STRYDE

De-risking geothermal projects with high-resolution seismic:

trends and case studies

About STRYDE

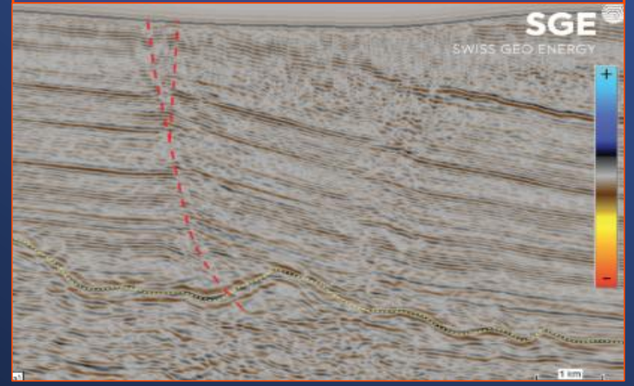
Our mission is to make high-definition seismic imaging affordable for any industry.

We provide seismic solutions that allow seismic data acquisition to be affordable, faster, safer, and significantly less disruptive to the environment.

At the heart of our solution is the STRYDE Node™, the smallest and most affordable receiver technology on the market today.

What is seismic?

A seismic image for geothermal



STRYDE - the market leader in nodal seismic technology

>860,000

nodes delivered to the market in 5 years

>300

surveys across geothermal, CCS, oil and gas, mining, civil engineering, hydrogen and academia

The case for geothermal energy

Why use geothermal energy?	Examples of where geothermal energy help
➢ Energy Security ➢ Low Carbon & Sustainable ➢ Reliable & Scalable ➢ Decarbonization ➢ Long-term Cost Stability	➢ Power Generation ➢ District Heating & Cooling ➢ Industrial Applications ➢ Green Hydrogen Production ➢ Agriculture & Aquaculture ➢ Mining & Data Centers

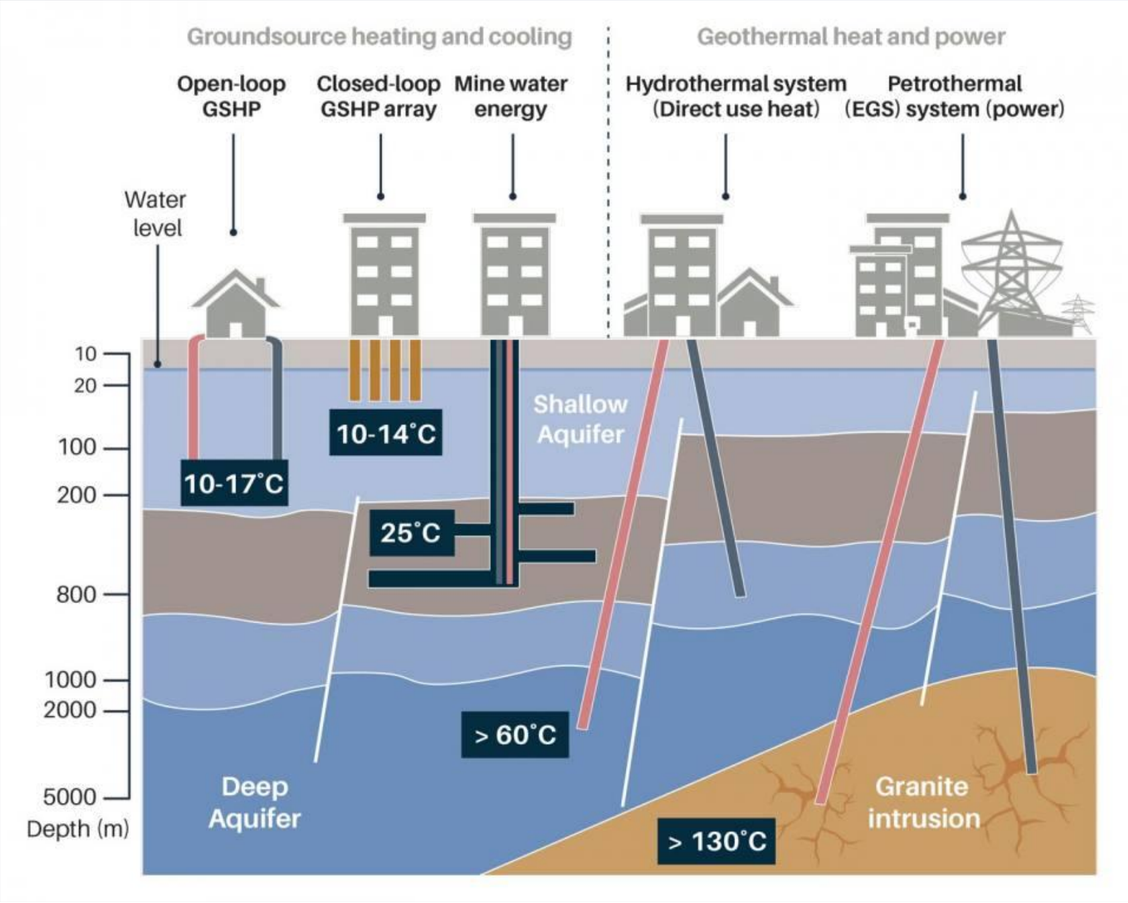
Global Geothermal Production

As of 2024, **198** geothermal fields, with **673** power generation units, were operational.

Giving a capacity of 16,318 MW, it has the ability to

power an entire country like the Netherlands

Types of geothermal systems



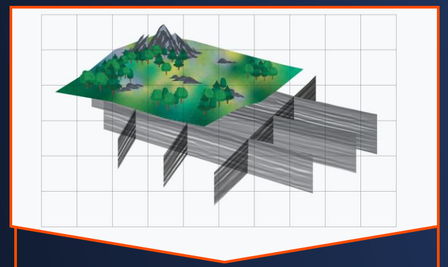
Graphic: British Geological Survey

Seismic is the most effective method of imaging the subsurface in high resolution to:

- ✓ Conduct regional scouting to identify areas with geothermal potential (hotspots)
- ✓ Identify optimal geothermal well locations and avoiding bad wells
- ✓ Monitoring the subsurface

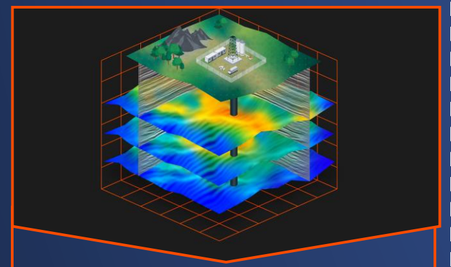
Uses of seismic for geothermal

Exploration



Scouting (regional 2D)

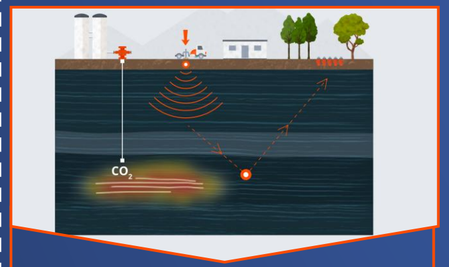
Survey-based around varying geometry of 2D receiver lines.



Baseline (HD 3D - characterisation)

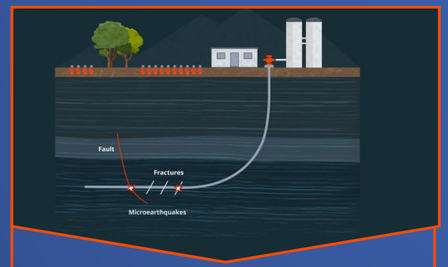
A high-density 3D survey, normally acquired pre-drill to characterise the subsurface of the potential site.

Monitoring



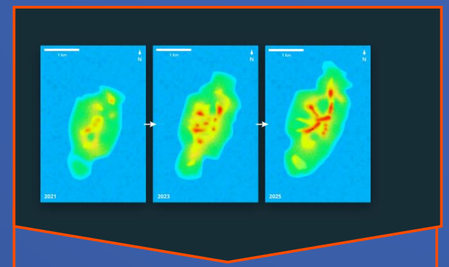
Reservoir Fluid Monitoring

Various economical and long-term solutions to monitor the site.



Seismicity

Dependent on local regulation and stakeholder needs various levels of seismicity monitoring may be required.



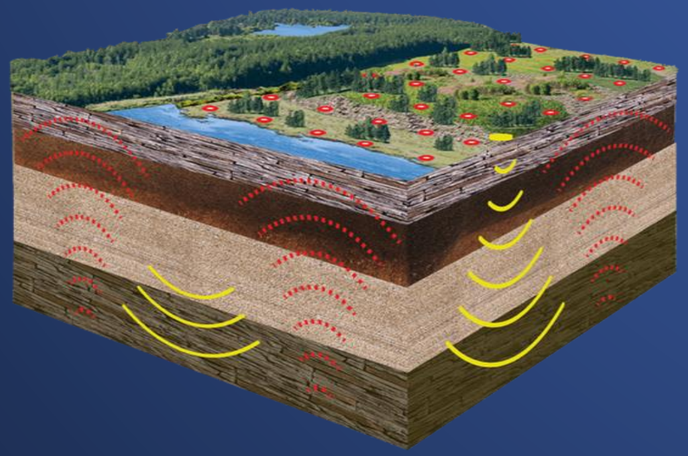
Baseline repeat (3-5yrs post injection)

Similar to the baseline 3D survey, over time repeat 3D surveys may be required to analyse the ongoing or completed project.

Historic perceptions of seismic in geothermal

Seismic has not been used as often as it should be in geothermal projects. Why?

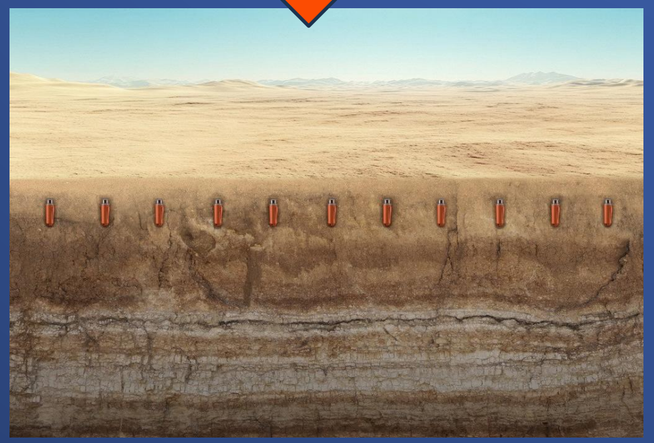
- Perception of high survey and equipment costs
- Assumed complexity: equipment, labour, permitting, HSE
- Lack of in-house resources for acquisition, processing & interpretation
- Uncertainty of feasibility (resolution, turnaround time)
- Unknown value of seismic data



How can we make seismic feasible and effective for geothermal exploration?

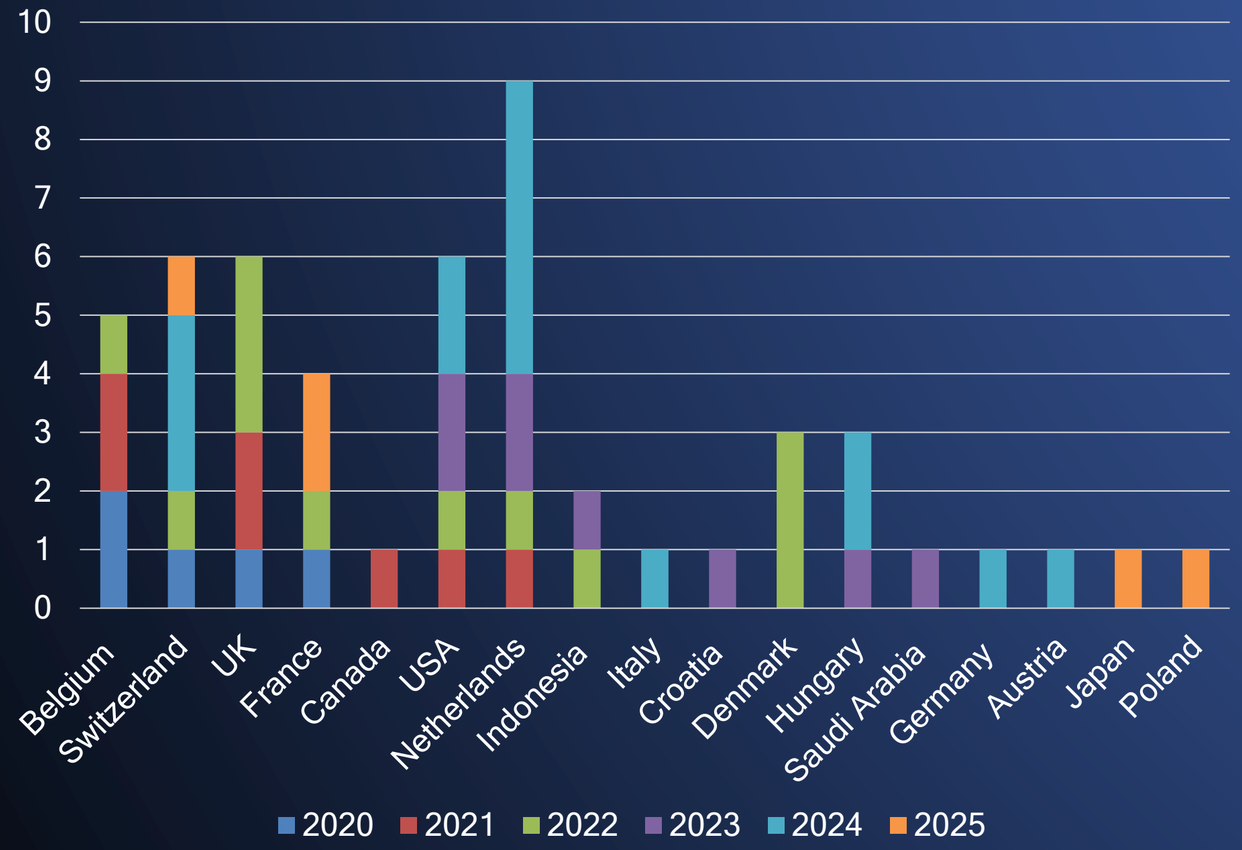
Key technology requirements for fast, effective, and low-cost geothermal exploration

- ✓ Fully autonomous, low-cost nodes
- ✓ Compact and lightweight design
- ✓ Rapid deployment & retrieval
- ✓ Non-intrusive placement

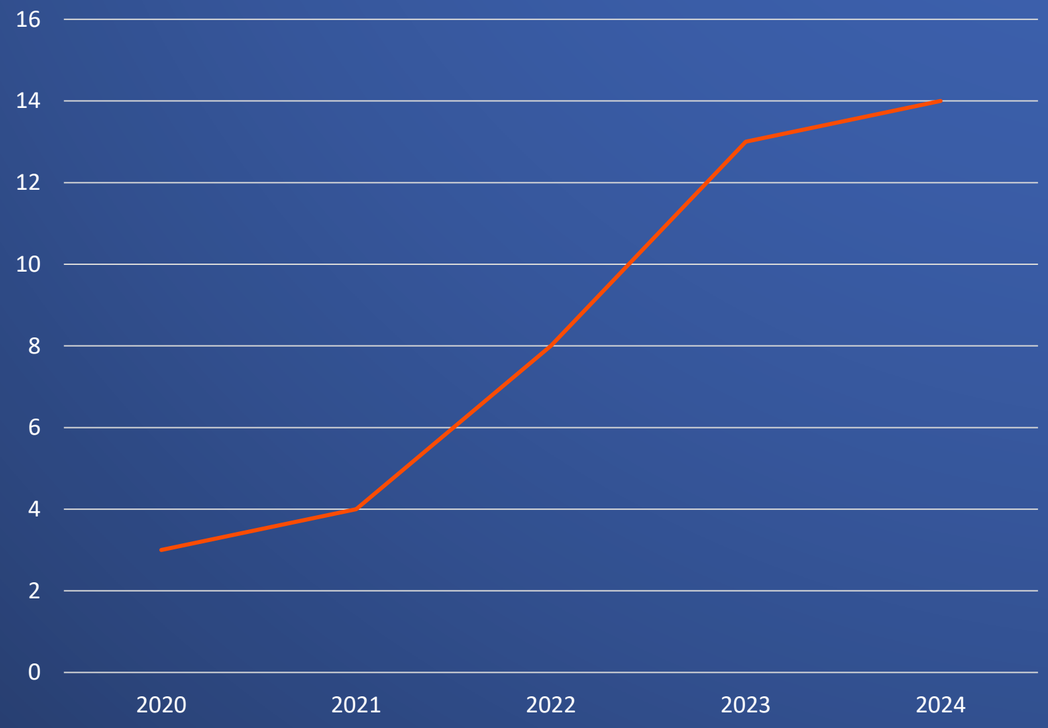


Uptake of seismic for geothermal is rapidly increasing

Geothermal exploration project trends by country in the last 5 years, using STRYDE



Geothermal exploration project trends by year, using STRYDE



We have enabled seismic in any environment

With our low-environmental impact, easy to deploy, low-cost seismic system.

15% of the seismic surveys we enable are for geothermal purposes.

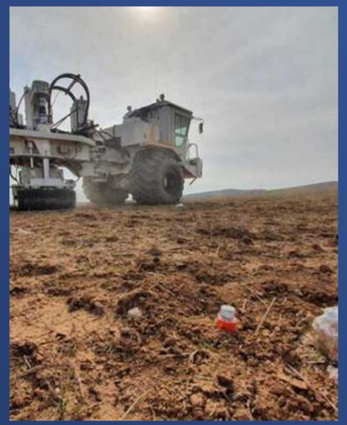
Urban
Copenhagen

Mountains
France

Foothills & forests
Colombia

Extreme cold
Antarctica

Swamps & mangroves
Nigeria

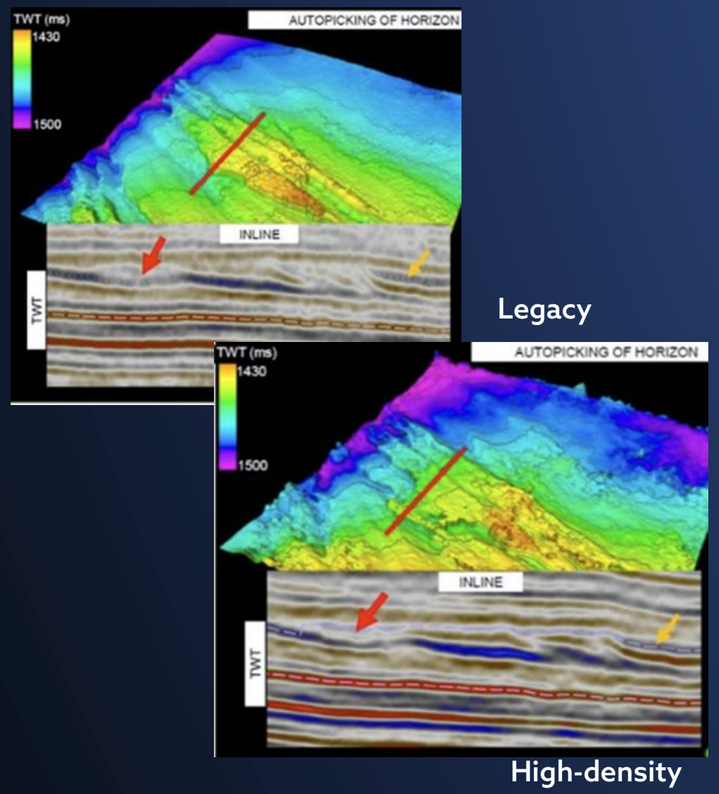


Farmland
Poland

Desert
Saudi Arabia

Vegetation and canopy
Indonesia

What our geothermal customers need when it comes to seismic



Higher density = higher resolution

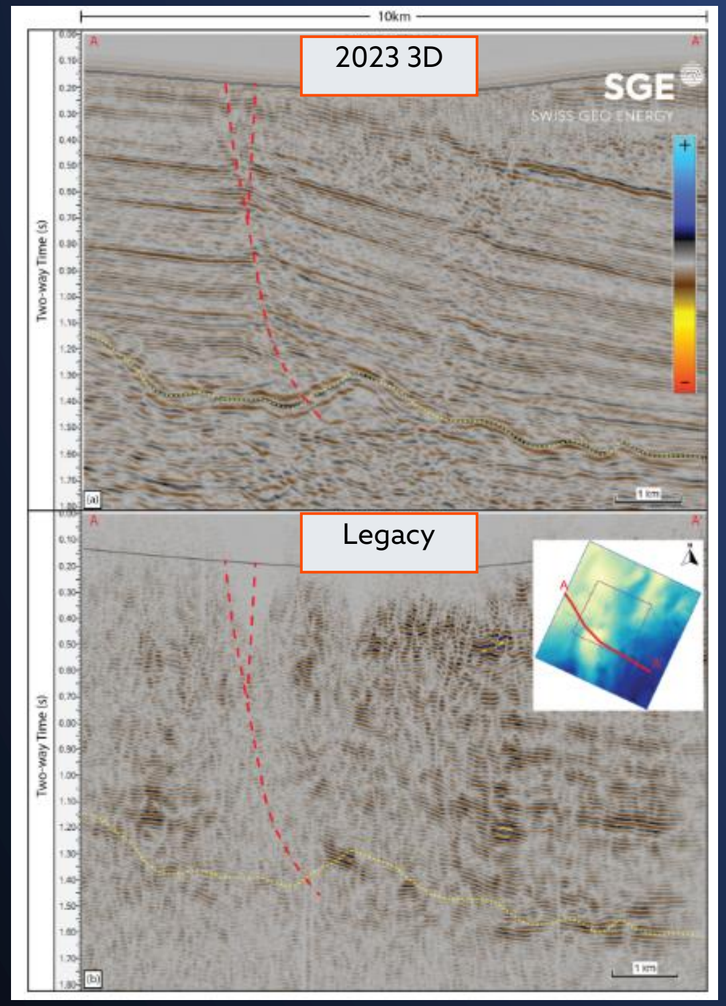
Subsurface geothermal needs	Solutions
Subsurface de-risking	High-density seismic acquisition to provider clearer images of the subsurface and optimise well placement
Affordable subsurface intelligence	Novel survey designs (e.g. Pseudo 3D) enabled by low-cost technology
Ability to acquire seismic in urban areas, comply with environmental regulations and obtain local stakeholder buy in	Low environmental footprint, discreet seismic technology to acquire high-quality seismic with minimal disruption

How STRYDE has fulfilled the geothermal sector’s seismic needs

Case studies

Subsurface de-risking

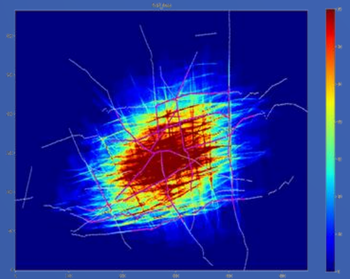
Geothermal, Switzerland – the worlds densest geothermal 3D seismic survey using 21,475 nodes (2023)

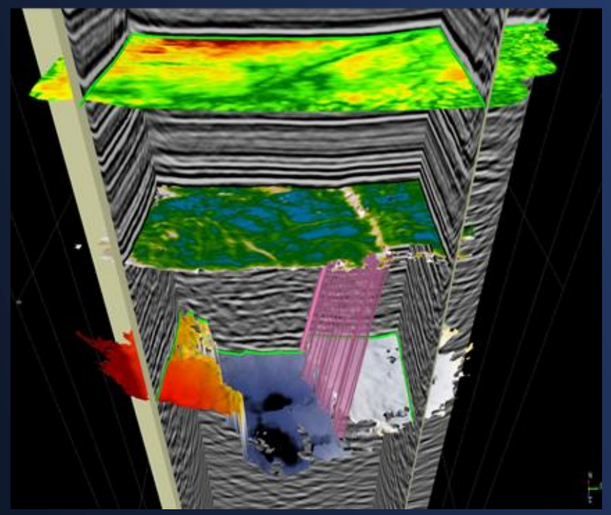


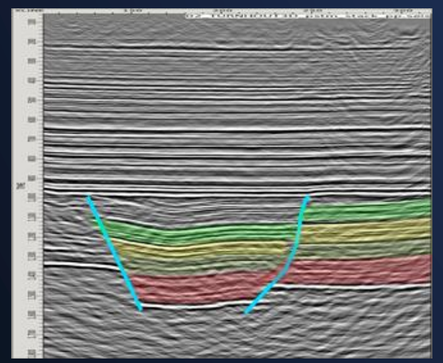
Project	104 sq km 3D seismic survey in a semi-urban environment
Project partners	STRYDE, Geo2X, Swiss Geo Energy
Receivers	21,475 nodes
Source	Conventional vibroseis sources
Conclusion	Project completed within just 12 days

Low-cost, novel survey design

Geothermal, Belgium (2020)







Project	Geothermal 2D & pseudo 3D
Project partners	STRYDE, Realtime Seismic, HITA
Overview	• The nodes small size and large inventory allow for an easy move from 2D to 3D or pseudo 3D surveys • Multiple live 2D lines are laid ahead of shooting, allowing live lines to record any fired sources
Conclusion	Successful deployment – pseudo 3D model created

Low environmental impact survey operations

Geothermal, City Centre in the Netherlands (2022)

Project	7.5km 2D survey in an urban environment
Project partners	STRYDE, Seismic Mechatronics, Dayboro Geophysical
Receivers	• 1,500 nodes deployed along a 7.5km line
Source	Storm10 eVibe
Conclusion	Successful acquisition and imaging of target, no permitting required for project

Final thoughts

Demand for geothermal exploration is increasing

Uptake varies by country. Why is this?

Seismic can make or break a geothermal project

Image quality matters

STRYDE

The market-leading onshore seismic nodal technology provider

www.strydefurther.com