# From Field Lessons to the Future of CCUS Monitoring with DFOS

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and the Silixa Team

Aberdeen, 8th June 2026

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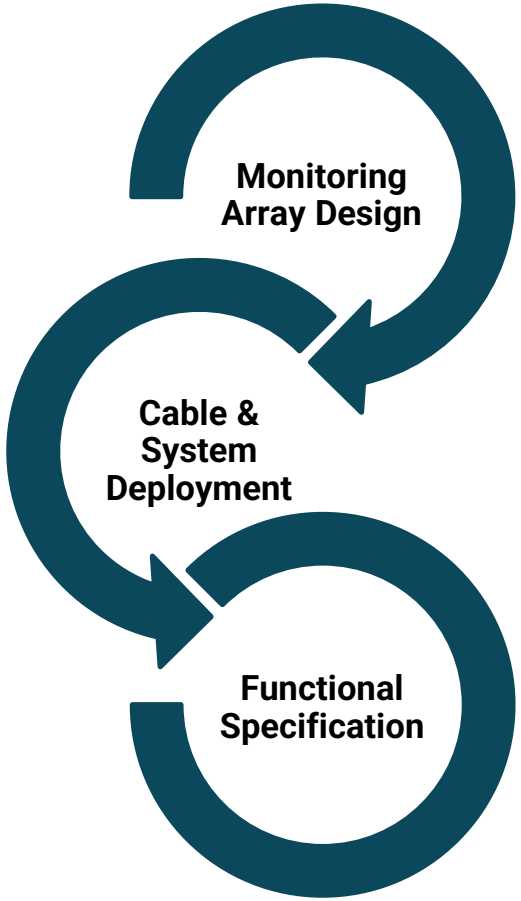
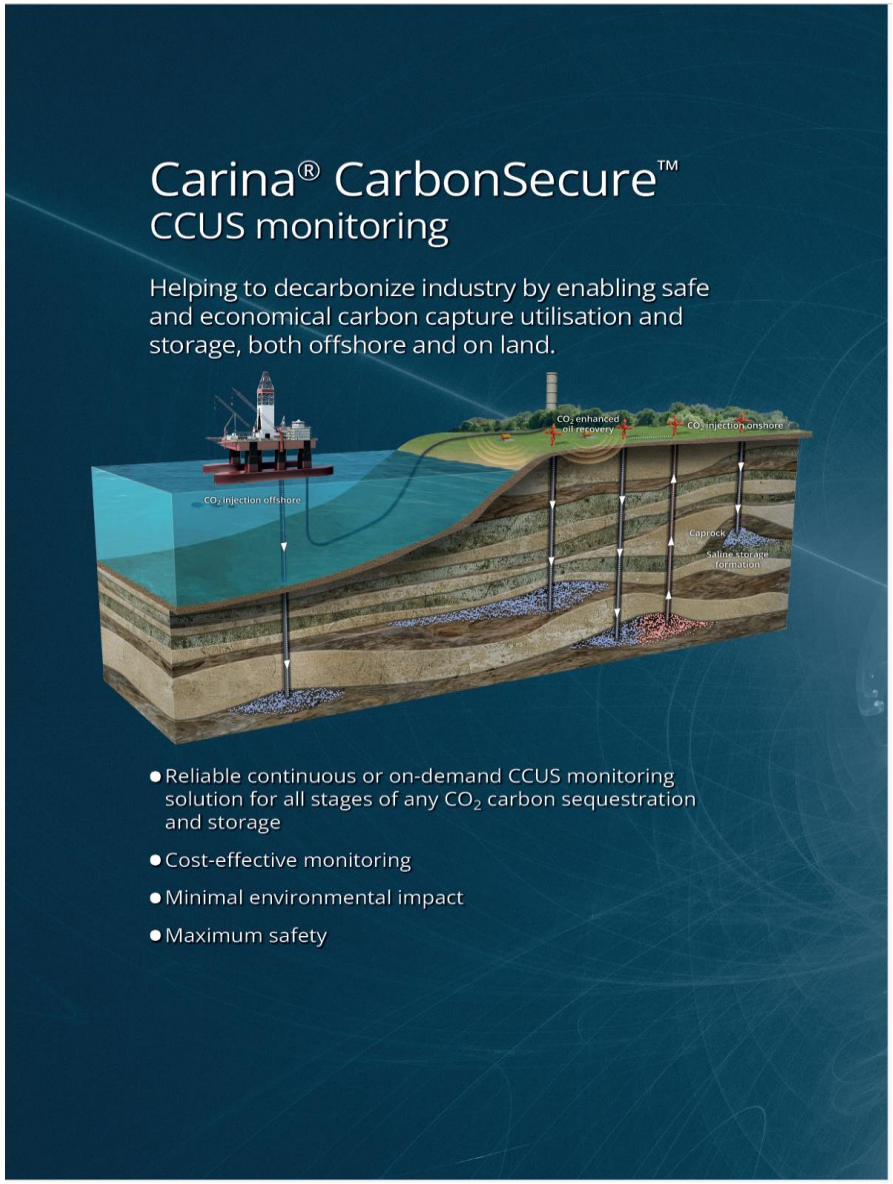
THE QUEEN'S AWARDS FOR ENTERPRISE: INNOVATION 2021

# Carina® CarbonSecure™




Real-Time Fiber Optic Monitoring
Edge-based solution




## MMV requirements

- Reservoir characterization
- Leak detection
- Well Integrity monitoring
- Seismicity monitoring

## System Benefits

- Permanent monitoring
- Real-time, remotely operated
- High resolution
  — sensitive to $CO_2$ volumes
- Low environmental impact



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# Silixa CCS/CCUS Monitoring


**Silixa CCUS Projects:**

**LBNL**, USA **2012**, Multiple Sites; **CO2CRC**, Australia **2012**; **PTRC** *Aquistore* Canada **2013**; Archer Daniels Midland, Decatur, Illinois; **CIUDEN**, Spain; Research Institute of Innovative Technology for the Earth (**RITE**), Japan; Korea Research Institute of. Geoscience & Mineral Resources (**KIGAM**); **ACT SUCCEED**, Reykjavik, Iceland; Zorlu Energy, Turkey; **ACT DIGIMON**, **CaMI** FRS site, Alberta, Canada; **SINTEF** Svelvik, Norway; Midwest Regional Carbon Sequestration Partnership (**MRSCP**) **BATTELLE**, Otsego County Michigan, CARBON Utilisation and Storage Partnership (**CUSP**), **Shell Quest** CCUS, Red Trail Energy CCUS, New Mexico Tech **CarbonSafe,**

**JOGMEC** Japan**, JAPEX** Japan**, INPEX** Japan**, ADNOC** Middle East**, PERENCO** UK, **Several undisclosed** USA



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# Lessons Learnt

- Project Design and Collaboration
- Deployment and Technology Adaptation
- Large Data Management
- Data-to-Decision Workflows
- Integrated Data Visualisation

# Offshore – Poseidon CCS Project



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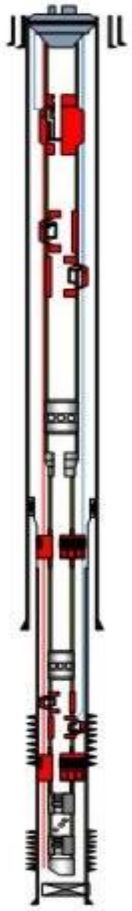
# Poseidon CCS – Leman $CO_2$ injection test



**Wellhead** compatible for low temperature service

**Safety valve** compatible for $CO_2$ and low temperature service

**Packers** for injection zone selection

**Electric gauges** for data acquisition

**Optical gauges** for data acquisition

**Optical fibre** for temperature data acquisition and near-bore seismic

CO2 Injection Package

Baker Hughes

HALLIBURTON

Weatherford

SILIXA

slb

PERENCO

**Poseidon Project • $CO_2$ injection test well**
Completion equipments & main technology providers

wintershall dea

Carbon Catalyst



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# Poseidon CCS Project

## ❖ Design, Deployment and Collaboration

- Specialised cable design to withstand rapid temperature swings - cold at the surface and in the reservoir

- Splice all the way to avoid dry-mate connections
- Premade assemblies helped reduce rig time
- Beacon to locate FOC

- PT gauge selection was made independent of the DFOS selection, which limited the combined solution options

➔ Early collaboration and monitoring-system integration improves deployment efficiency and overall monitoring performance.

**Optical fibre** for temperature data acquisition and near-bore seismic



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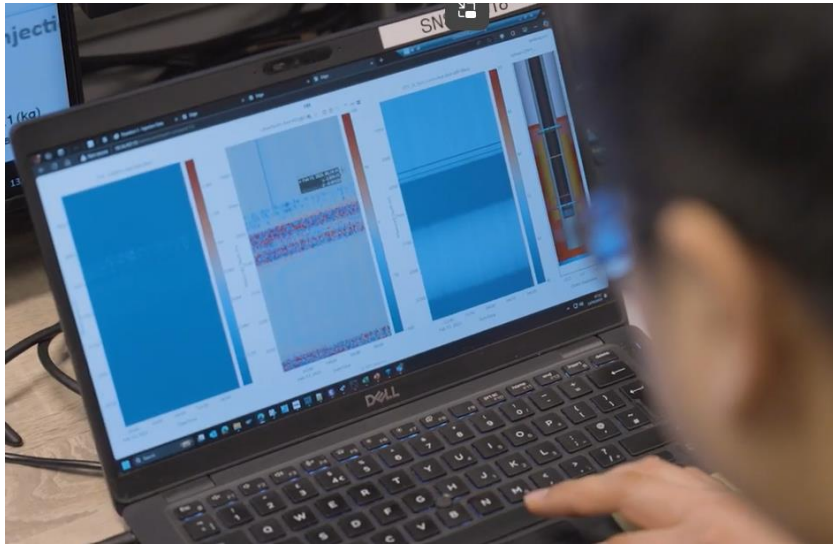
# Poseidon CCS Project

## ❖ Data Management

- ~100% uptime through automated monitoring and alerts
- Local data replication and shore transfer architecture
- Lightweight datasets enabled remote access
- EDGE compression could reduce data movement requirements



➔ Reliable, scalable data infrastructure is essential for long-term CCS monitoring



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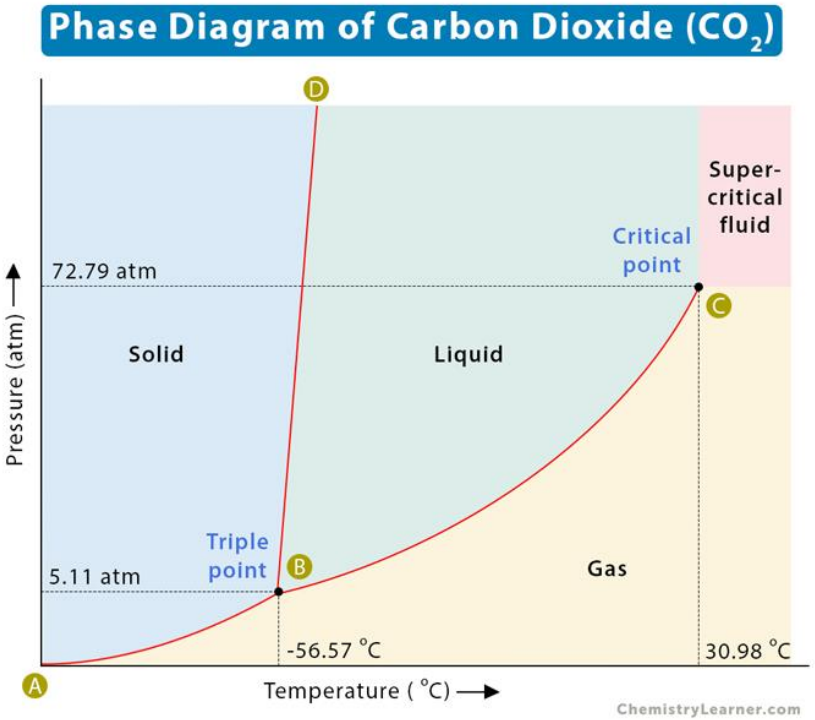
# Poseidon CCS Project

## ❖ Data-to-Decision & Visualisation

- DTS resolved true reservoir temperature distribution
- DAS supported injection allocation and profiling
- Multiple PT gauges confirmed phase behavior
- $CO_2$ preferentially entered the upper injection interval
- Rapid depressurisation events explained cooling behaviour
- Well integrity assessment supported

- Integrated visualisation of DFOS and third-party datasets
- Local and remote access
- Real-time EDGE processing

➔ Integrated monitoring data delivers actionable MMV insights that support Containment, Conformance, and Confidence.



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# Onshore CCS/CCUS Projects



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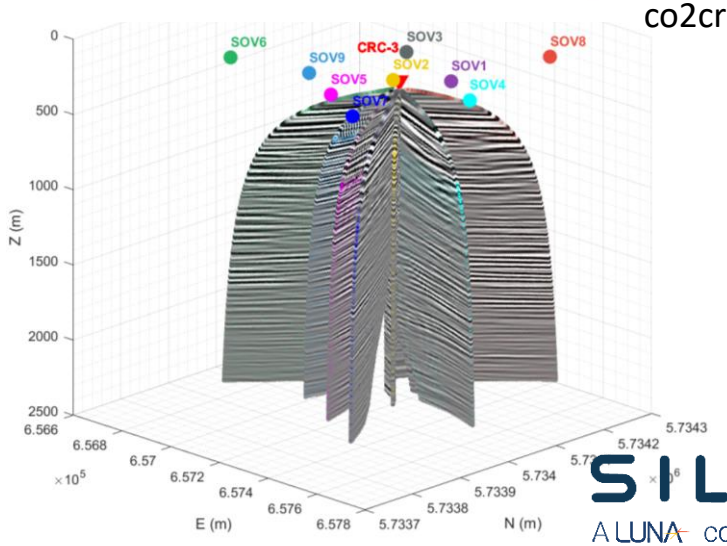
# CO2CRC Otway Project

## ❖ Data-to-Decision & Visualisation

- Multi-well monitoring deployment
- Borehole active seismic - VSP, CWT, SOV
- DAS, DTS and DSS monitoring
- Automated near-real-time plume monitoring
- Demonstrated monitoring of small injection volumes


co2crc.com.au

➔ Integrated DFOS and seismic monitoring enabled sensitive plume tracking and conformance monitoring, even for small $CO_2$ injections.



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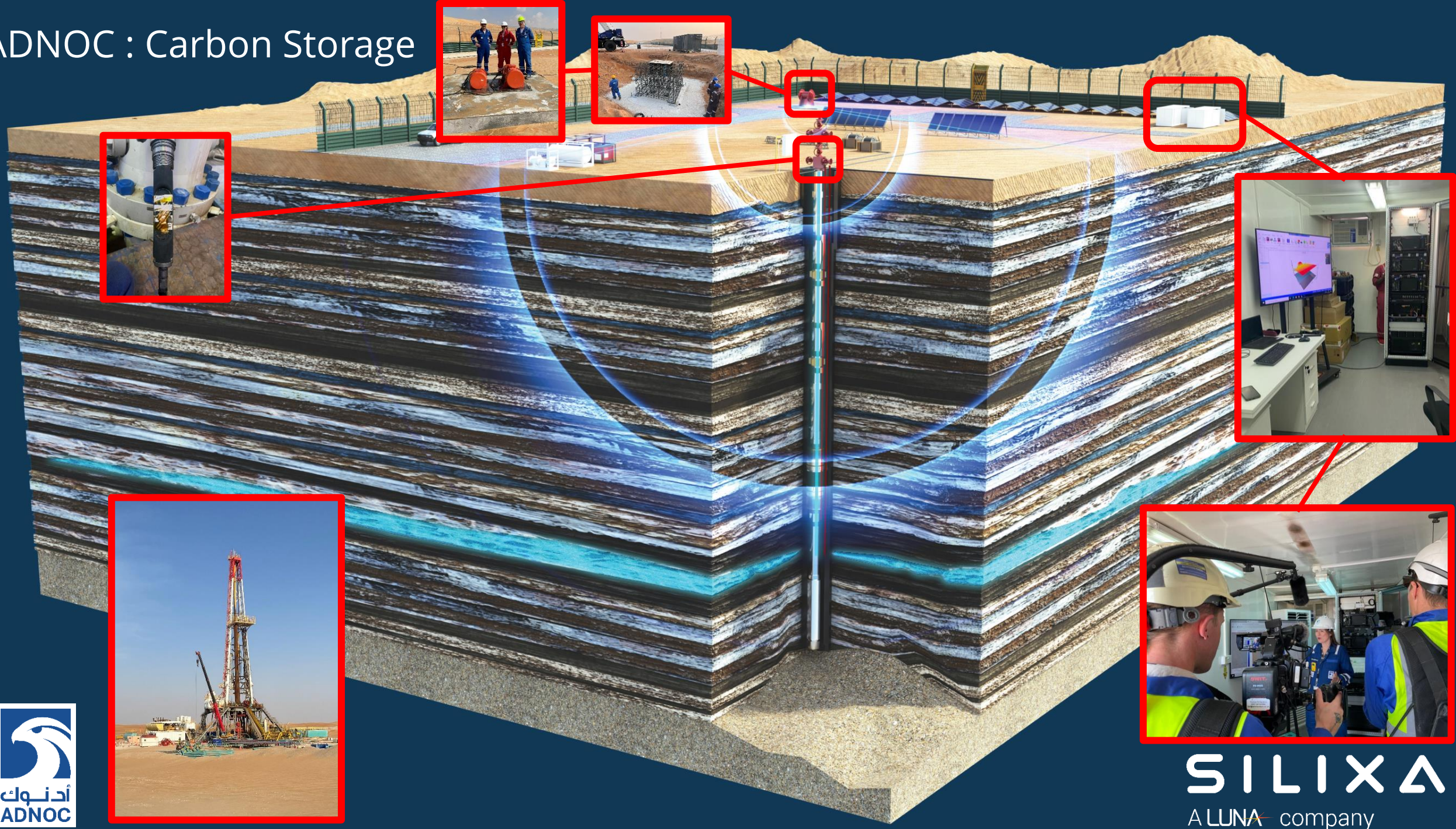
# ADNOC : Carbon Storage



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# ADNOC X1 CCS

## ❖ Deployment & Technology Adaptation

- One well with casing and tubing cables, Constellation Fibre
- Behind casing better than on tubing
- Engineered fibre improved DAS performance
- No localised fibre strain at low temperatures

## ❖ Data-to-Decision & Visualisation

- Active and passive seismic monitoring, DTS and DSS measurements
- Centralised visualisation of different data types
- EDGE processing integrated DFOS and PT gauge data
- Remote connectivity via cellular router

➔ Monitoring performance was improved through optimised fibre deployment and integrated data visualisation.



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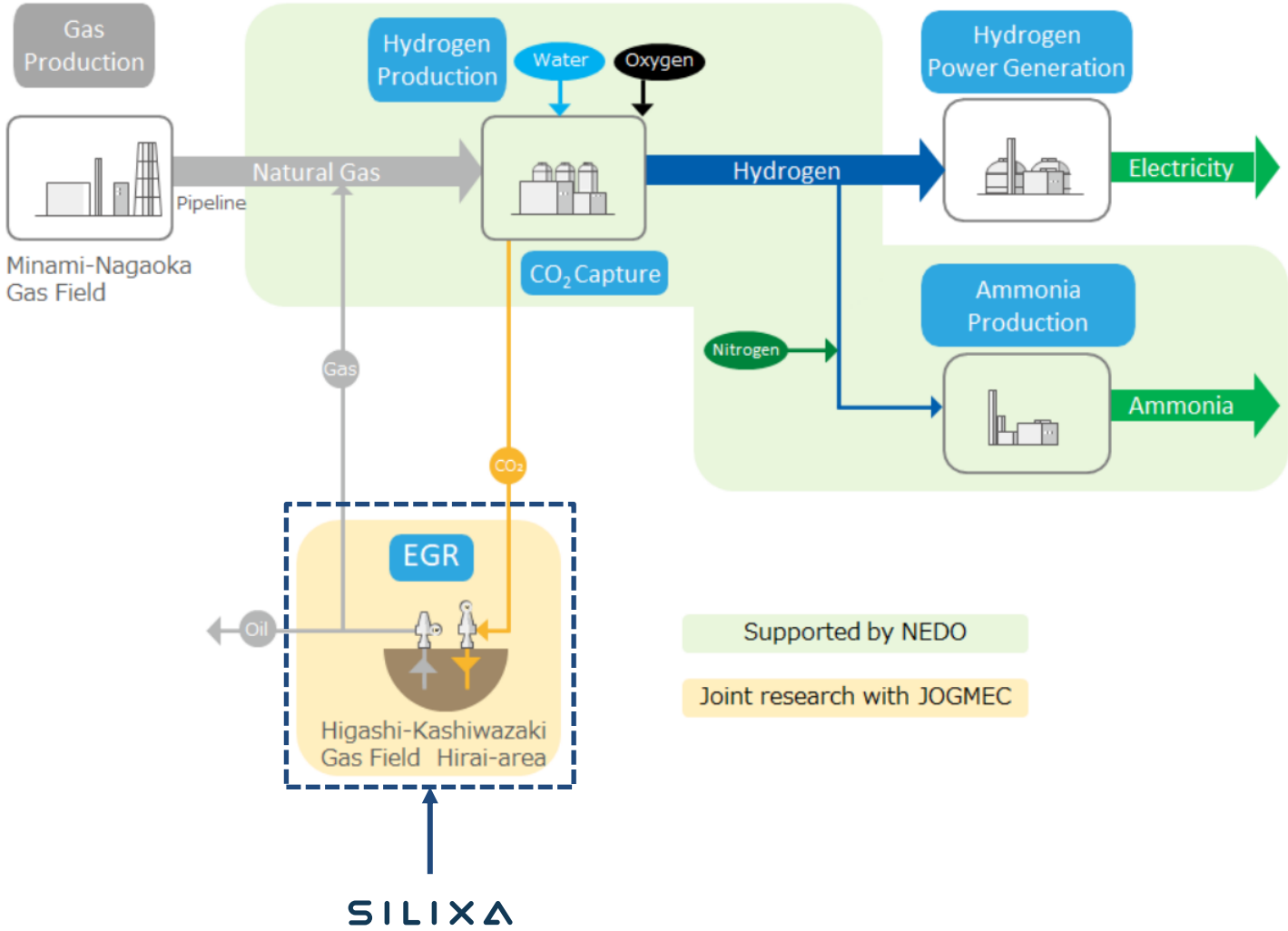
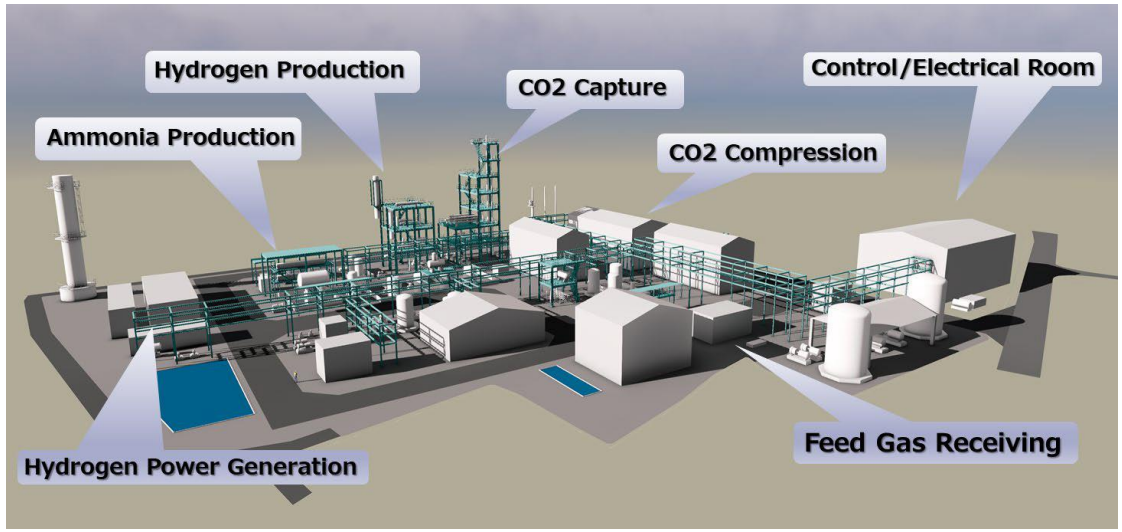
# Kashiwazaki Clean Hydrogen/Ammonia – CCUS Project

**Scope**: Monitoring CO2EGR from blue hydrogen & ammonia production.




**Location**: Kashiwazaki City, Niigata Prefecture, Japan




https://www.inpex.co.jp/english/news/assets/pdf/20221115.pdf, Feb2025



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# Kashiwazaki Clean Hydrogen/Ammonia – CCUS Project

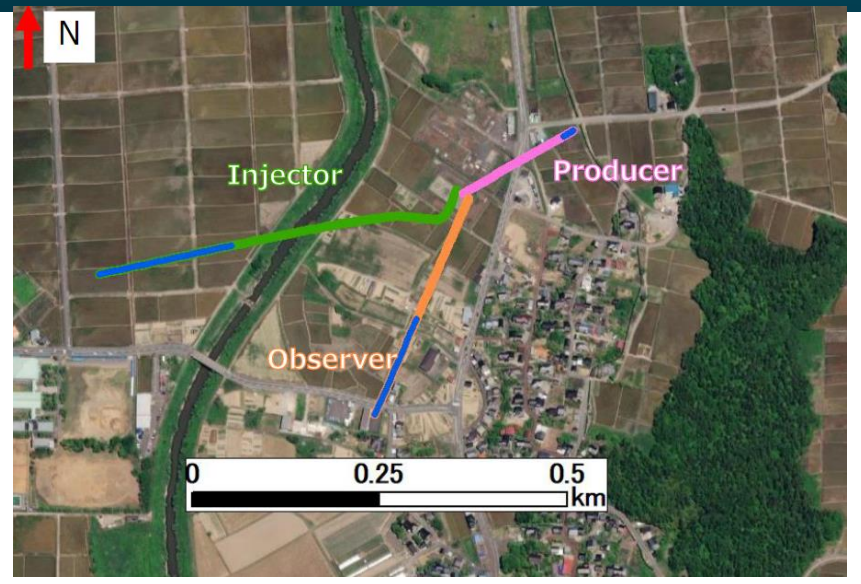
## ❖ Deployment & Technology Adaptation

- Multi-well monitoring deployment
- Constellation Fibre cemented behind casing
- Designed for long-term CCUS surveillance

## ❖ Data-to-Decision & Visualisation

- Active and passive seismic monitoring, DTS and DSS measurements
- Near-real-time EDGE processing
- Visualisation

➔ Near-real-time processing and visualisation enabling scalable monitoring across a complex multi-well CCUS system.





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# Future of CCUS Monitoring with DFOS

- **Project Design and Collaboration**
  – critical for providing the best available monitoring
- **Deployment and Technology Adaptation**
  – project-specific optimised deployment of the newest technology
- **Large Data Management**
  – safe storage and transfer of data under project conditions
- **Data-to-Decision Workflows**
  – EDGE processing ensuring Containment, Conformance and Confidence
- **Integrated Data Visualisation**
  – EDGE platform with multi-source data in adjustable dashboards

Thank you for listening!
Any questions?