co2crc
Building a low emissions future

Otway International Test Centre

Leverage research / laboratory infrastructure for upscaling and standardization of results from test facilities

Dr Max Watson

Senior Manager – Technology Development

27 June 2022

CSLF Technical Group Meeting, Bergen Norway

CO2CRC is a world leader in applied CCUS research

We do research and commercially relevant demonstrations in CCUS applications.

We build and operate first of a kind plant and equipment.

We develop industry led technology options to accelerate commercial deployment.

We own and operate the Otway International Test Centre in South-West Victoria, Australia.

Optimising Storage **Reducing Capture Costs** **Enhancing CO_2 Utilisation** **Collaboration and Leadership**

co2crc
Building a low emissions future

Otway International Test Centre

CO2CRC's Otway International Test Centre enables field scale research and development of CCUS & H_2 storage technologies for commercial deployment.

co2crc
Building a low emissions future

Otway International Test Centre

Otway Stage 1 (Concept): 2004 – 2009

- ✓ Demonstrated safe transport, injection and storage of CO_2 into a depleted gas reservoir

Otway Stage 2 (Risk Reduction): 2009 – 2019

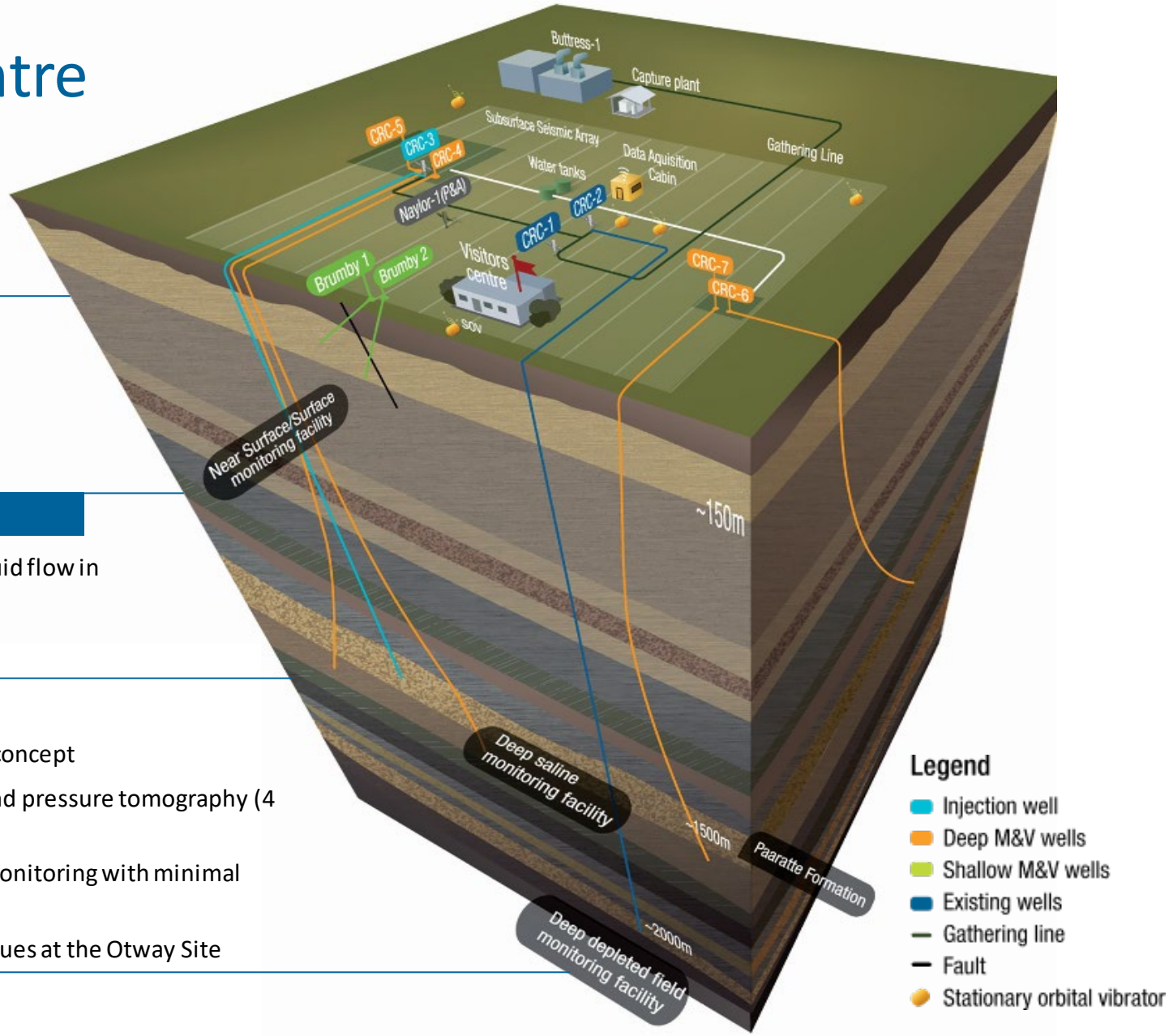
- ✓ Demonstrate safe injection of CO_2 into a saline formation
- ✓ Stage 2B – Near well residual & solution trapping characterisation
- ✓ Stage 2C – Minimum detection, 4D M&V & Plume stabilisation

Otway Shallow CO_2 Migration (Appraisal): 2016 - 2020

- ✓ Improve capability to predict the role of faults in controlling CO_2 fluid flow in the near surface;
- ✓ Improve near surface monitoring capabilities

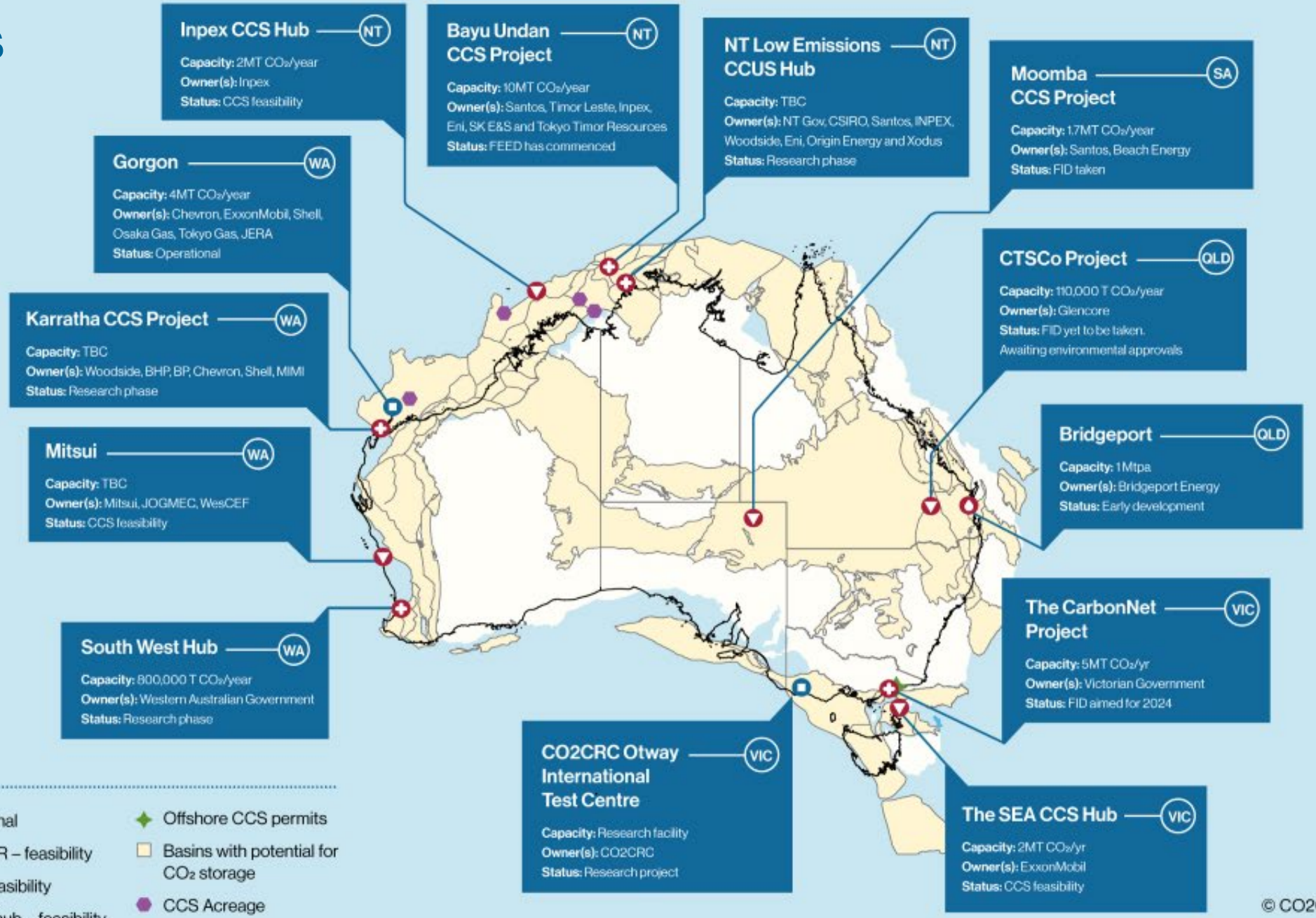
Otway Stage 3: 2015 – 2022

- ✓ Develop an "on-demand", sub-surface and permanent monitoring concept
- ✓ Two primary technologies - sub-surface seismic data acquisition and pressure tomography (4 new monitoring wells)
- ✓ Field test the various techniques to demonstrate lower cost CO_2 monitoring with minimal surface and environmental impact
- ✓ Demonstrate regulatory and community acceptance of the techniques at the Otway Site



Building a low emissions future

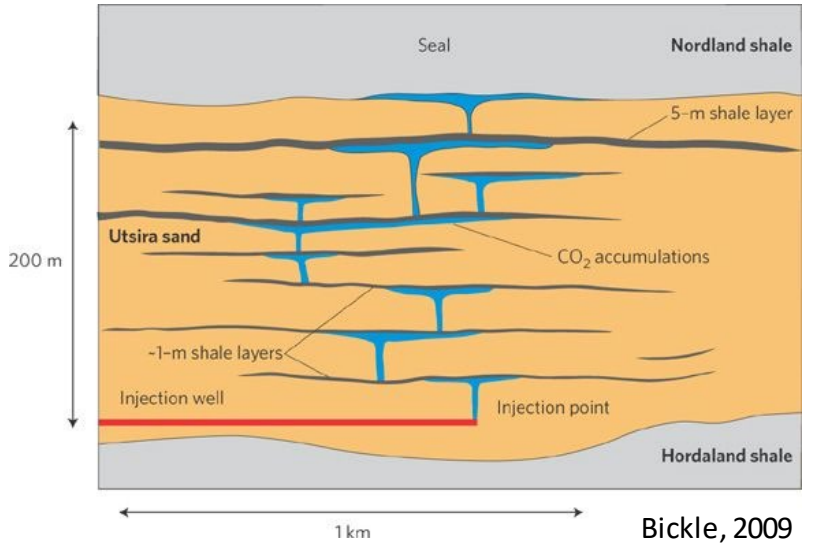
CCUS Projects 2022



CO2CRC
Building a low emissions future

Optimising CO_2 Storage

- Injected CO_2, particularly for high quality reservoirs, can bypass a large portion of available pore space resource
- Applying storage optimisation techniques can increase utilised storage capacity and reduce costs by:
  - Improving CO_2 sweep / penetration into heterogeneous and low permeability zones of a reservoir
  - Increasing residual trapping and dissolution of CO_2
  - Through economies of scale a higher CO_2 storage rate/volume decreases cost per tonne CO_2 stored
  - Limiting areal region accessed by CO_2, reducing monitoring operational (and risk based) costs
  - Reducing the number of injection wells, reducing capital costs
- An understanding of optimisation processes can potentially accelerate site development approvals, increase viability for large scale CO_2 storage hubs and enable previously discounted poorer quality reservoirs.



Bickle, 2009

P	Technology Type	Prior R&D and application	Technology Readiness Level (TRL)	Technology Prospectively
1	Microbubble CO_2 Injection	Laboratory and Modelled, prototype	TRL 4	High potential
2	Swing Injection	Laboratory and Modelled	TRL 3	High potential
3	Increased Injection Pressure	Laboratory and Modelled	TRL 3	High potential
4	Active Pressure Relief (increase sweep & reduce lateral spread)	Enhanced Oil Recovery (EOR), planned for Gorgon CO_2 injection project	TRL 6	High potential
5	Foams (block high permeability pathways)	EOR	TRL 6	Reasonably well understood
6	Passive Pressure Relief	Modelled	TRL 4	Limited effectiveness
7	Polymers (increase formation water viscosity)	EOR	TRL 7	Reasonably well understood
8	Surfactants (reduce residual saturation of formation water)	EOR	TRL 7	Reasonably well understood
9	CO_2 saturated water injection & geothermal energy	Laboratory and Modelled	TRL 3	Site specific & lower volume

Carbon Sequestration Leadership Forum, 2019

OITC Forward plans

Otway Stage 4: 2020 – 2026

- Demonstrate commercially-focused reservoir management technologies to improve injection, storage, and monitoring efficiencies, and thereby materially lower project costs.

Otway Shallow CO_2 Migration (Injection) 2022 - 2025

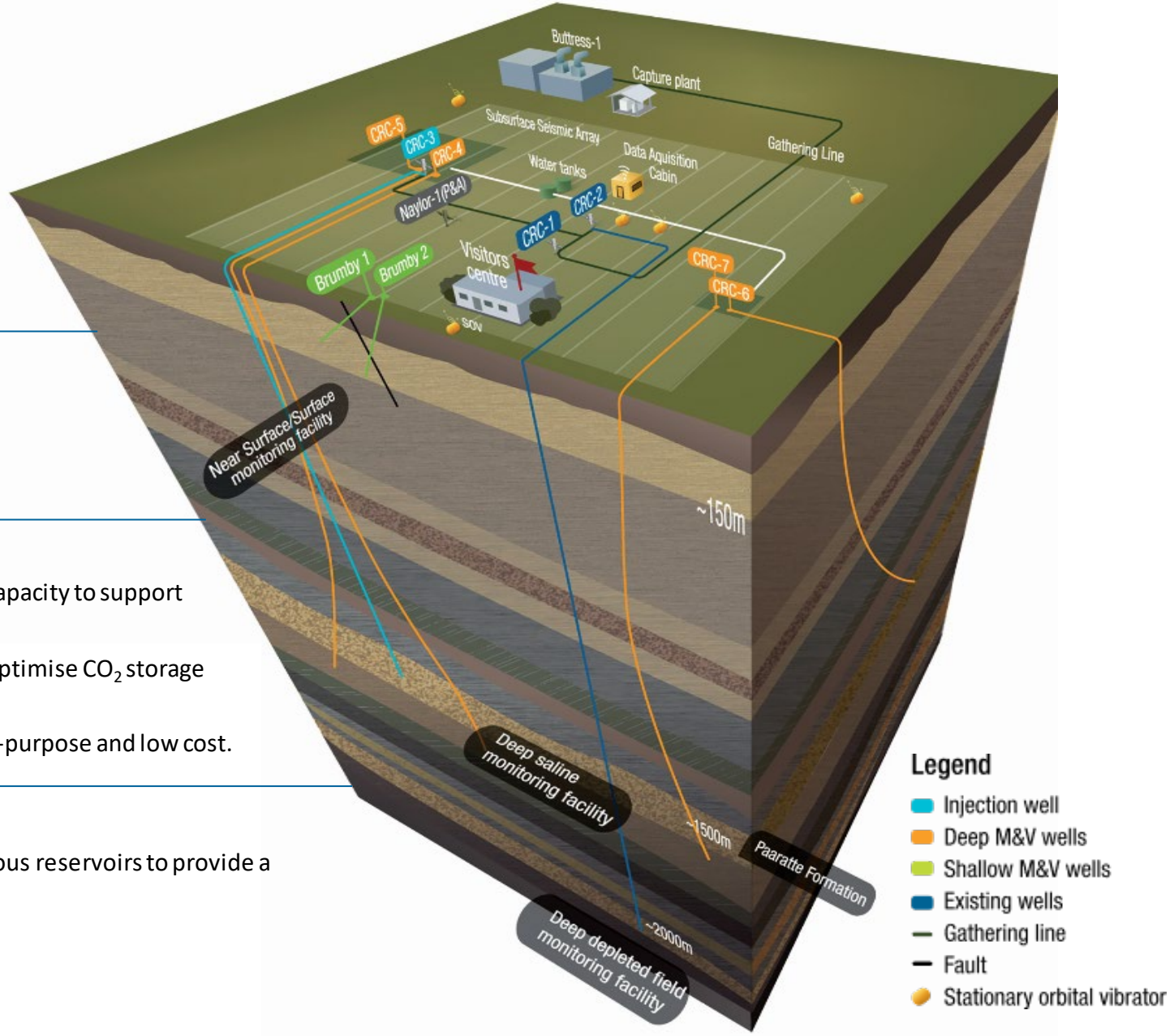
- Distributed Strain Sensing and Reverse VSP trials
- Assessment of capability to predict the role of faults in controlling CO_2 fluid flow in the near surface

Otway Deep Projects (Optimisation): 2020 – 2027

- Improved modelling workflow, with sufficient predictive capacity to support performance-based closure.
- Demonstrate a suite of technologies and workflows that optimise CO_2 storage usage while minimising capital and operating costs.
- Develop storage 'performance' monitoring which is fit-for-purpose and low cost.

Underground Hydrogen Storage Demonstration: 2021 – 2028

- Field scale demonstration of underground hydrogen storage in porous reservoirs to provide a platform for technology development.



Building a low emissions future

Otway International Test Centre

Key Success Factors

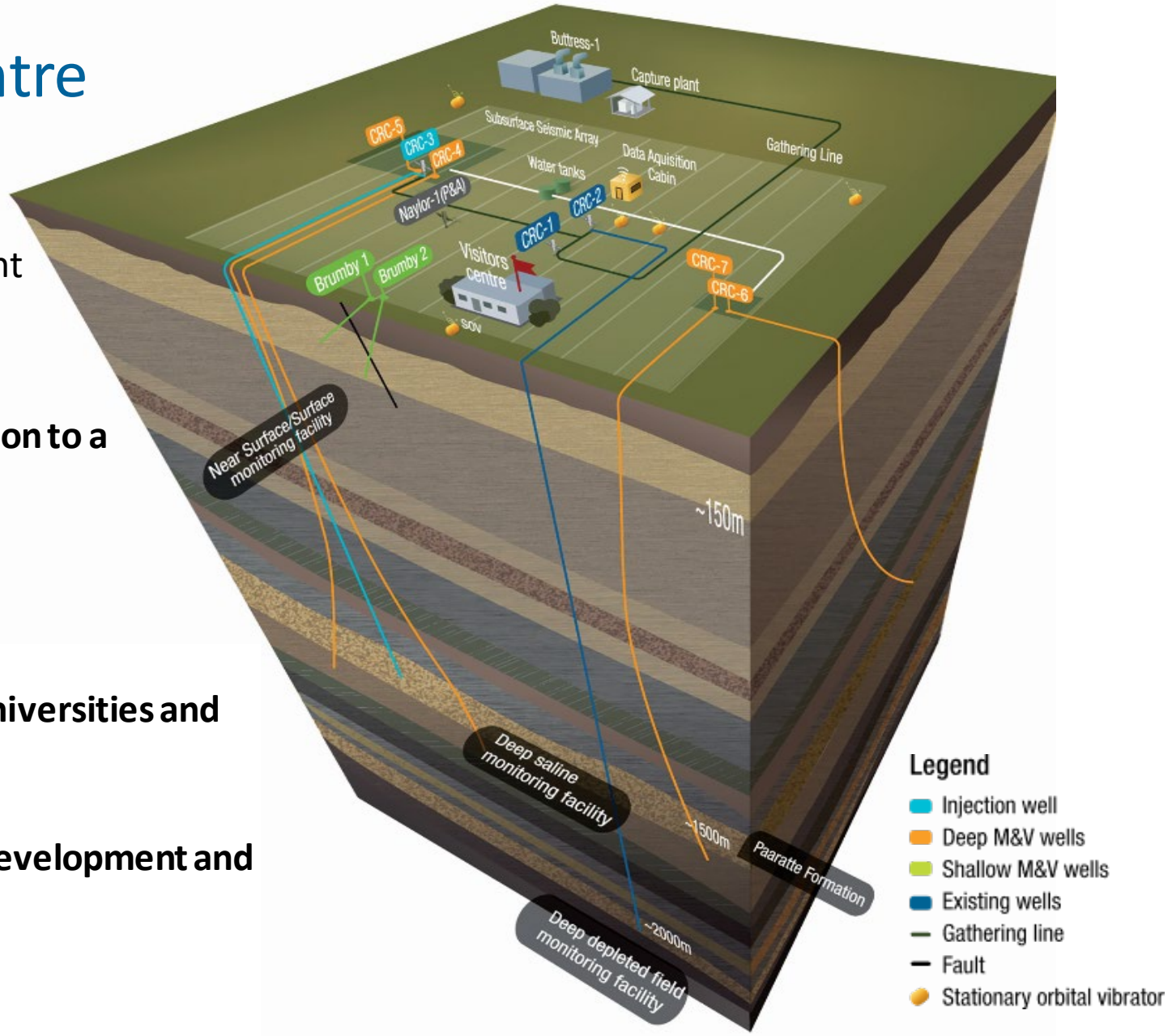
At scale investment - Long term Government and Industry funding

Focused on **accelerating Australia's transition to a low emissions future**

Industry led Research

Well-established **collaboration between universities and industry**, nationally and internationally

Globally unique test centre to **accelerate development and commercial deployment** of technologies



CO2CRC
Building a low emissions future

CO2CRC acknowledges and appreciates the strong relationships it has with industry, community, government, research organisations, and agencies in Australia and around the world