The Nodal Shift

Dense, Agile and Low-Cost Land Seismic for onshore CCUS

Amine Ourabah

STRYDE

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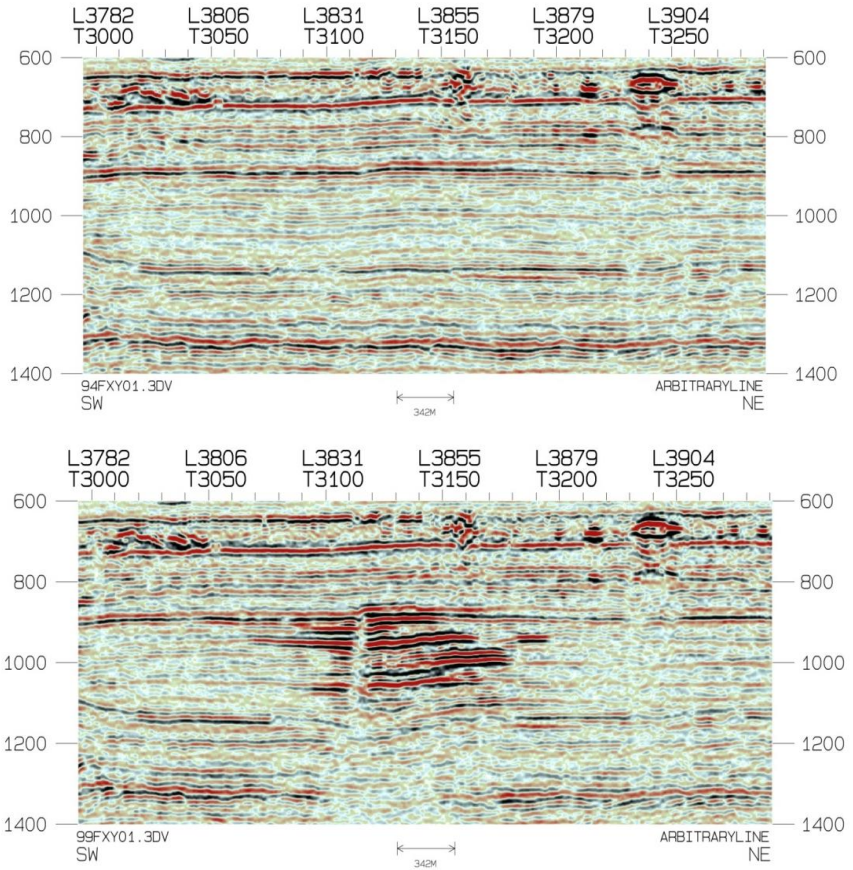
International Meeting for Applied Geoscience & Energy

Outline

- What can seismic do for CCUS
- Challenges of using seismic and what nodal systems solve
- **Seismic for CCUS in the renewables landcape**
- **4 examples of recent CCUS seismic acquisitions**
- Conclusions



Sleipner CCS project (Arts et al. 2008)

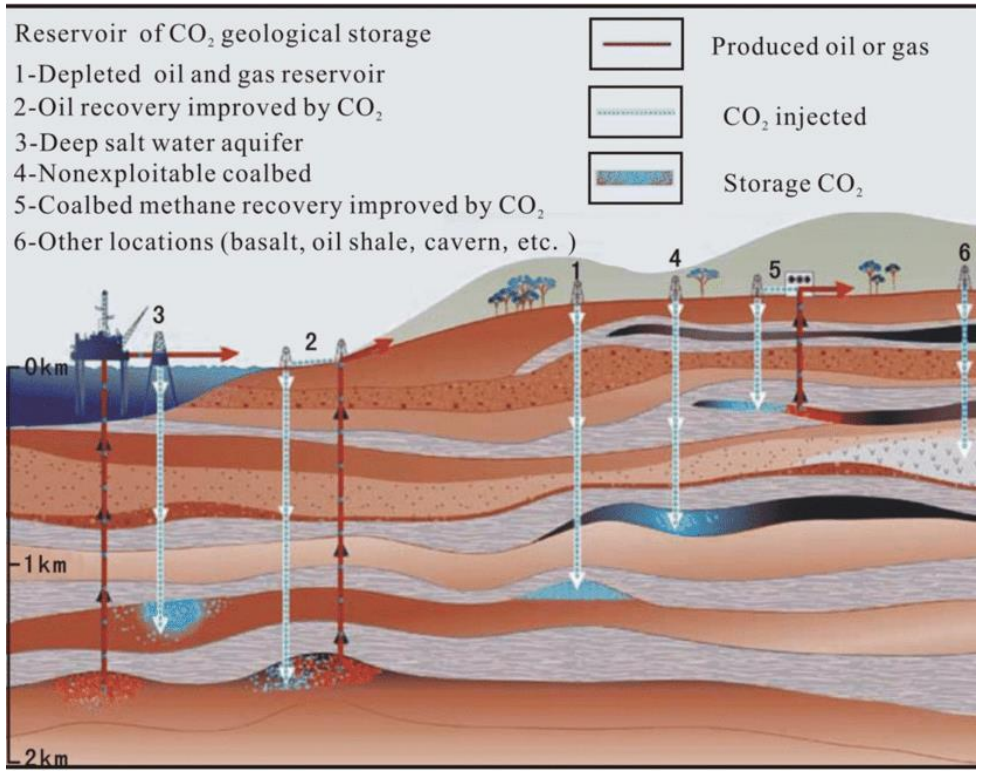
What seismic can do for CCUS

Find

Plan

Monitor

Protect



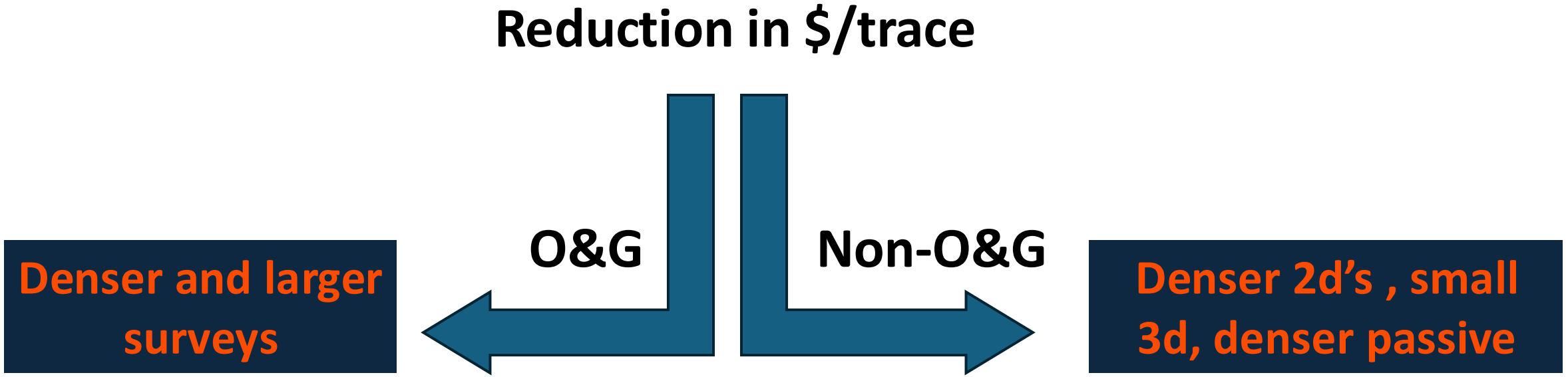
What nodal systems are solving

Stryde LTD data (2025)

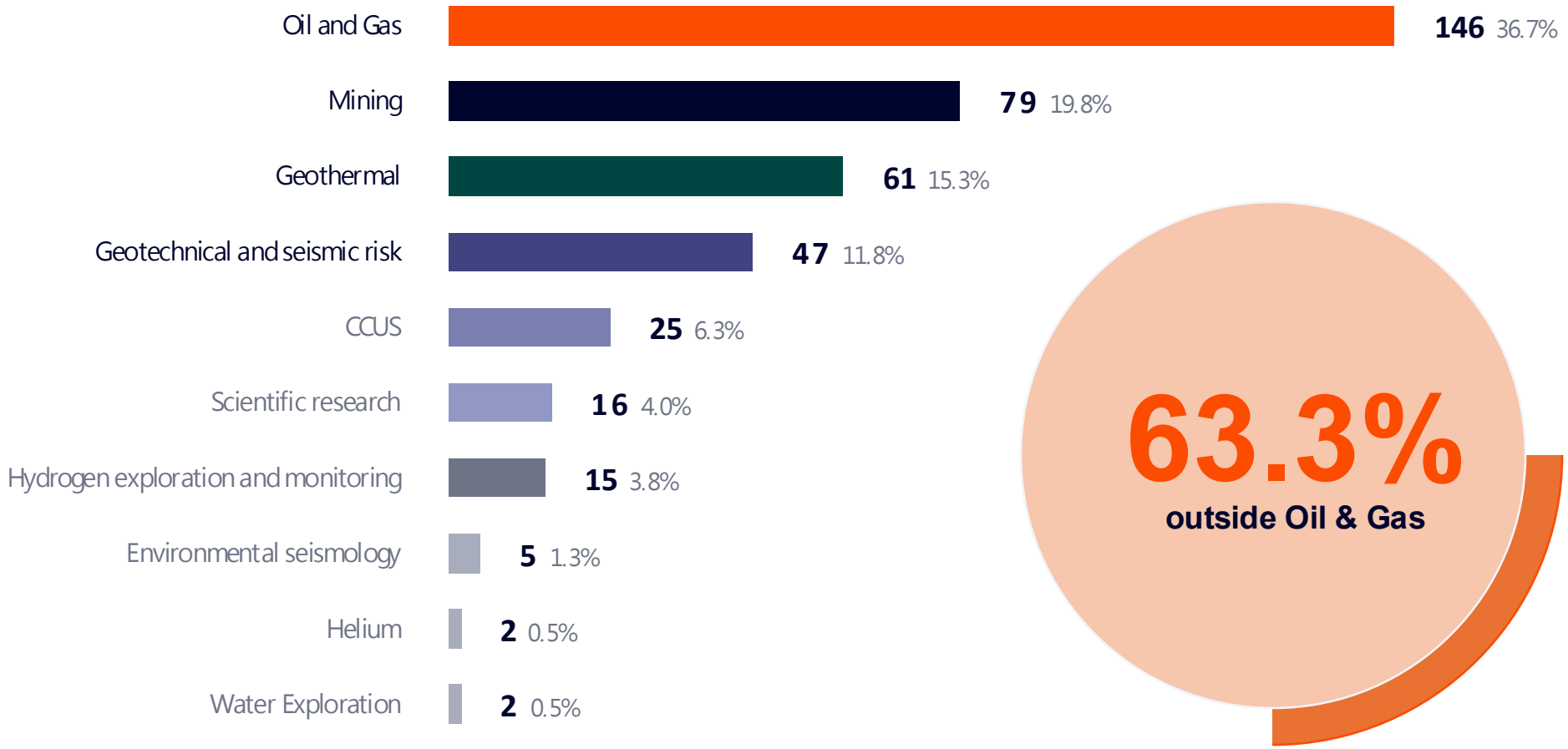
The nodal shift driving source diversity and efficiency

- Agnostic to source type
- No synchronization needed
- Free ground for source movement
- Fastest moving element*
- Compensate for low source density
- Passive data as a free byproduct
- Unlocks new environments
- Nurturing sources diversity

Impact of cost saving on the usage of seismic

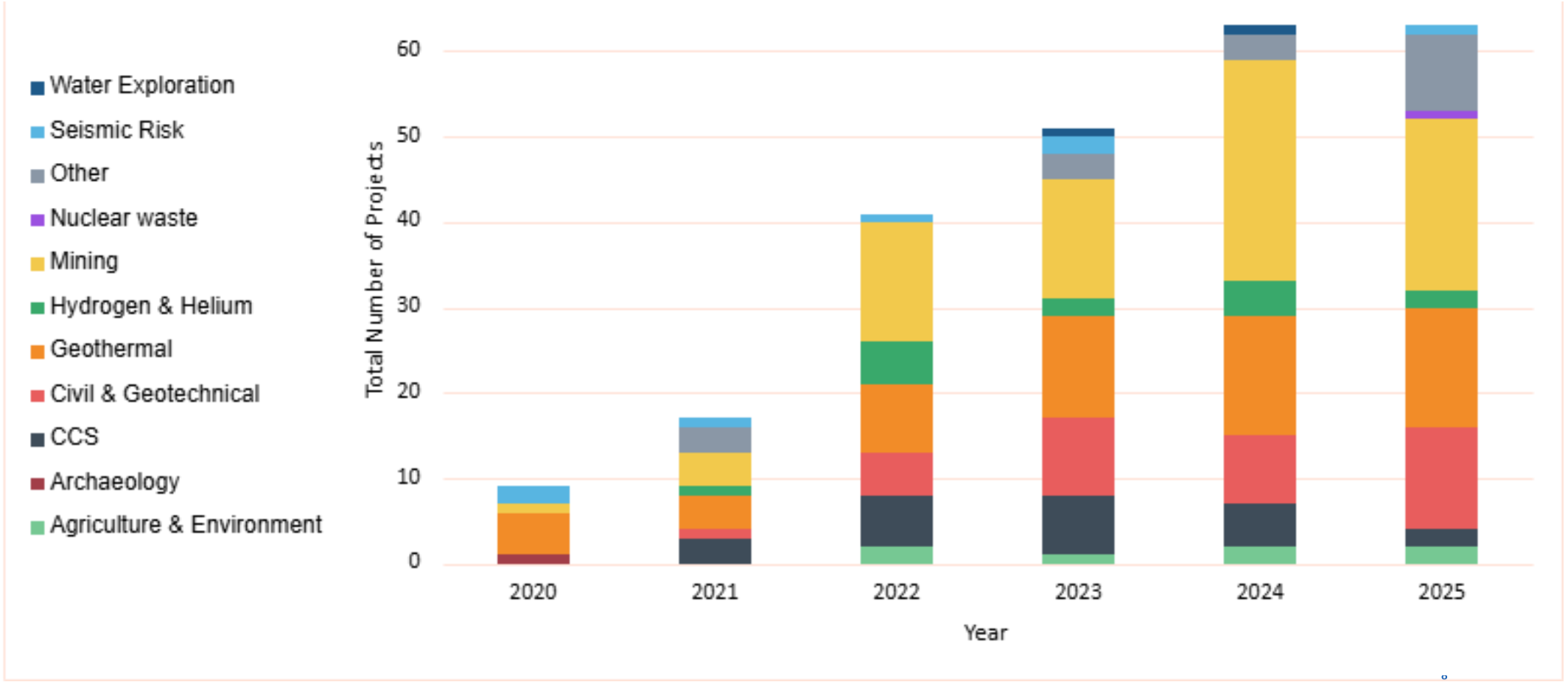


Seismic acquisition is supporting an increasingly diverse range of industries



Stryde LTD data (2025)

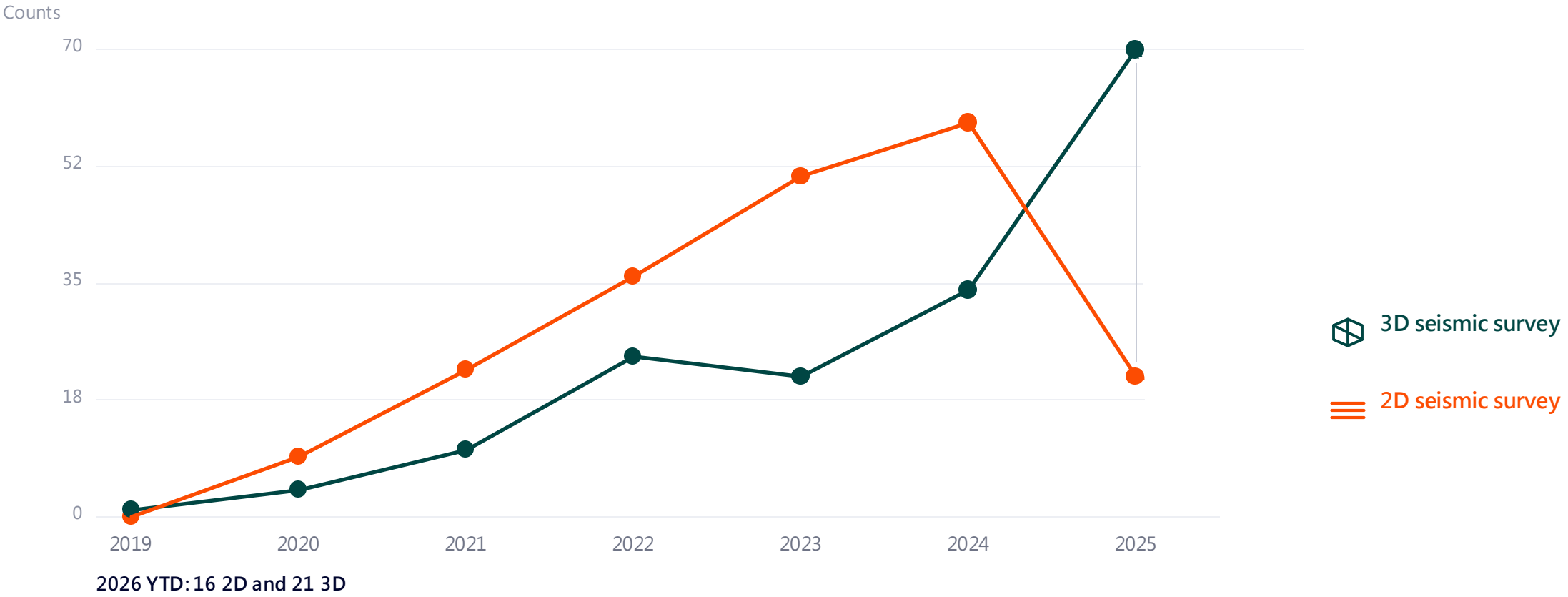
We are seeing an increase in non-O&G seismic projects



Stryde LTD data (2025)

The survey mix shifted materially towards 3D in 2025

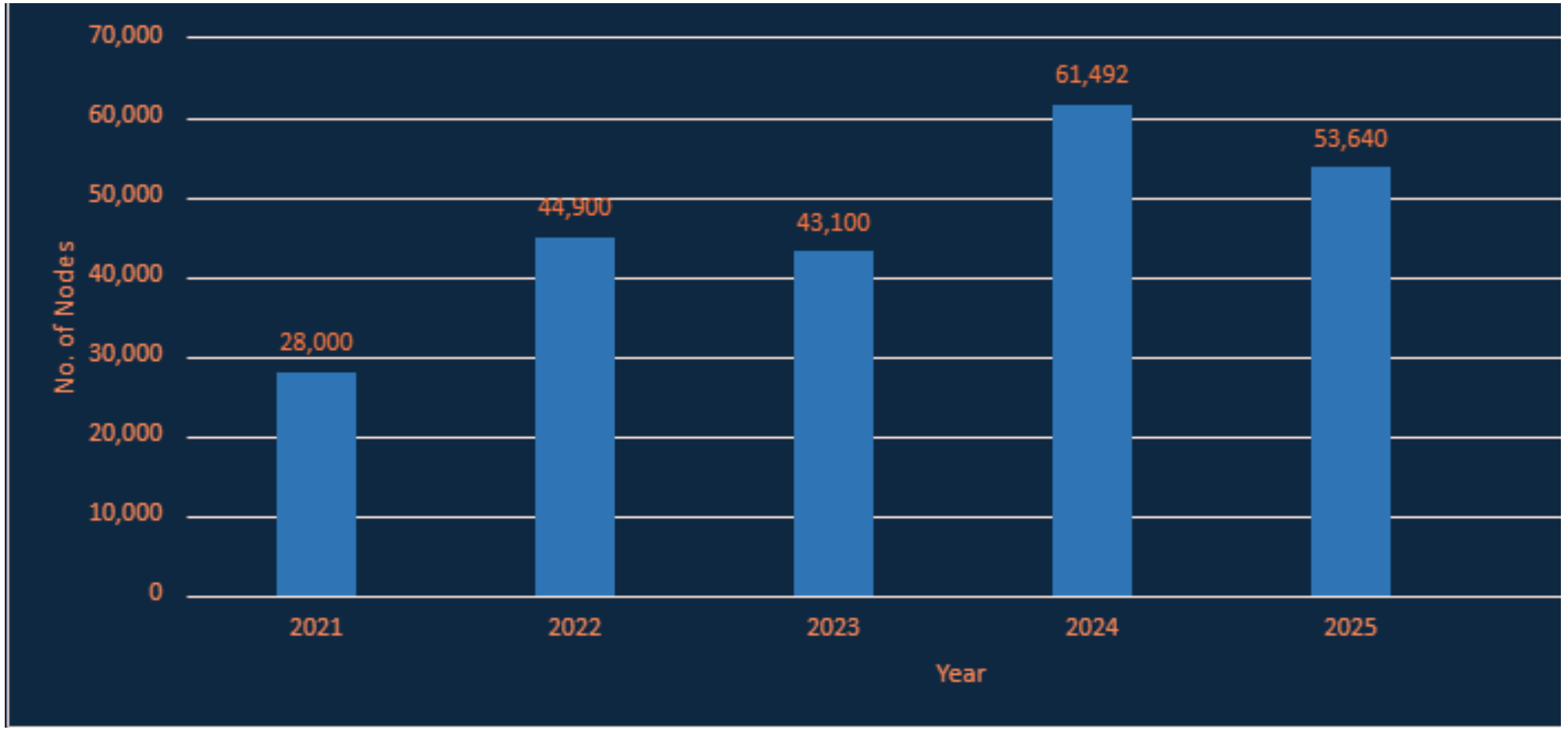
Annual project counts for the two principal survey types



2026 YTD: 16 2D and 21 3D

Stryde LTD data (2025)

Total number of STRYDE nodes deployed explicitly on CCUS projects

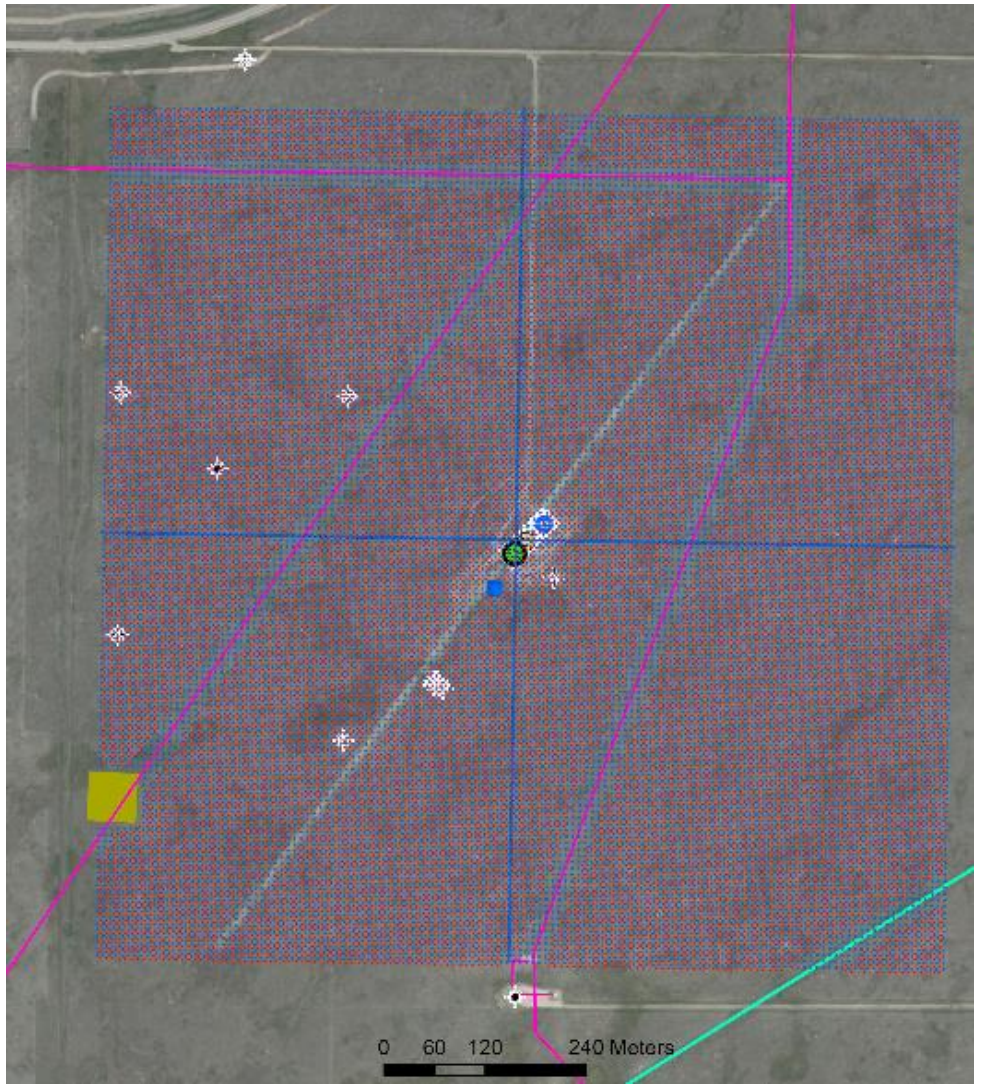


Stryde LTD data (2025)

"Likely an under-estimate: clients who have purchased STRYDE systems don't need to inform STRYDE of new projects"

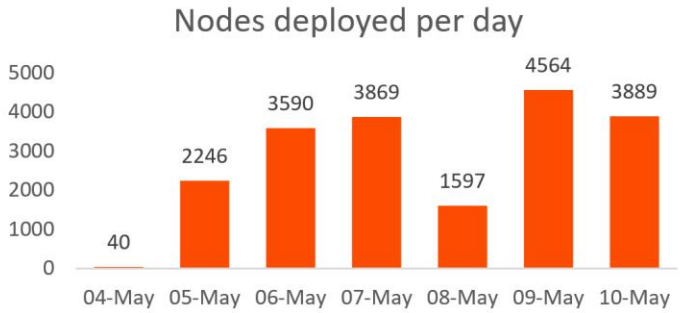
Example 1 – The small super dense

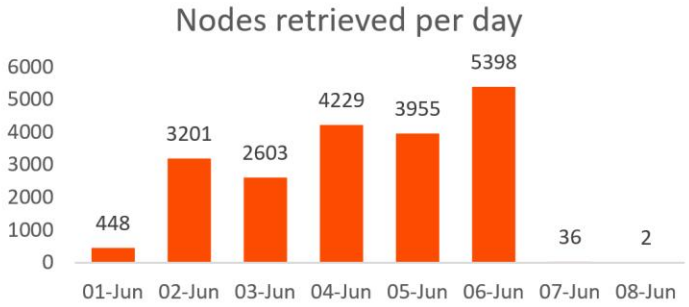
- ~ 1x1km
- ~20,000 STRYDE nodes were used on a grid of 7.5x7.5m
- ~4000 vib points on a grid of 30 x 7.5m grid using University of Calgary IVI Envirovibe
- ~9000 PinPoint sources were shot on a grid of 7.5 x 7.5m

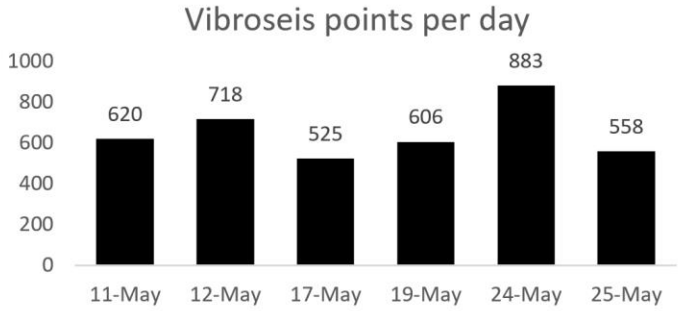


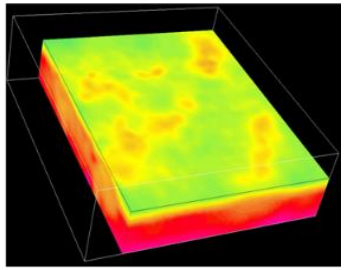
Example 1 – The small super dense

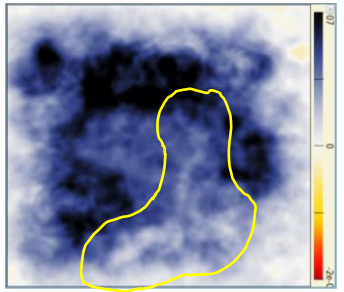
- 10 people deployed ~20K nodes in five 5 days.



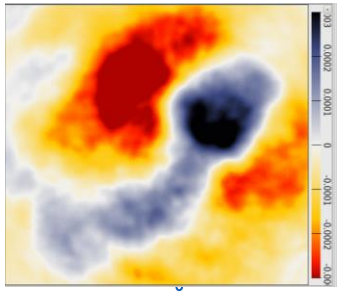






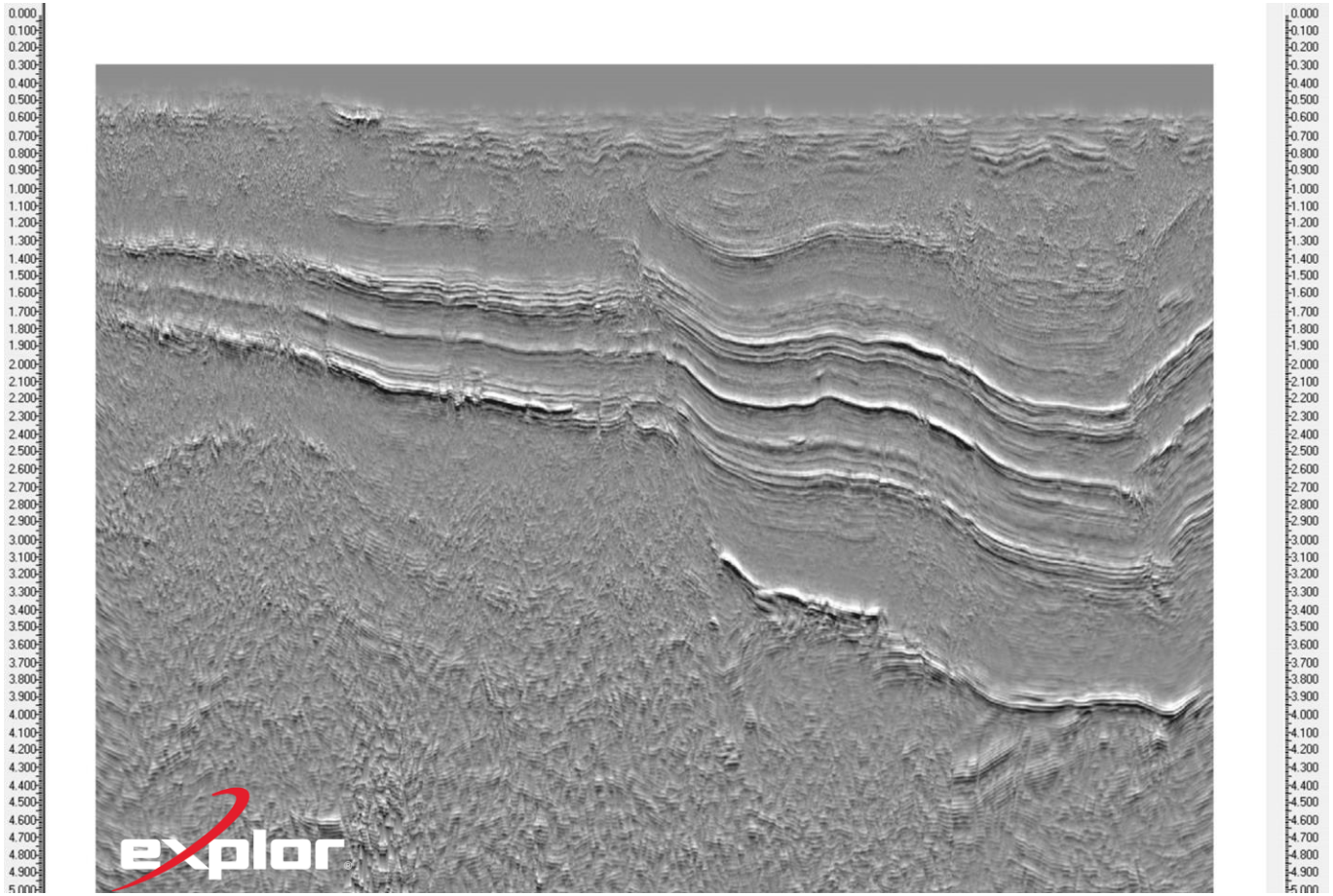


~300m



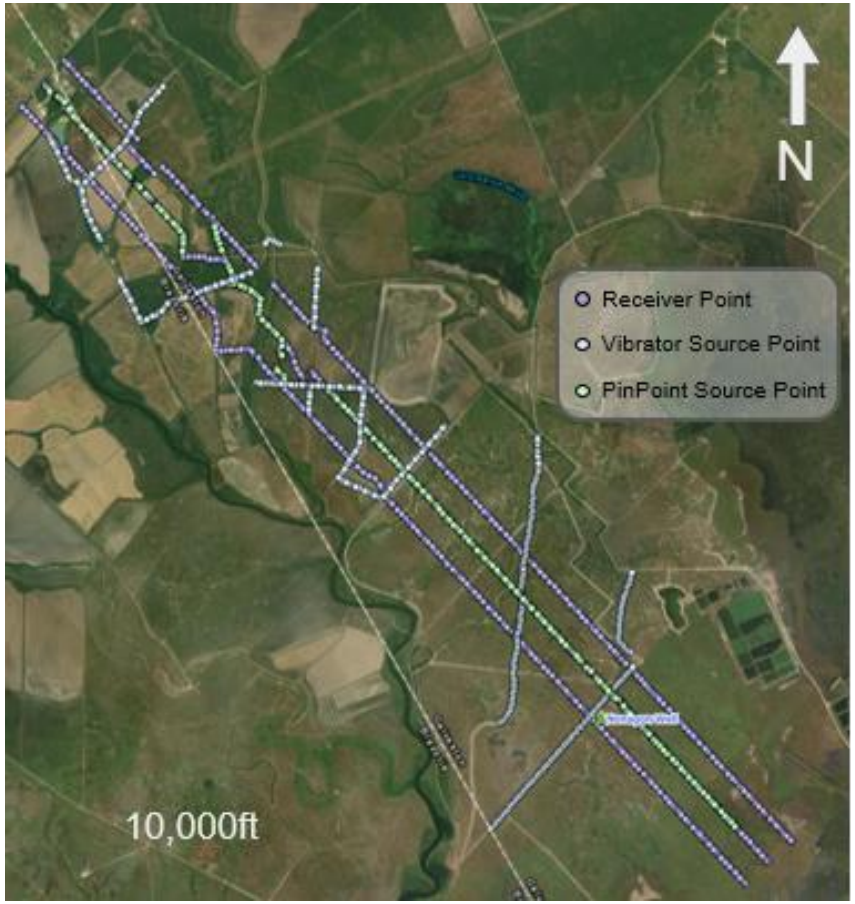
~1200m

Example 2 – The adaptive design in frontier exploration

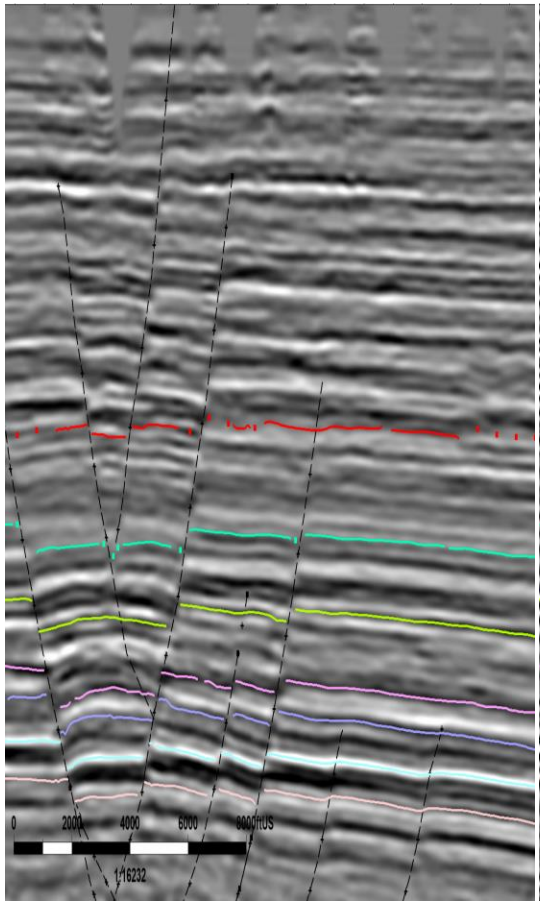


Example 3 – The bit of everything 2.5d

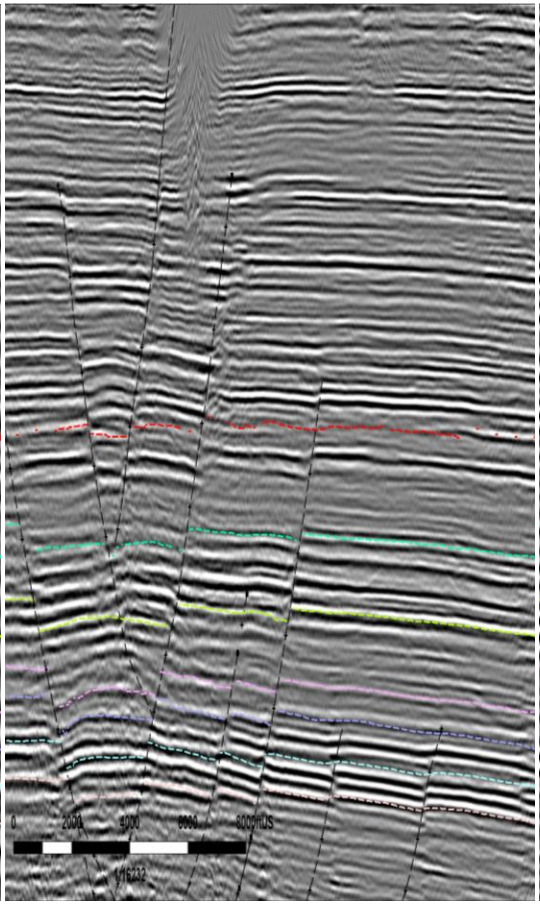
Naranjo et al; EAGE 2025 **- "**Getting the right amount of a bit of everything; acquisition at bp's West Bay site, Texas"



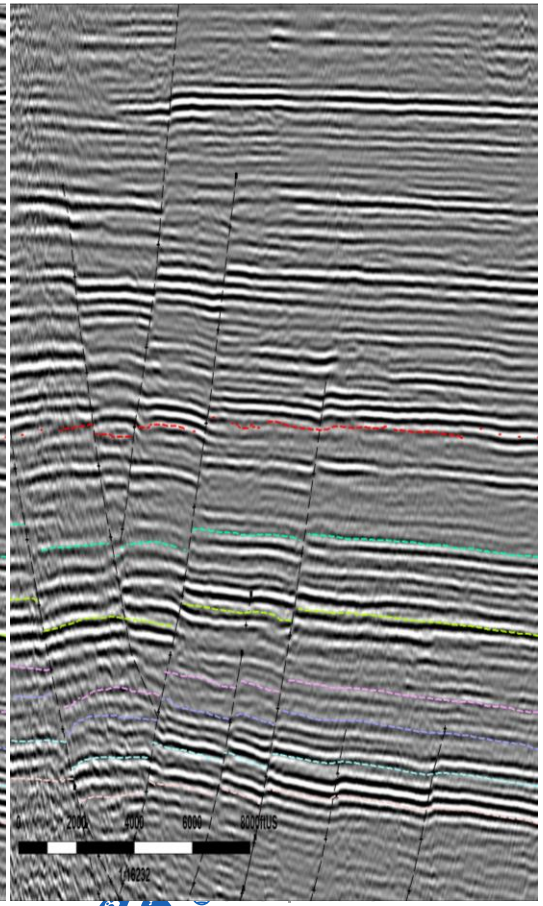
NW



legacy



Vibroseis



Pinpoint

SE

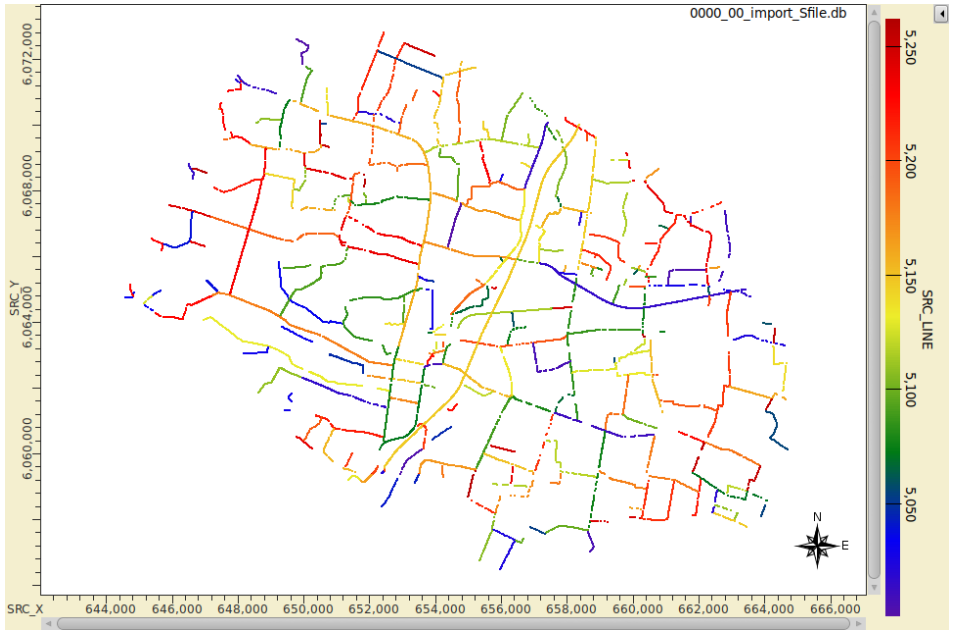
Seismic data owned or controlled by Seismic Exchange, Inc.; interpretation is that of bp.

Example 4 – The large & complex urban

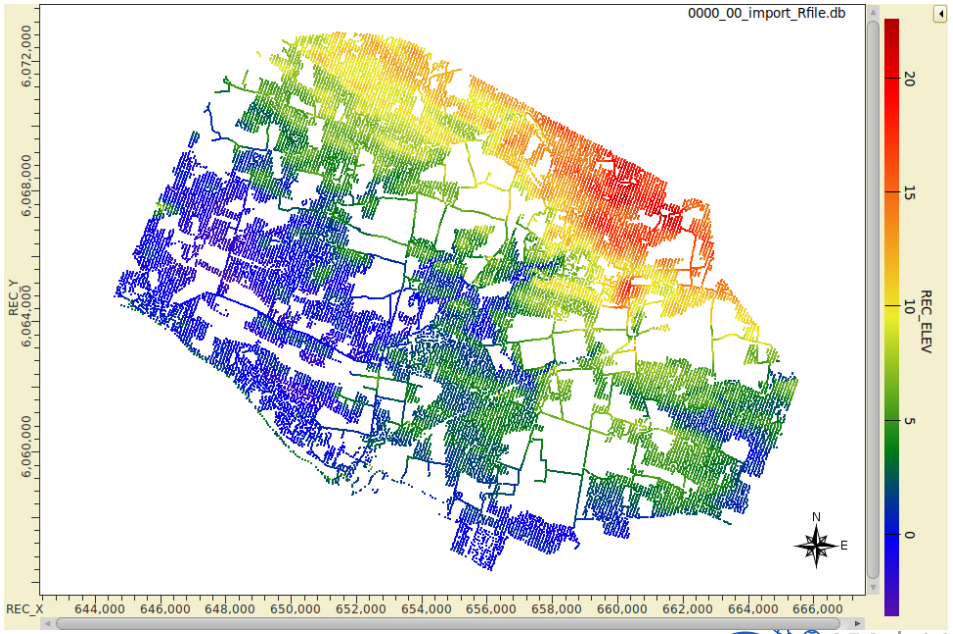
- **Project objective**: provide inputs for CO2 storage assessment & development – Copenhagen, Danmark
- **Challenges**: Irregular geometry (low source density), Large gaps, Coherent and incoherent noise, Low relief structures

220km2
42,000 nodes

Source location



Receiver location



Courtesy of realtimeseismic CarbonCuts

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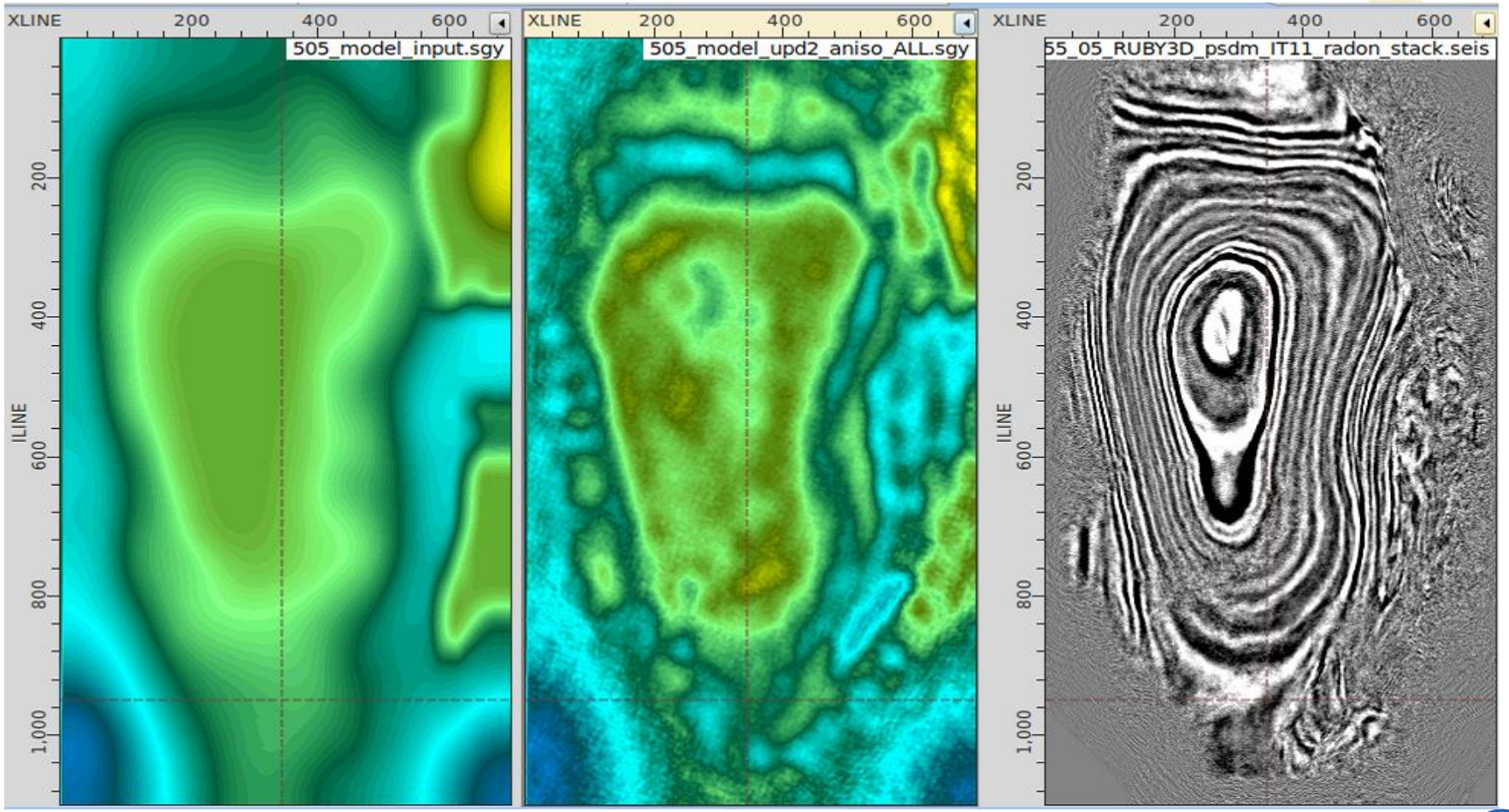
Example 4 – The large & complex urban

PSDM with FWI model – slice *target level (1500m)*



Courtesy of realtimeseismic CarbonCuts

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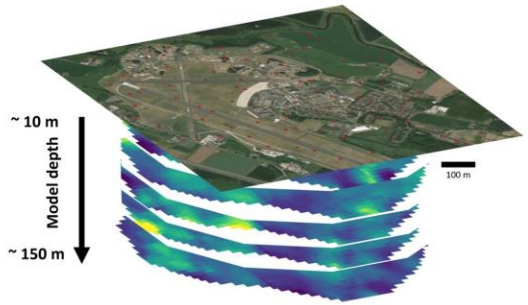
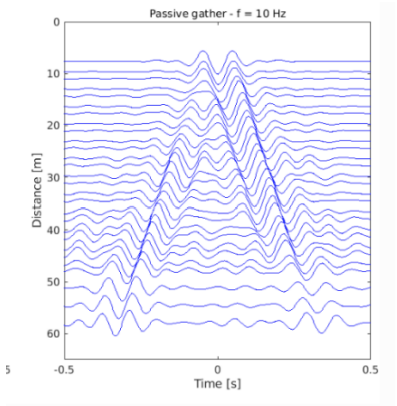
What's next?

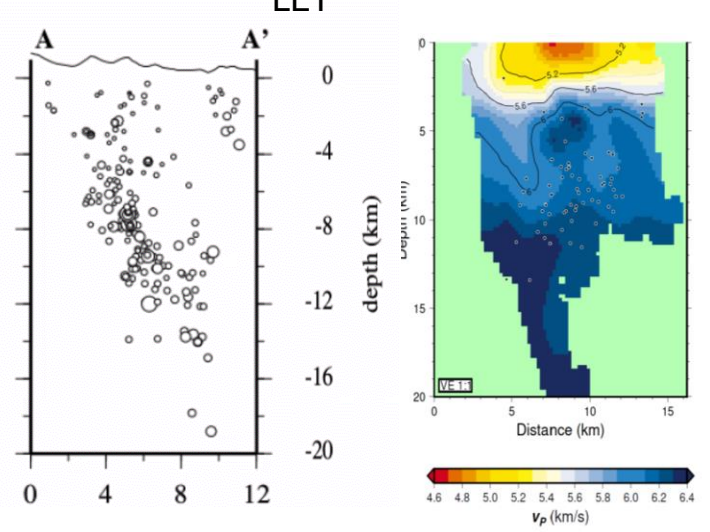
ANT





Multicomponent active seismic

LET

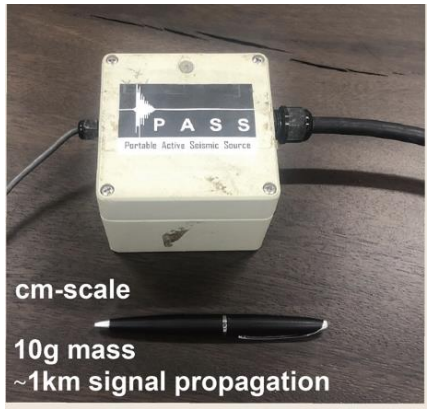


"Permanent" active seismic source

Size: ~1 m

Tsuji et al., 2021 Sci Rept

"Portable" active seismic source



Size: ~10 cm

Tsuji et al., 2022 SRL

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Conclusion

- Nodes have lowered the cost of high-density seismic in different terrains and are allowing denser and larger seismic to be acquired for CCS.
- They are also nurturing a source diversity in different environments.
- This pattern is seen on various non-O&G industries.
- The main impact is seen on seismic imaging rather than permanent monitoring
- The increase in passive seismic application is visible on many non-O&G industries; we expect this to benefit CCUS monitoring.