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# $CO_2$ Storage & Low-Carbon Gas Opportunities in Georgia

## Block Energy Plc


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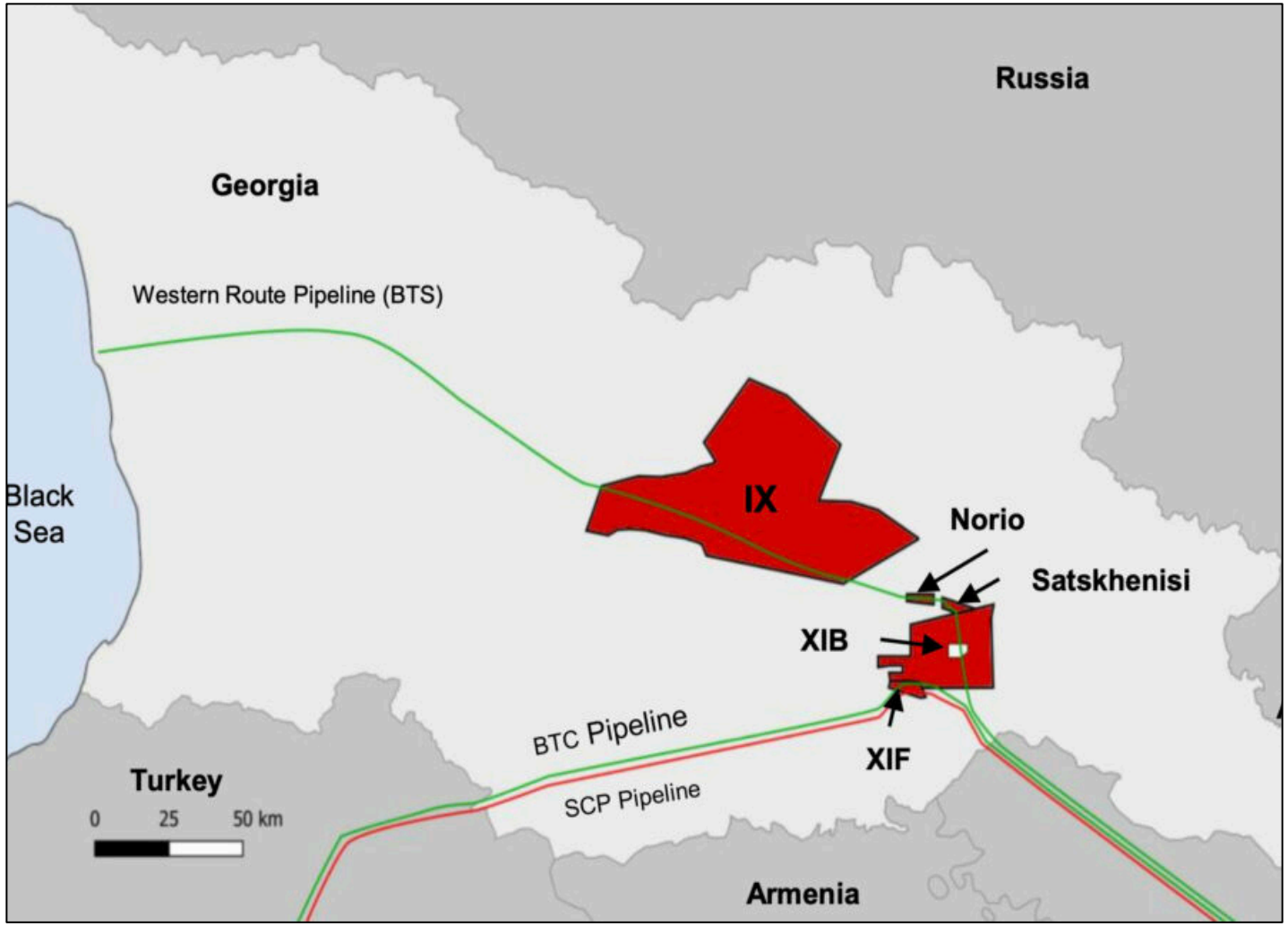
# $CO_2$ Storage & Mineralisation

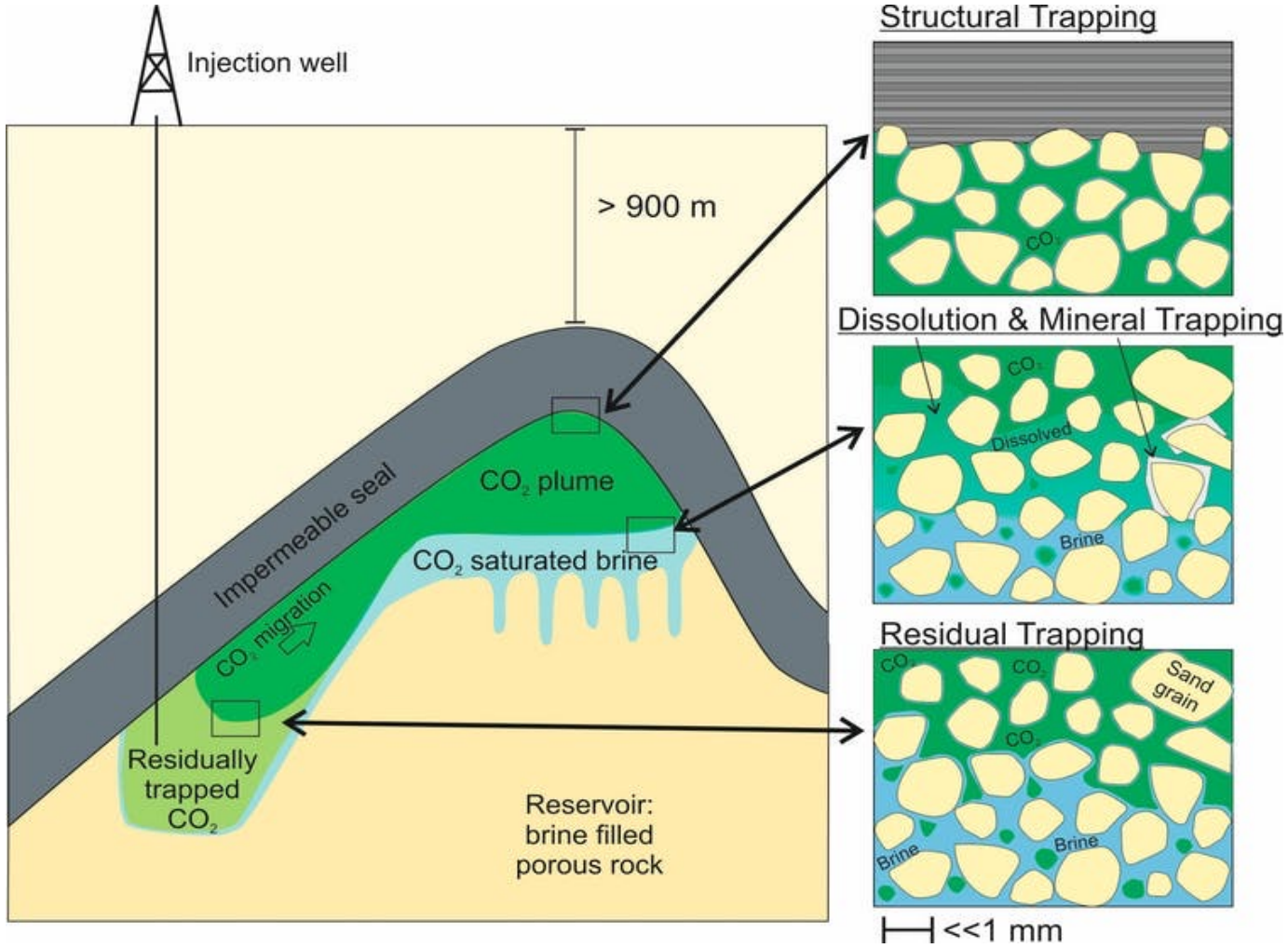
# $CO_2$ Storage Capacity

- **Reservoir scale e.g Patardzeuli**: 256Mt $CO_2$ Storage (55 million cars)

- **Basin scale e.g Block XIB/F**: up to 8.7Gt $CO_2$ (Türkiye emissions – 20 years)



# $CO_2$ Storage Overview

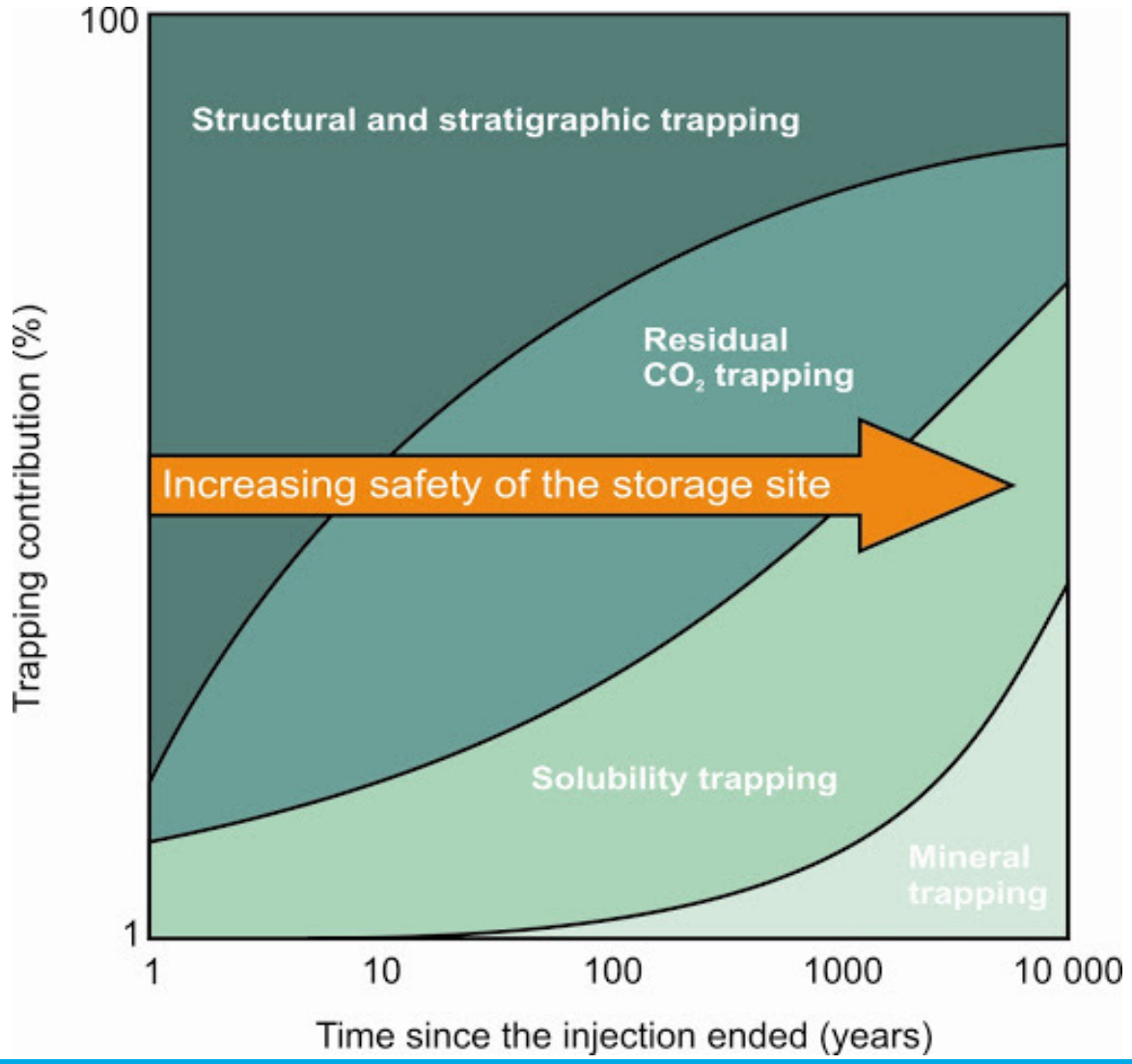


# $CO_2$ Storage Overview

Capture the $CO_2$ – usually direct exhaust from power station/industrial process. Store the $CO_2$ four main ways:

Increased Storage security

1. Structural trapping
2. Residual trapping
3. Dissolution/Solubility Trapping
4. **Mineral Trapping (Mineralisation)**

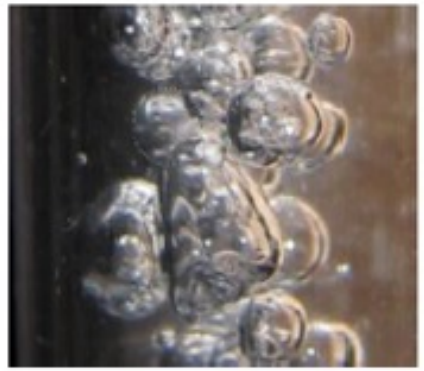


# Mineral Trapping

## Immediate solubility storage, gradual mineral storage through natural chemical processes

Photo: J. Alean

Basalt



$CO_2$ dissolved in water

Photo: H. Sigurdardottir

Carbonates

$(Ca^{2+},Mg^{2+},Fe^{2+})(aq)$ + $HCO_3 + H^+ =$ **$CO_3^{2-} + 2H^+$** (pH 3.5) = $CO_3(Ca,Mg,Fe)$

# In Practice – CarbFix Injection Well


## Carbonates

- Mainly Calcite ($CaCO_3$)
- 95% mineralisation of injected $CO_2$ in one year.
- Successfully injected >100,000 tonnes of $CO_2$

# Trade Offs

## Challenges

- Requires an **abundance** of the right minerals (easy to dissolve & right elements)
- Large water requirments (20 tonnes of water to dissolve 1 tonne of $CO_2$)
- Thermodynamics need to be right

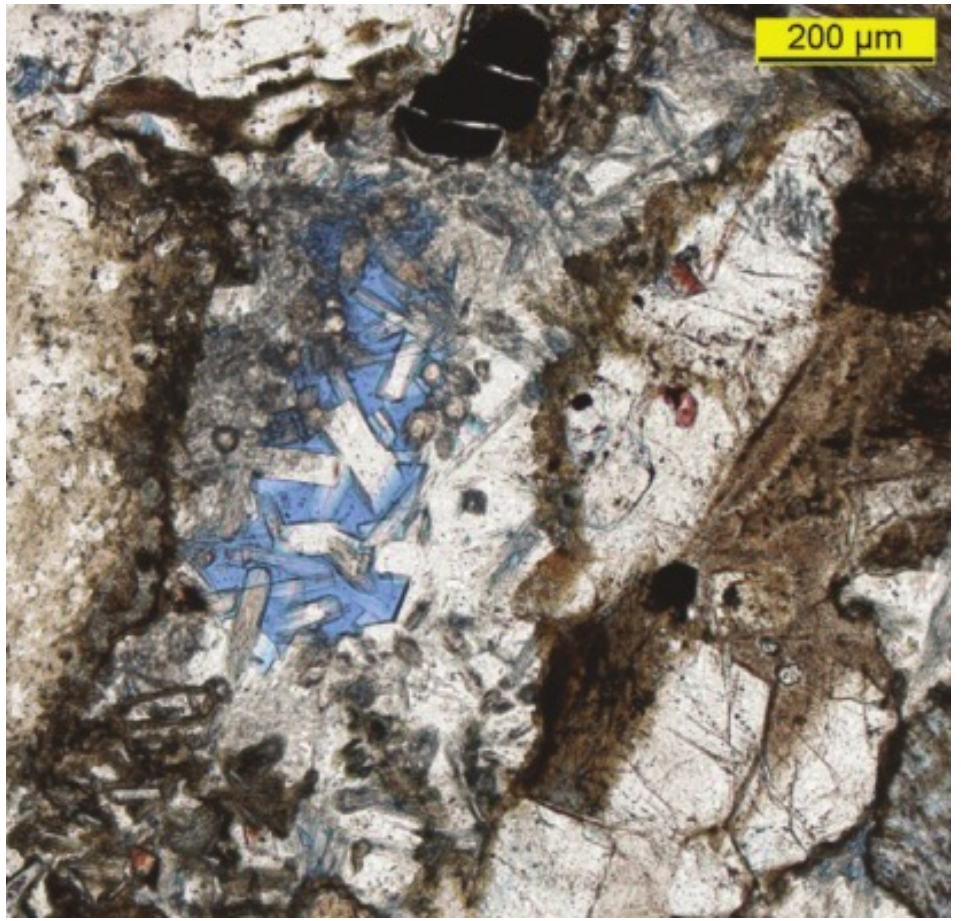
## Advantages

- Does not require a cap rock
- Cheaper – as $CO_2$ does not have to be highly compressed
- Very high capacity & rates in the right places
- Very low chance of leaks due to physically fixating the $CO_2$

# Project III & $CO_2$ Storage Potential

# $CO_2$ Storage Potential

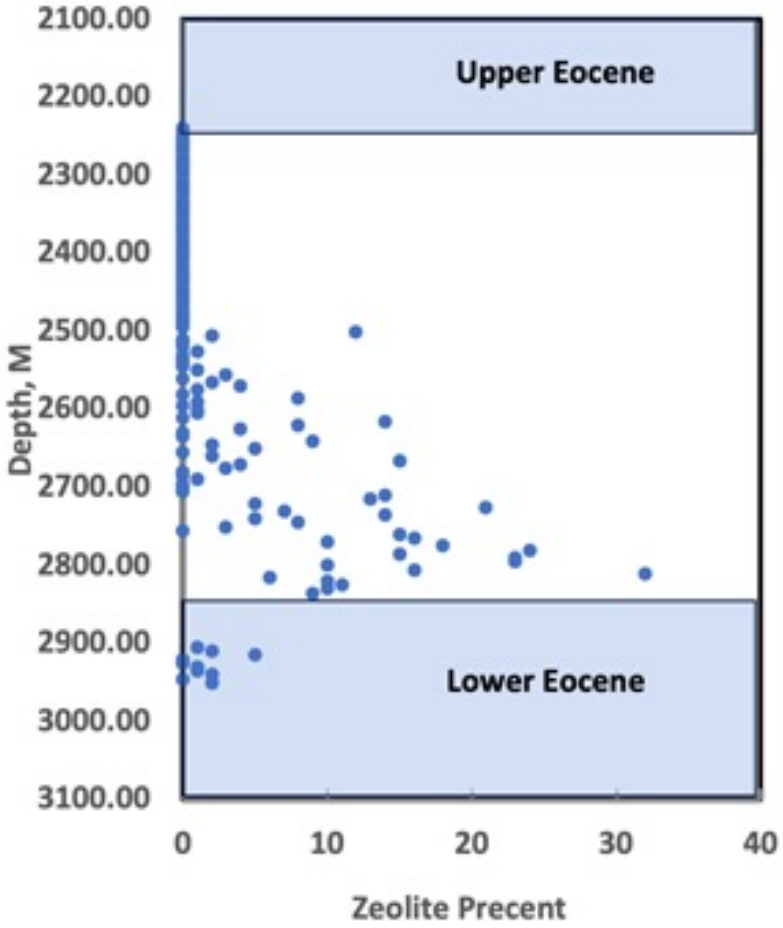
- Middle Eocene volcaniclastic sequence in central Georgia – **prolific hydrocarbon basin**
- Previously un-examined for its $CO_2$ storage potential
- Study commissioned by Block Energy with leading $CO_2$ Storage consultancy OPC supported by Prof. Eric Oelkers




Zeolite cement occluding intragranular pore space

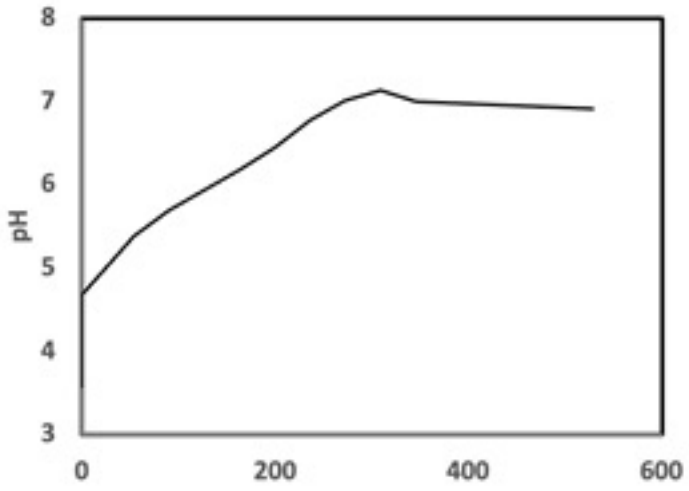
# Middle Eocene Volcaniclastics

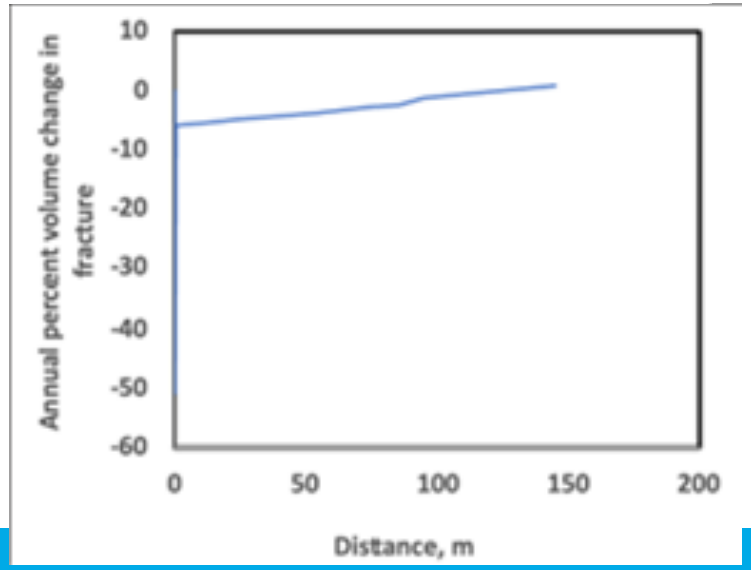
- 600m thick from 2400-3000m depth
- Abundance in Zeolites, a **highly reactive** mineral with large amounts of calcium
- An active aquifer with fresh-brackish water, possibly of the order of a billion barrels
- Ideal pressure/temperature conditions
- Connected fracture system



# Results – Carbonation Rates

- Geochemical modelling: **250 days** for 95% carbonation ($CO_2$ fixated as a rock). Compared to 1,000 years in sedimentary systems
- Increase in fracture size – promote well injectivity productivity
- Reactions are pore space negative – meaning they create more space



# Results – $CO_2$ Storage Capacity

- **Reservoir scale**: 256Mt $CO_2$ Storage (55 million cars)

- **Basin scale**: up to 8.7Gt $CO_2$ (Türkiye emissions – 20 years)
  - Within the Tbilisi area

- **Limits**: water injection capacity. Project III supply 30 mbbl/d water with capacity to scale >100 mbbl/day
- **Injection rates:** Initial 0.1-0.3Mt/year.

<u>Highly favourable unique area for permeant, abundant, $CO_2$ storage</u>

# Opportunities

- Opportunities for developing net-zero industry
  - Hydrogen
  - Fertilizer
  - Steel
  - Refined petroleum products
- Decarbonising electricity production
- Carbon credit market development & commercialisation

# Thank you

- Max Richards, OPC
- Stephen James, Subsurface Manager – Block Energy
- Paul Haywood, CEO – Block Energy

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