Moomba to Cross-Border Carbon Capture and Storage Pipeline

APGA Conference
12th October 2021

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Moomba to Cross-Border Carbon Capture and Storage Pipeline

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Agenda

- Role of Carbon Capture and Storage
- Moomba CCS Project
  - Transmission of Supercritical CO_2
  - Avoidance of CO_2 Corrosion
  - Low Temperature Design
  - Fracture Mitigation
  - Safety Management
  - Material Selection
- Moomba CCS Project Status

Harry Evans

Blake Minge

Carbon Capture and Storage for Sustainable Energy

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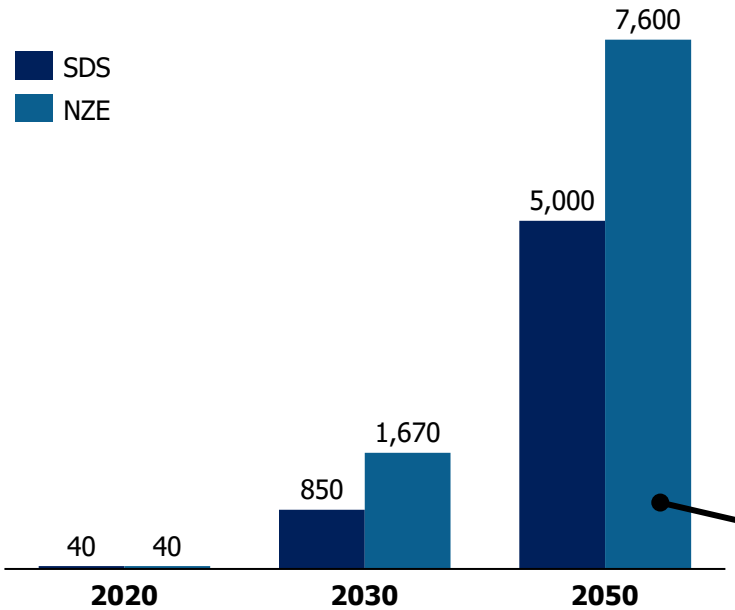
CCS is an established technology, which requires rapid expansion to achieve the IEA Sustainable Development (SDS) and Net-Zero (NZE) Scenarios

CCUS Capacity under IEA SDS and NZE Scenarios (mtpa)



~95% of CO2 captured in 2050 is stored in permanent geological storage

Global CCS Projects (>0.5 Mt CO2 p.a.)

Project	Location	Year Operational	Size (Mt CO_2 p.a.)
Sleipner	Norway	1996	0.9
In Salah	Algeria	2004*	1.0-1.2
Snohvit	Norway	2008	0.7
Quest	Canada	2015	1.2
Gorgon LNG	Australia	2019	3.3-4.0
Qatar LNG CCS	Qatar	2019	2.1

Source: IEA Net Zero by 2050, IEA World Energy Outlook 2020, MIT Carbon Capture & Storage Technologies Project Database: https://sequestration.mit.edu/tools/projects/storage_only.html
* In Salah ceased operation in 2011

Moomba Carbon Capture and Storage Project Overview

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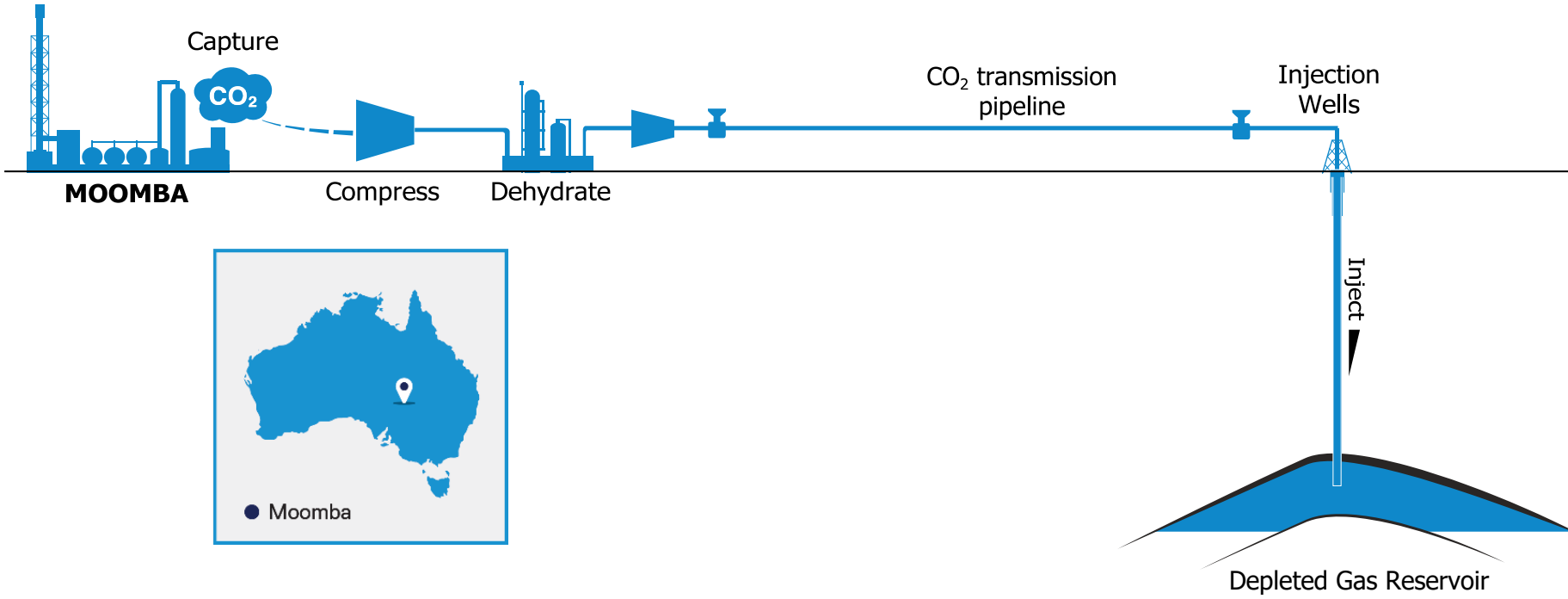
1.7 Mt CO_2 p.a. captured from Moomba and permanently stored in Cooper Basin depleted gas reservoirs



Transmission of Supercritical CO_2

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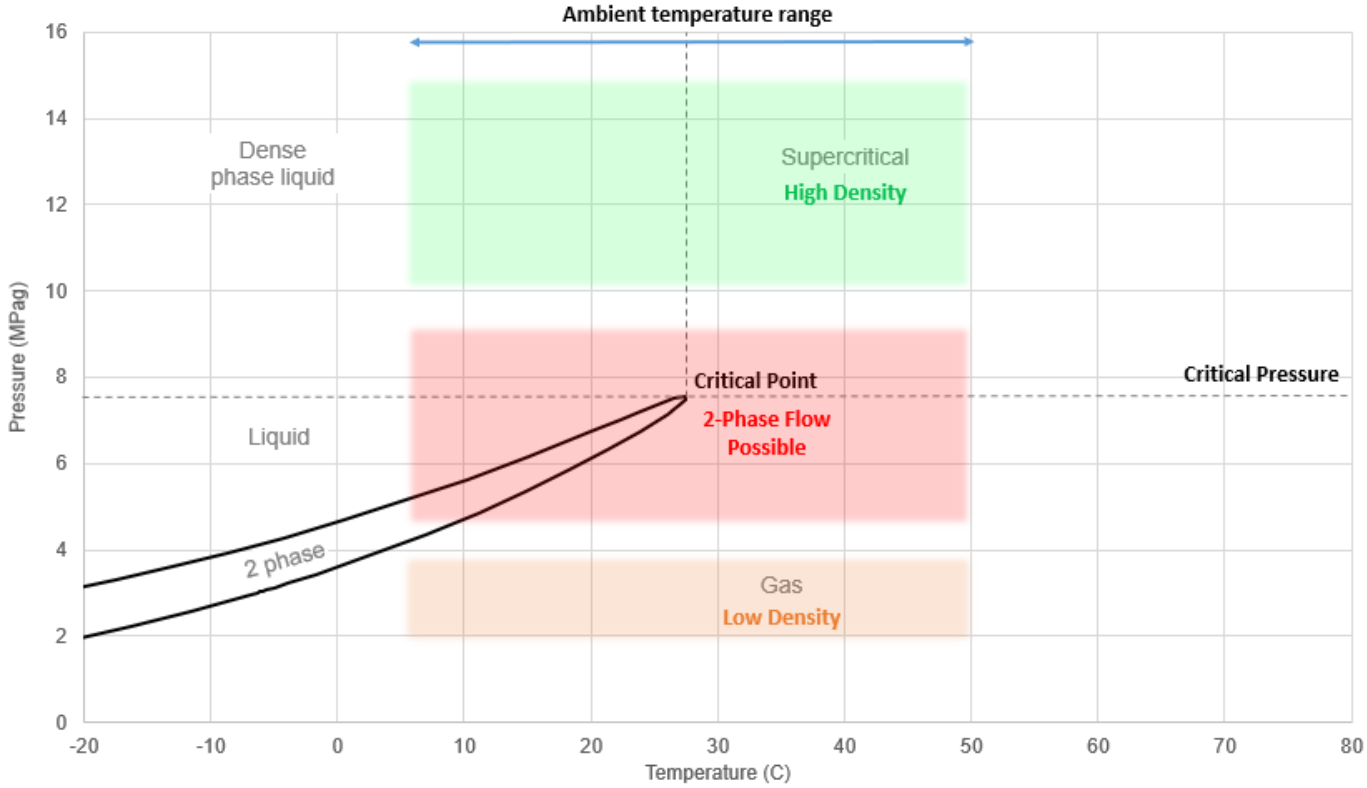
Long distance transport of CO_2 is best suited to conditions above the fluids critical pressure, increasing fluid density and avoiding 2-phase flow



Process Phase Envelope

Transmission of Supercritical CO_2

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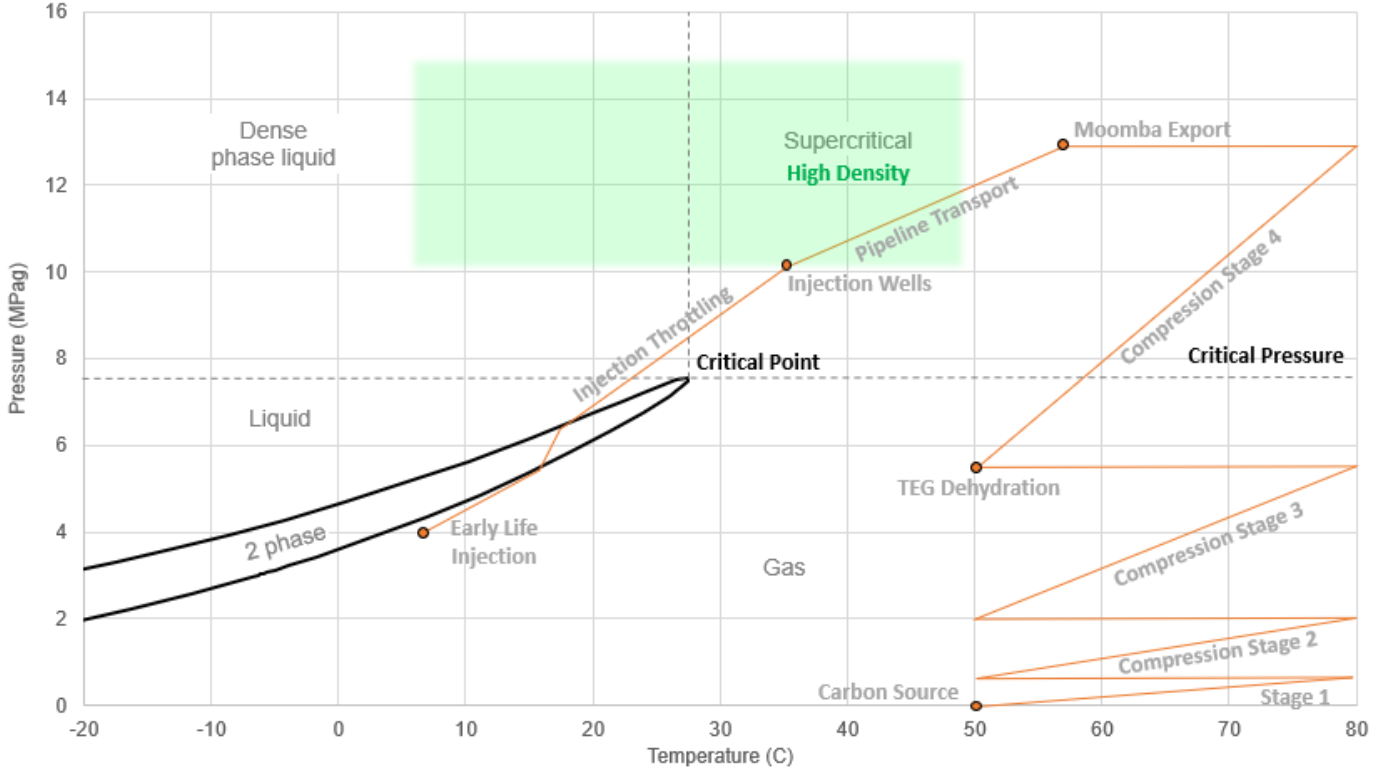
The Moomba CCS project avoids two-phase flow within the pipeline and within the Moomba compression facility



Process Phase Envelope

Indicative Moomba CCS Process

Avoidance of CO_2 pipeline corrosion

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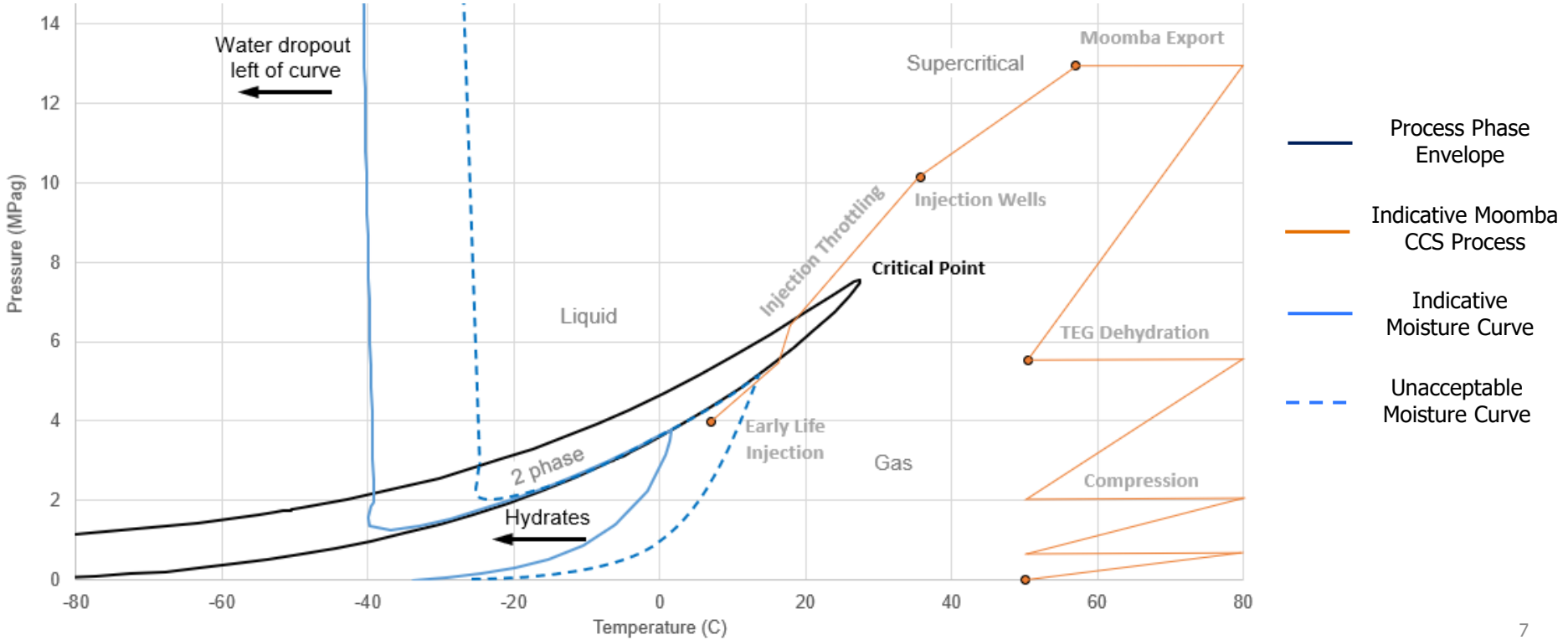
CO_2 dehydration avoids potential for free water drop out and hydrate formation under routine operating scenarios



Low Temperature Design

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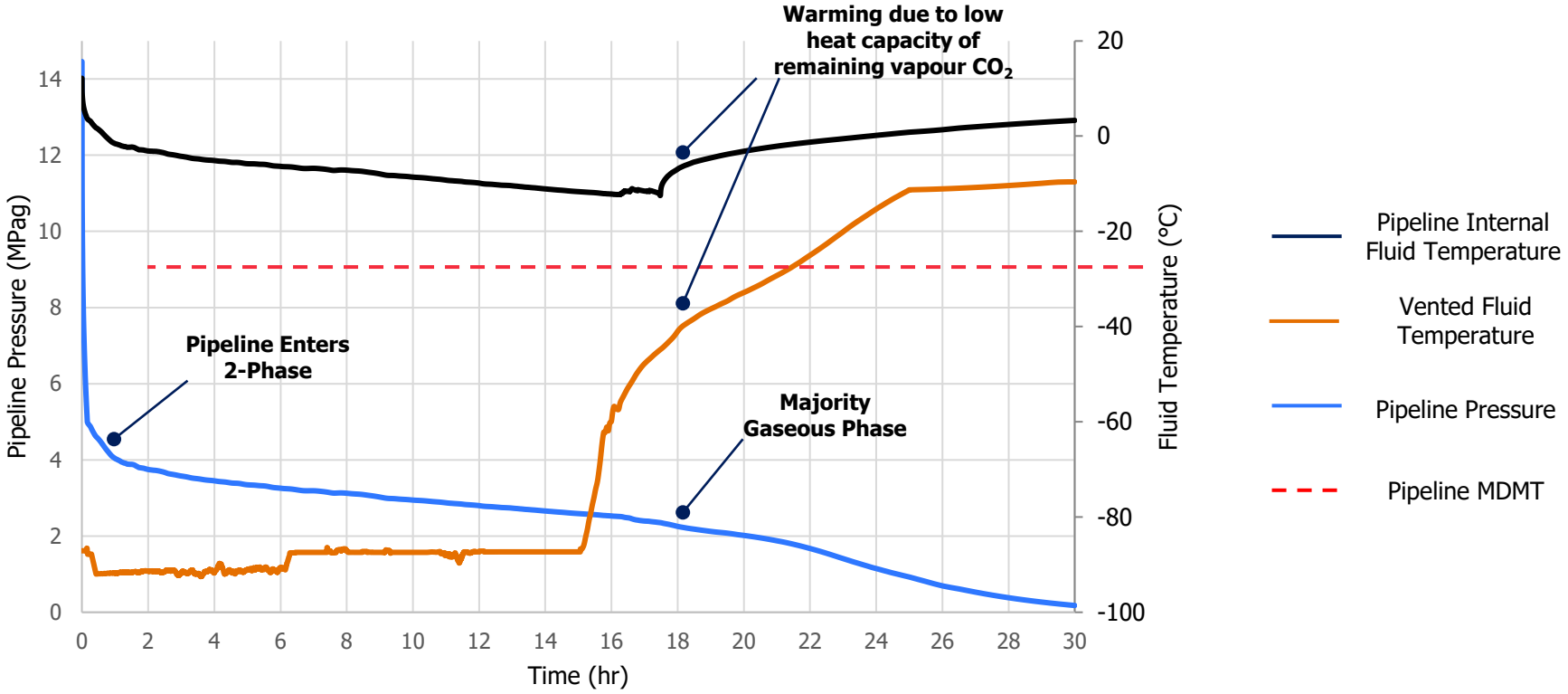
Slow controlled depressuring is key for operation of blowdown vent



Pipeline Fracture Mitigation

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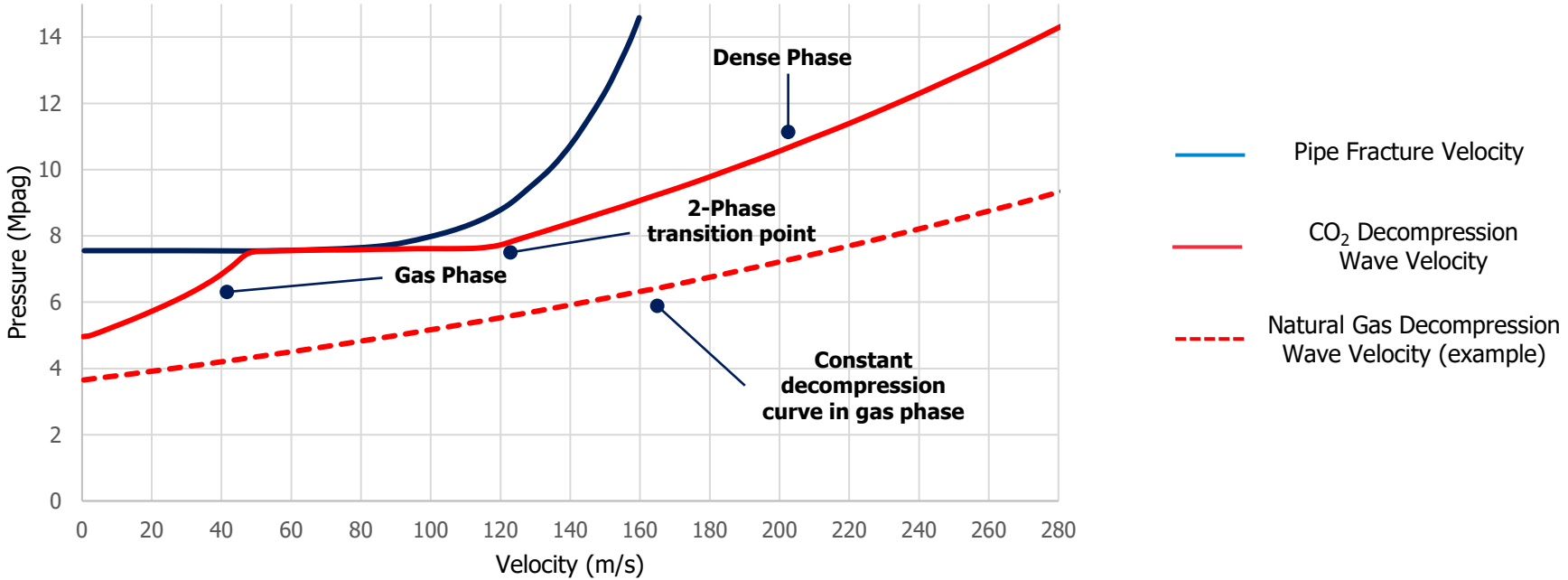
Running ductile fracture requires particular attention due to characteristics of depressuring dense phase CO_2 when compared to Natural Gas



Safety Management

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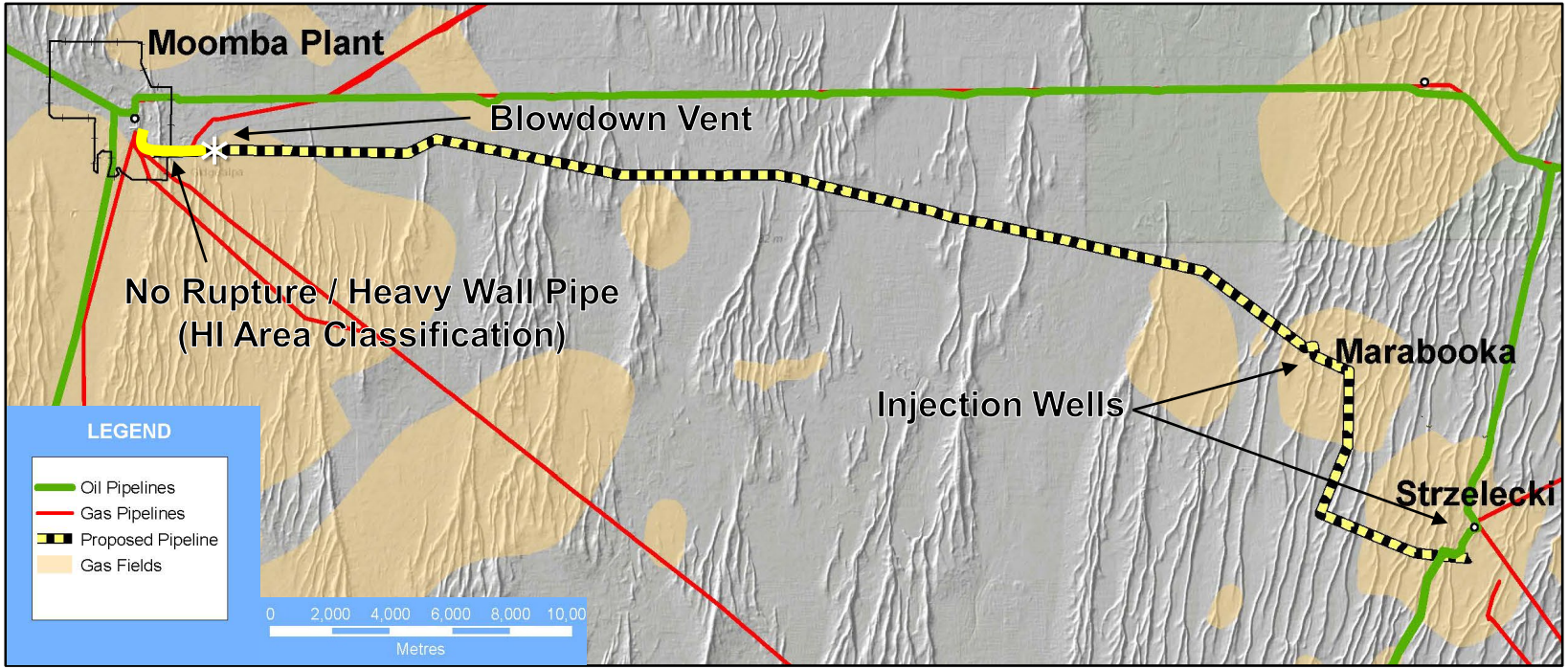
Dispersion modelling has informed the safety management plan



Material Selection Overview

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Design for dense phase CO_2 with sour service

Component	Driving Design Considerations
Line Pipe	Penetration resistance (Heavy wall / no rupture sections) Fracture Control NACE Requirements Minimum temperatures Cost and availability
Vent Pipework	NACE Requirements Severe Low Temperatures
Valves	NACE Requirements CO_2 effect on soft goods Minimum Temperatures
Station Piping	NACE Requirements Minimum Temperatures

Moomba CCS Project Summary

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- ✓ FEED complete and FID-ready pending ACCU eligibility Q3/4 2021
- ✓ Design collaboration with domestic engineering firms and international CO_2 Pipeline Operators
- ✓ Moomba advantaged with large scale CO_2 source and well understood containment reservoirs
- ✓ Develops Australian CCS Industry
- ✓ Enables future clean hydrogen production