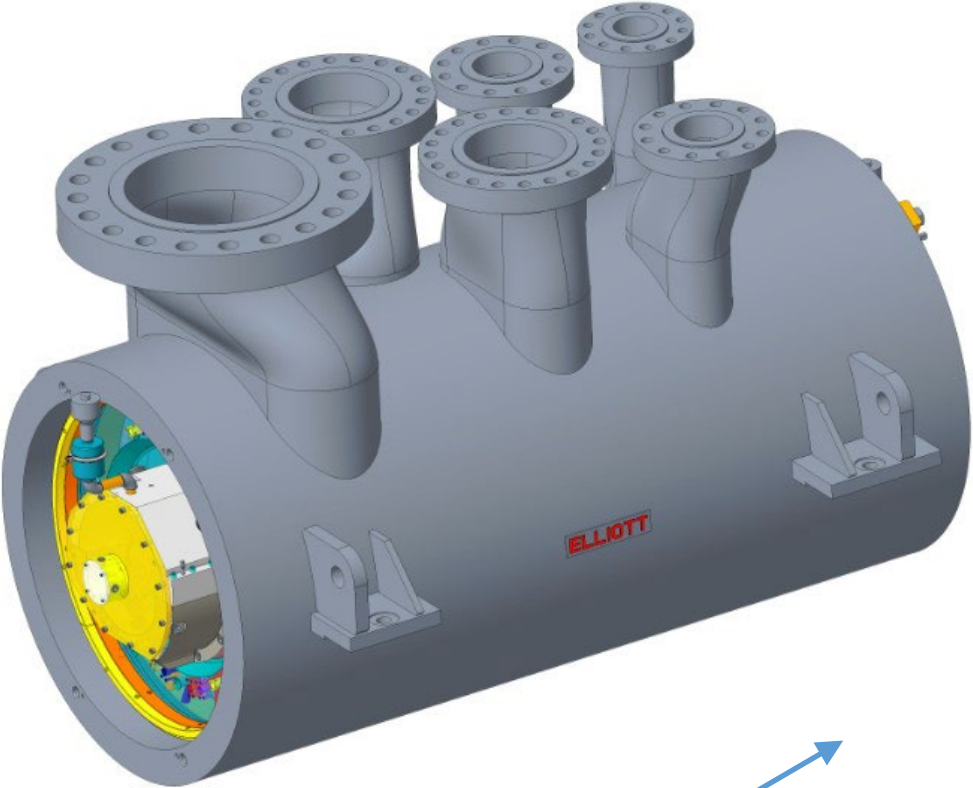
Integrally Geared Compressor

Hybrid Barrel Compressor And Pump



Double Iso Cooled Compressor with Pump
Two motor configuration

Hybrid CO₂ Compressor-Pump

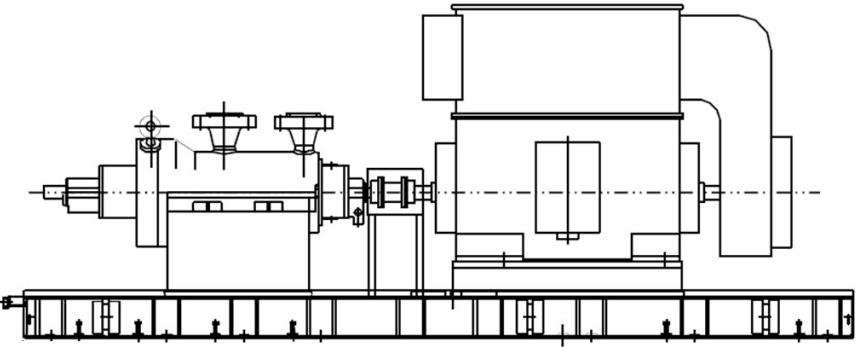


Below Critical Point:

- Multistage barrel compressor with intercooling

Above Critical Point:

- Multistage sCO₂ Pump

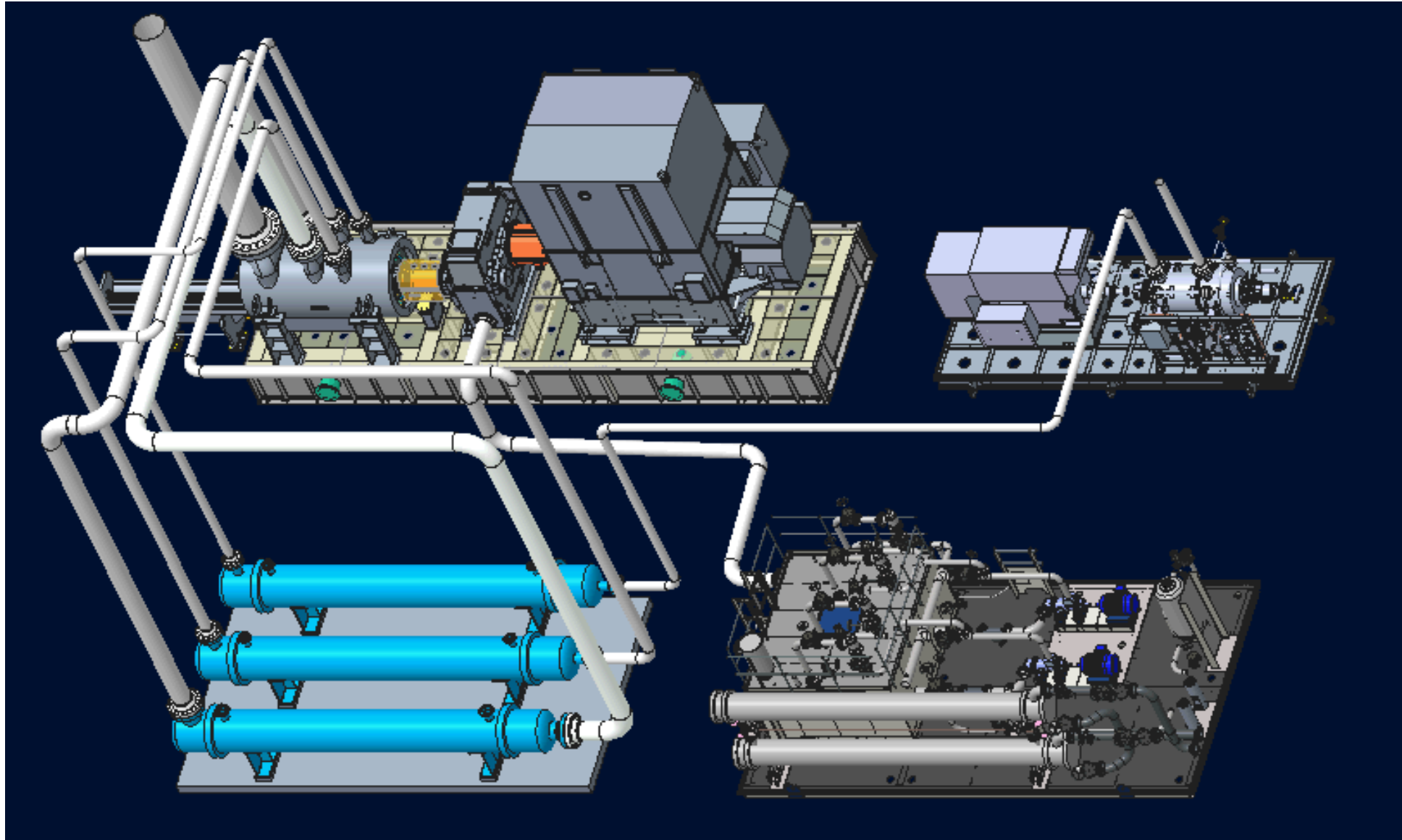


Layout of Hybrid Compressor-Pump (Example)

Multistage Compressor:
100% CO₂
20→1200 psia
30 kg/s
≈ 13,000 hp

Intercoolers:

- Water
- No.: 3

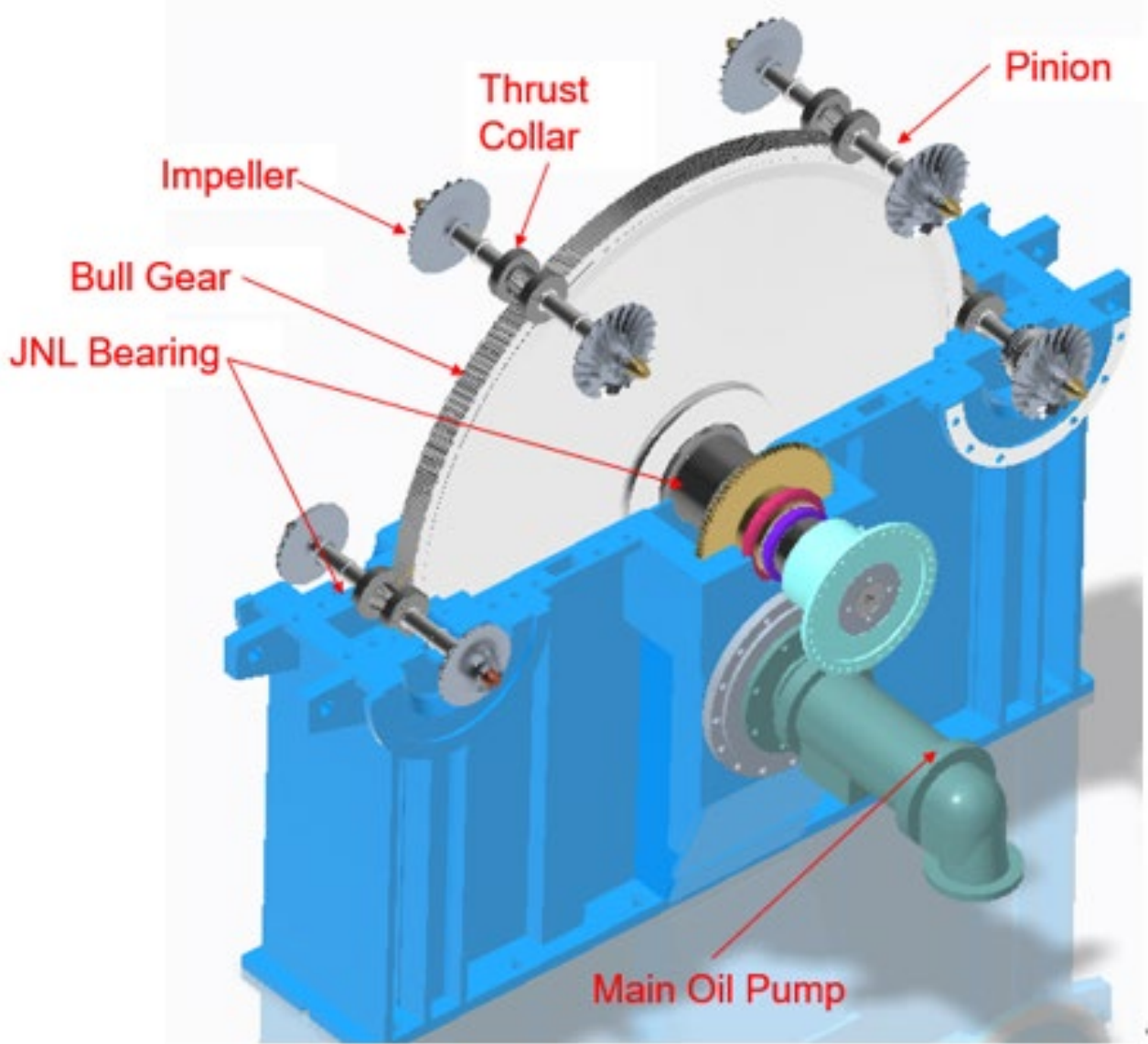
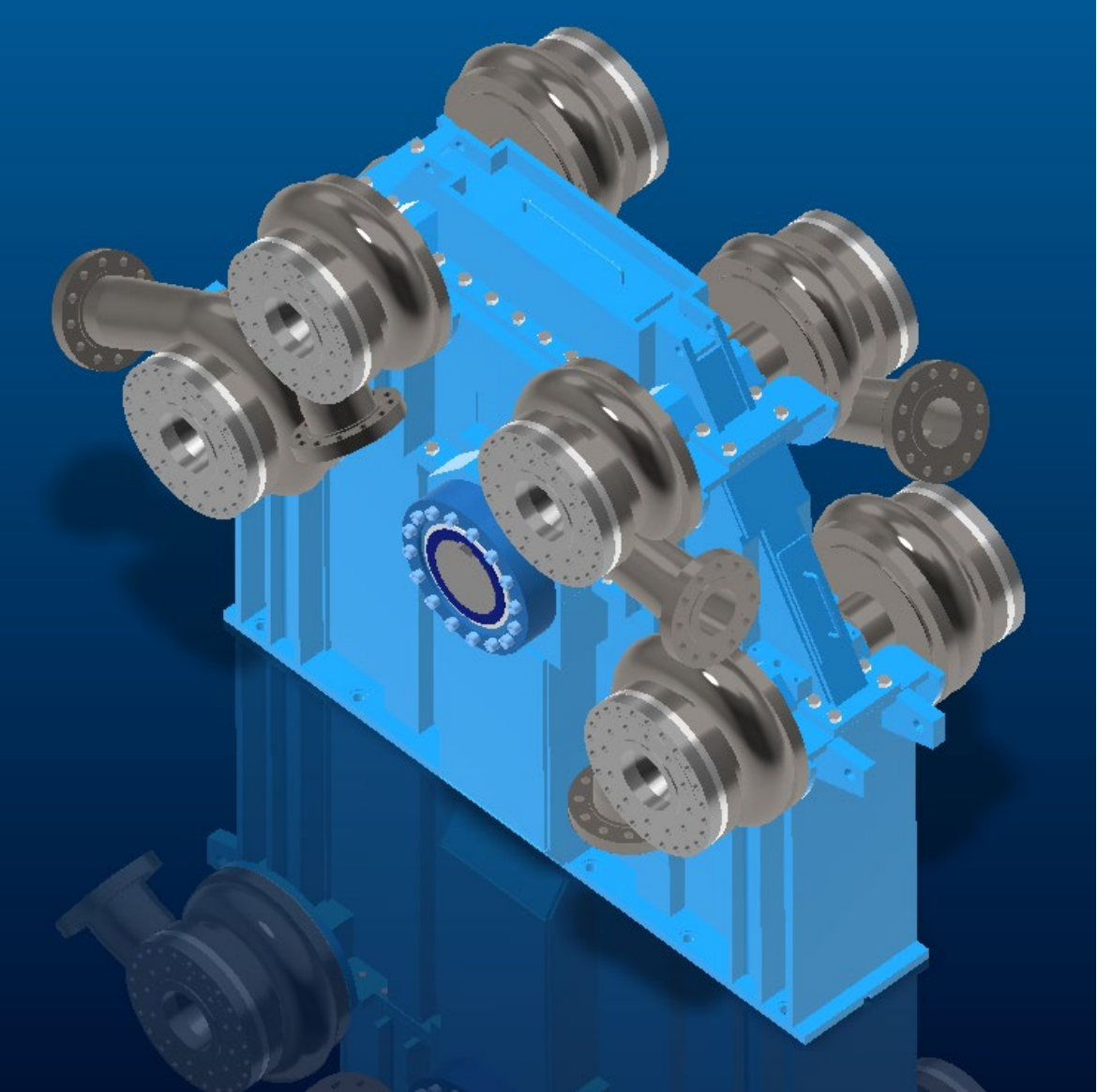


sCO₂ Pump:
1200→2200 psia
100% CO₂
30 kg/s
≈ 2,000 hp

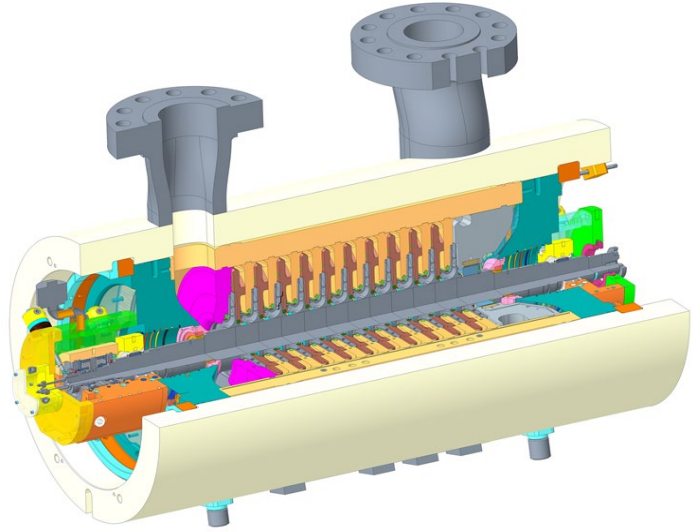
Ancillaries:

- Lube
- Seals

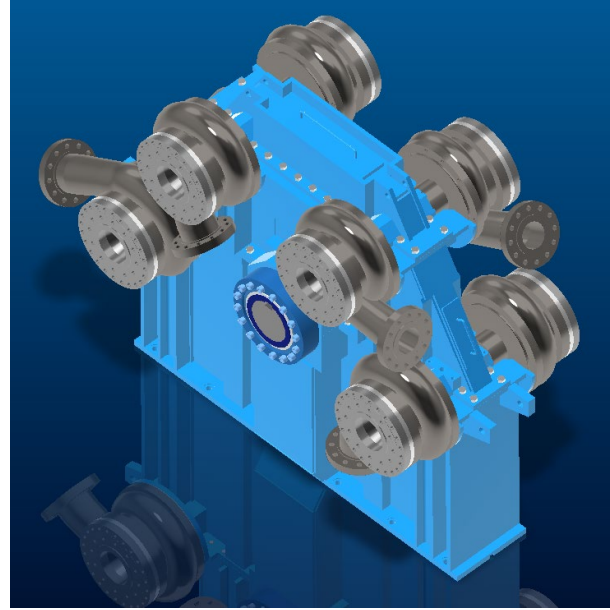
Integrally Geared Compressor



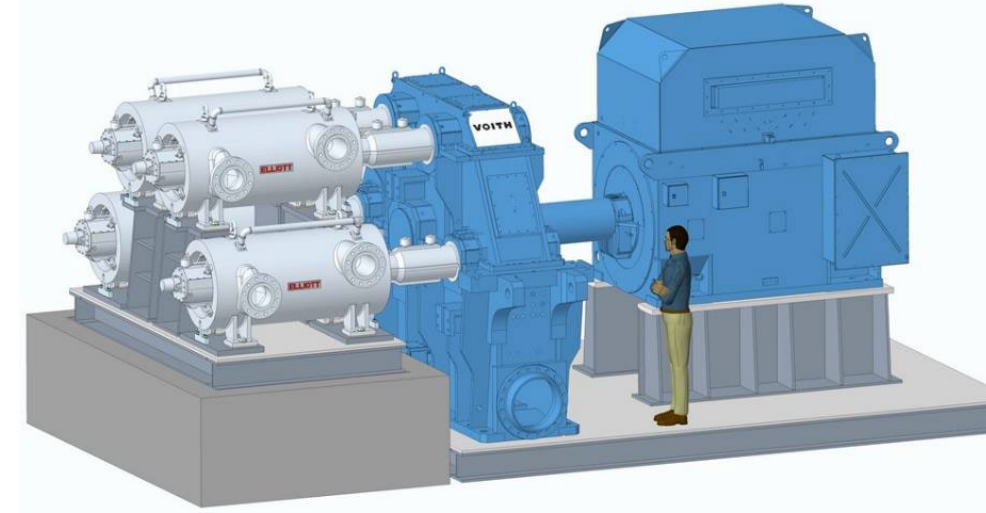
CO2 Compression Technology Options



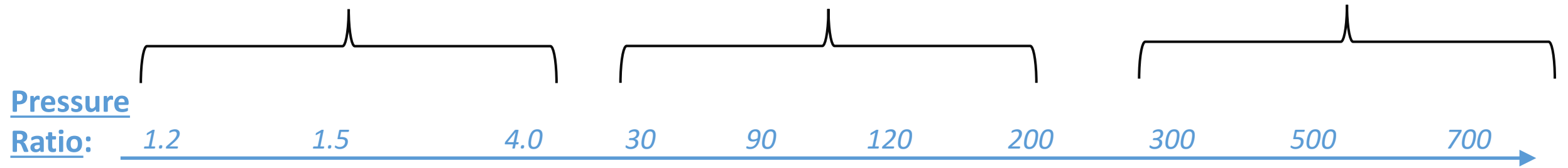
Conventional High Speed In-Line Centrifugal Compressors



Integrally Geared Conventional and High Speed Centrifugal Compressors



Flex-Op Multi-Body Centrifugal Compressors



Application:

Blower

Pipeline Transport

Pipeline Header

Production

Storage

Elliott-Ebara Turbomachines for Decarbonization of Energy Streams

- Centrifugal Compressors (API)
 - Barrel/Horizontal Split
 - Inline/Back-To-Back
- Axial Compressors (API)
- Steam Turbines (API)
- Single Valve Steam Turbines
- Gas Expanders
- Cryo Pumps
- Cryo Single Phase and Multi Phase Expanders
- Custom Pumps (hydrocarbons, sCO₂, ammonia, liquid hydrogen, etc.)



Elliott Centrifugal Compressor Train

Thanks a lot! Questions?



Klaus Brun, Ebara Elliott Company

kbrun@elliott-turbo.com

+1 210 262 2213

