



EAGE

EUROPEAN
ASSOCIATION OF
GEOSCIENTISTS &
ENGINEERS

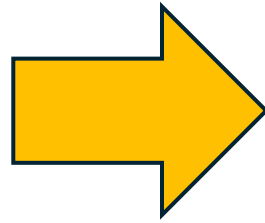
EAGE Workshop on Exploration

1-2 SEPTEMBER 2026 • AUCKLAND, NEW ZEALAND

Leveraging Petroleum Legacy to Advance Geothermal:
International Lessons for New Zealand
Evelien Wallace



EAGE



Conventional Geothermal

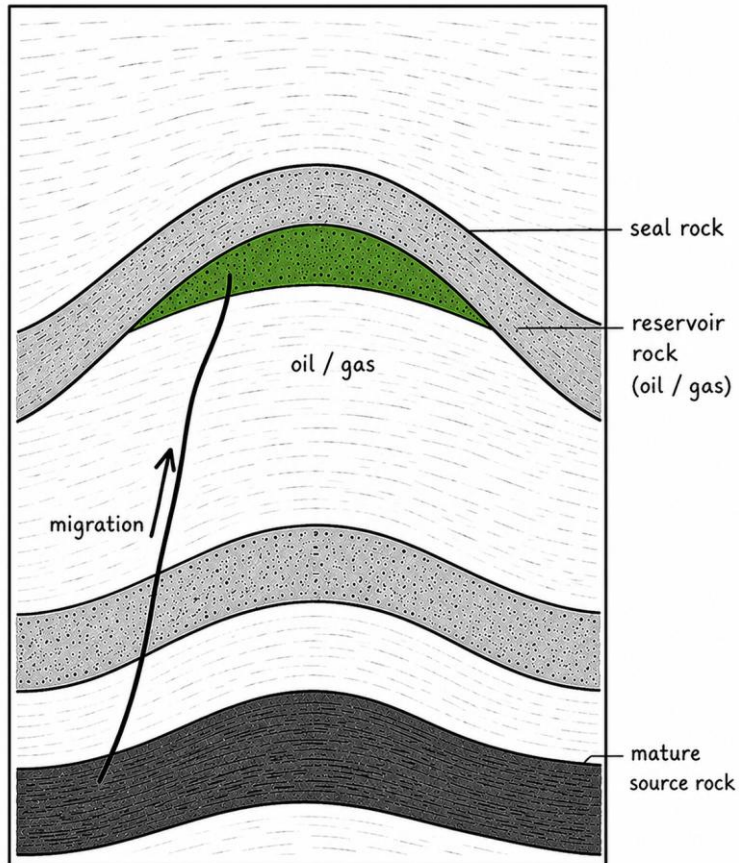
Next Gen Geothermal

Geoheat (direct use)

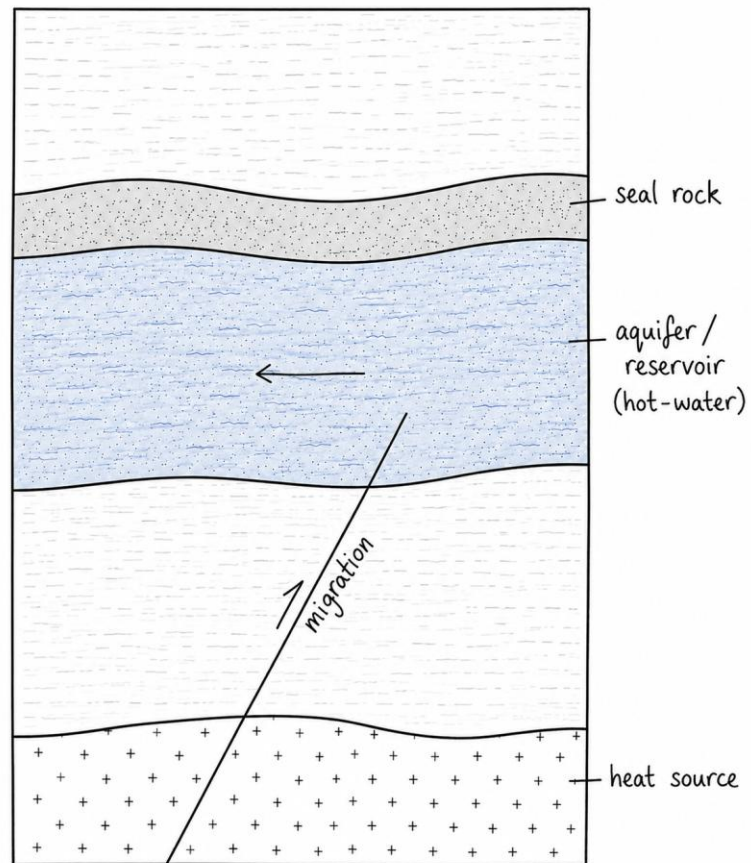


Two resources. One subsurface.

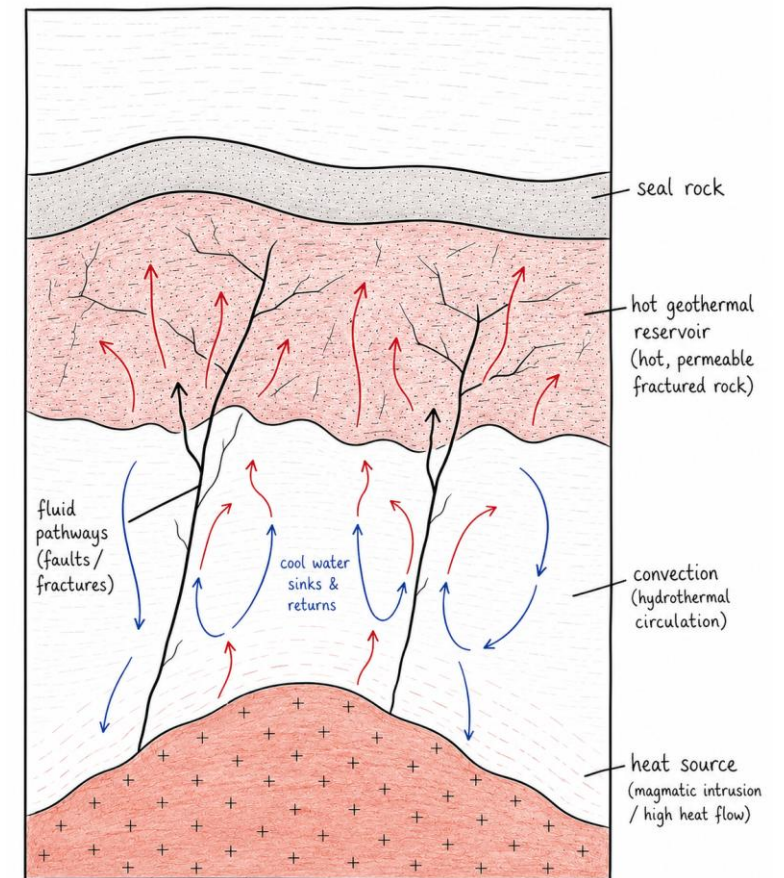
Petroleum



Geoheat

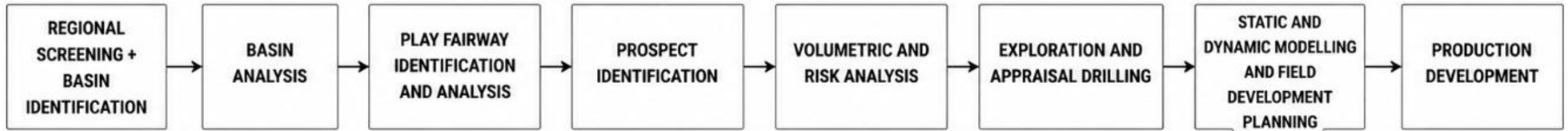


Conventional Geothermal

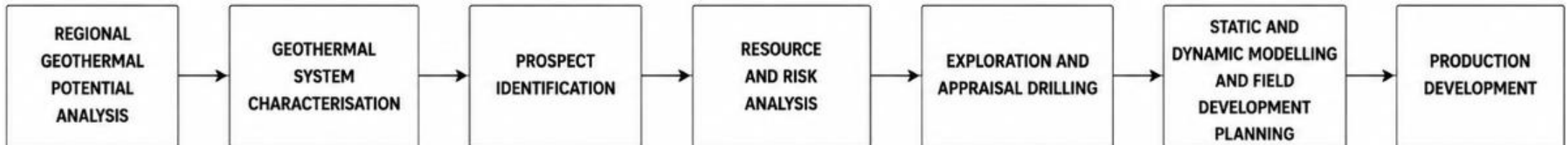


Parallel exploration workflows

Petroleum

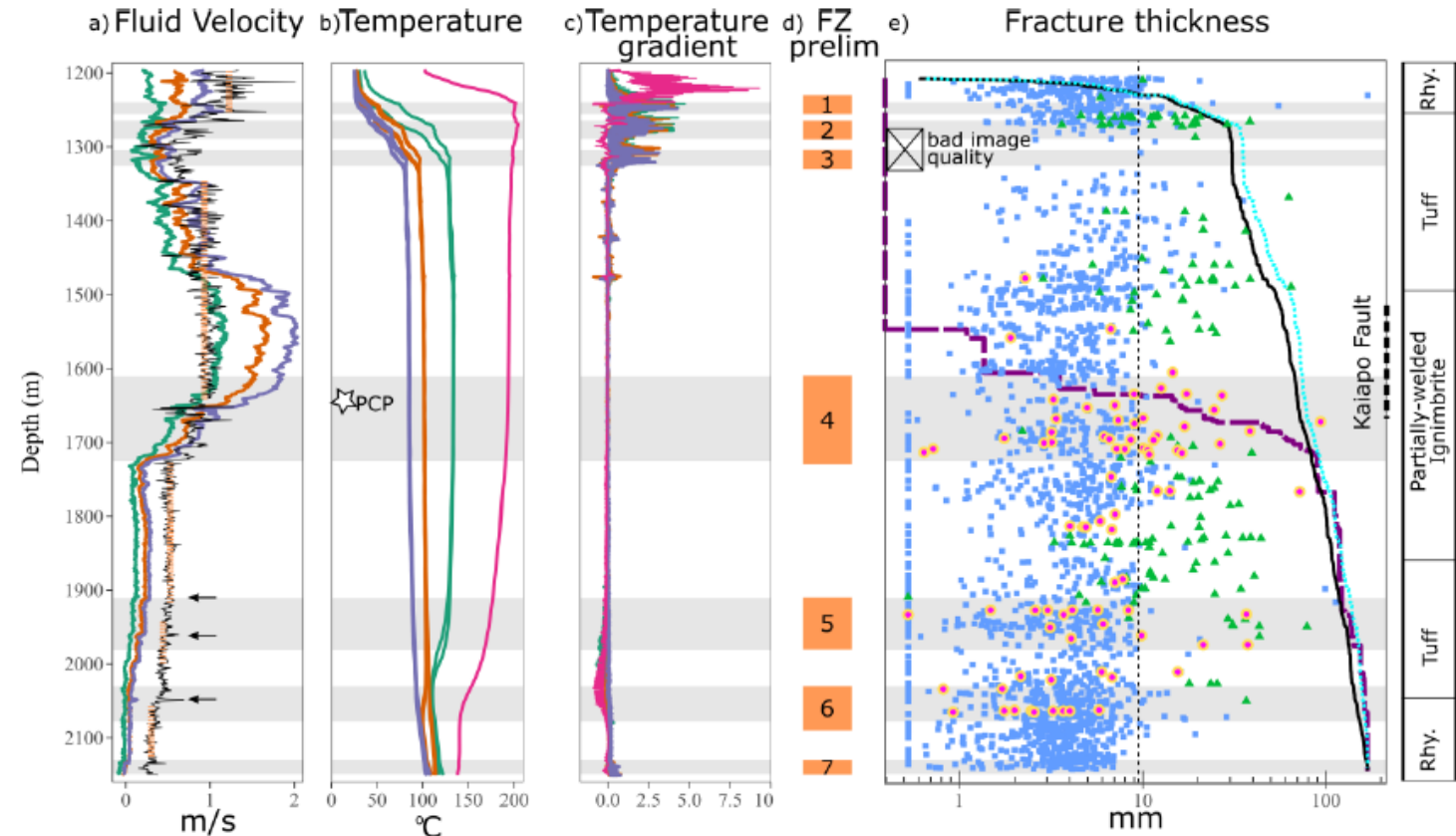


Conventional Geothermal



Similar data requirements

- Regional geophysical surveys
- Seismic
- Wells and drilling data – permeability, temperature
- Wireline and derived logs – Lithology, NMR, acoustic
- Pressure and temperature
- Core data - fractures
- Production data
- Fluid/Chemistry data



Similar production and resource management

Production and operations

- Well integrity & maintenance
- Production facilities & fluid management
- Scale, corrosion & flow assurance
- HSE & operational risk

Resource management

- Reservoir modelling & monitoring
- Production & resource forecasting
- Long-term reservoir stewardship

Community engagement & Consenting

- Tangata whenua partnerships
- Communications
- Landholder engagement
- Environmental and cultural impact assessments



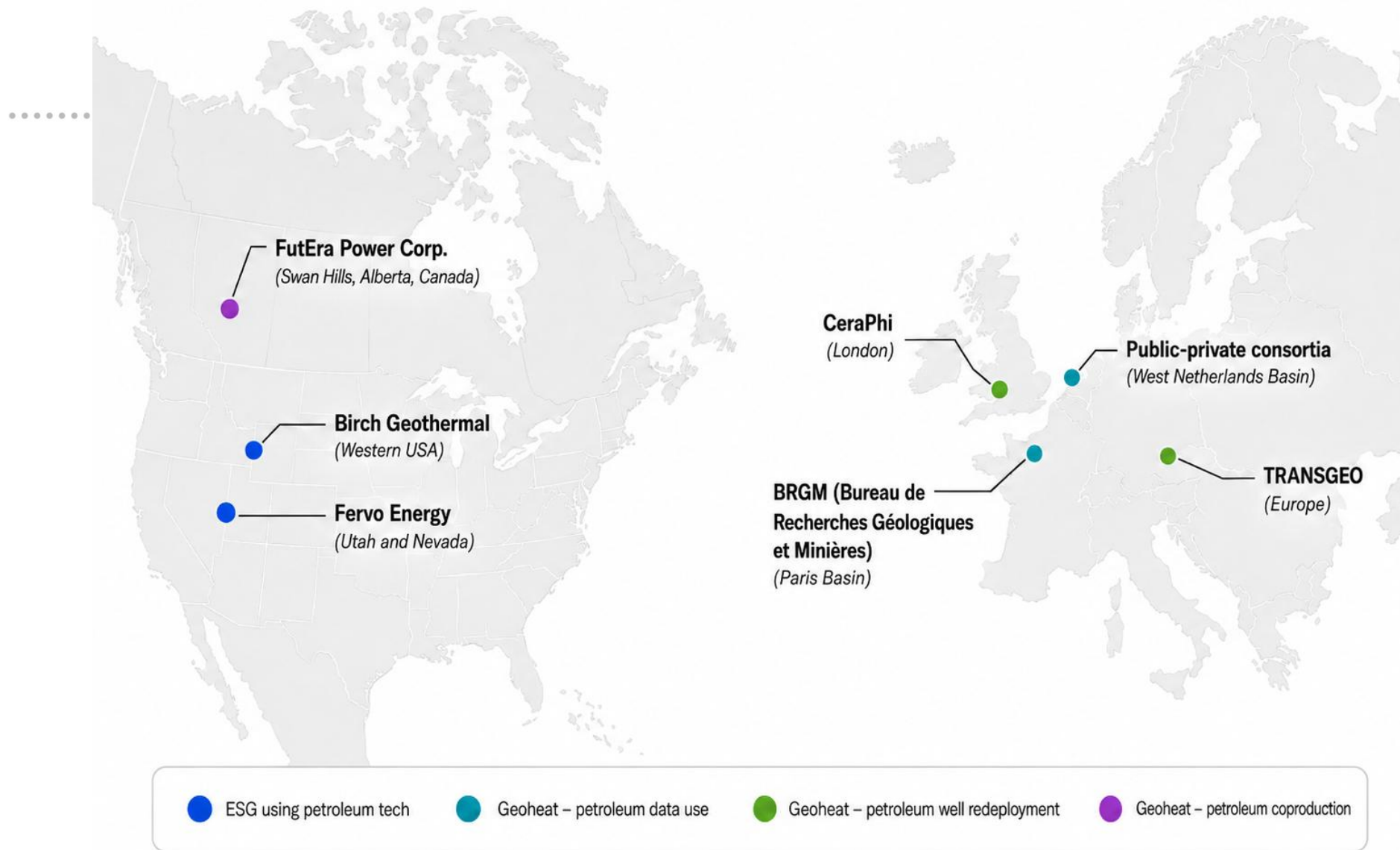
The skills overlap is substantial

60-70% of every dollar invested in **conventional geothermal** has significant overlap with oil & gas industry skills and expertise

>75% of investment in **next-generation geothermal** is closely related to oil & gas industry skills and expertise

Source: IEA, *The Future of Geothermal Energy* (2024)

International examples



Petroleum workflows and knowledge for ESG

Scalable EGS electricity development based on US Shale Gas methods

Petroleum Legacy:

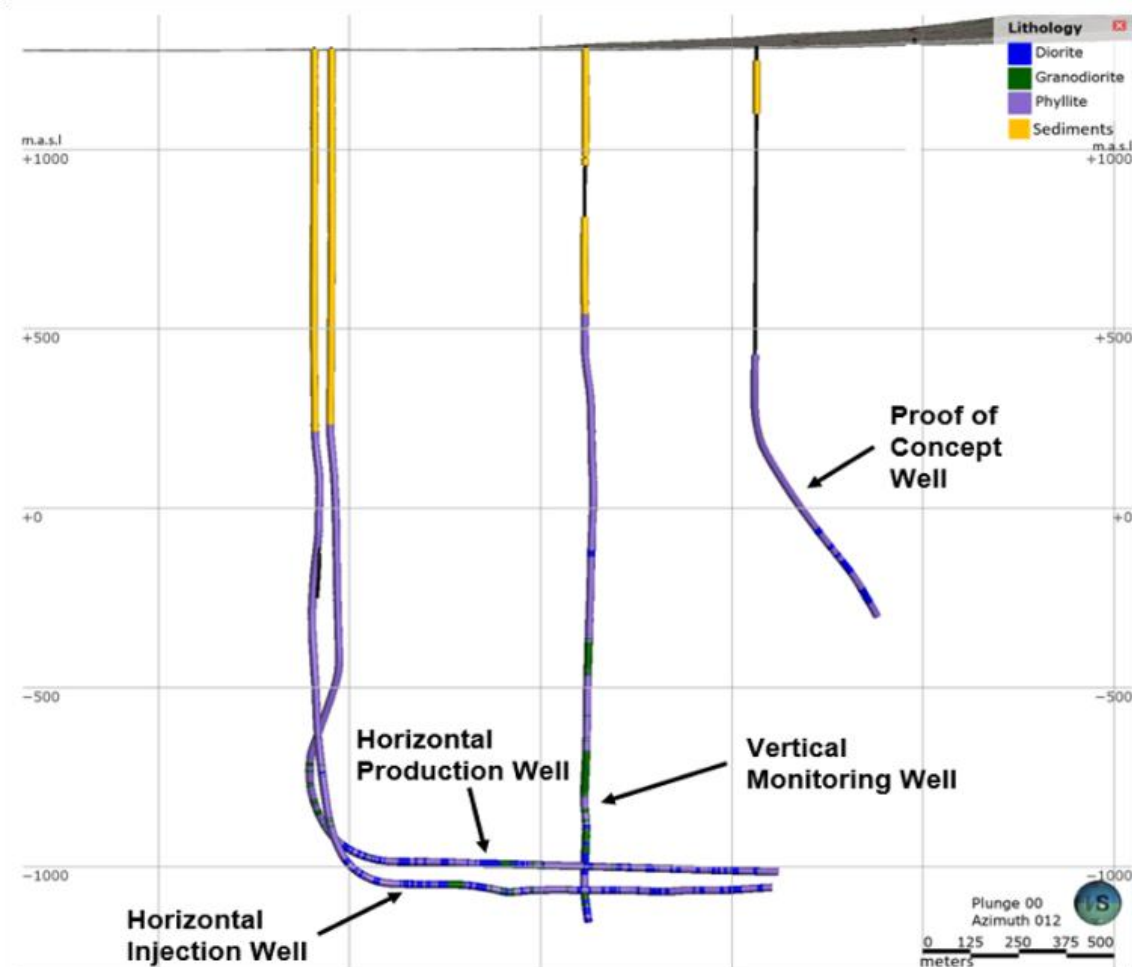
Horizontal drilling + stimulation + subsurface monitoring

Geothermal Application:

Engineered reservoirs in hot, low-permeability rock

Relevance to NZ:

- EGS potentially allows geothermal development beyond conventional hydrothermal fields to low permeability, high heat areas
- We already have much of the drilling and completion capability required



Fervo Energy – Development pipeline

Commercial pilot to utility scale development

Project Red, Nevada

- <190°C, 2,4kmTVD, 1km lateral, Metaseds and igneous rocks
- First commercial-scale horizontal EGS demonstration
- 3.5 MWe peak gross output
- Operating since 2023 - 600+ days of production history (world's longest-running EGS project)

Cape Station, Utah

- <240°C, 4-6kmTVD, 1.5-2.5km lateral, crystalline basement
- Utility-scale EGS development, with a phased build-out
- 500Mw build ongoing 1.5GW, 4.3 GW potential
- Modular development



Source: Fervo Energy

Birch Geothermal

Start up. Second Gen ESG; optimising reservoir development through intelligent well control to ensure long term production

Petroleum Legacy:

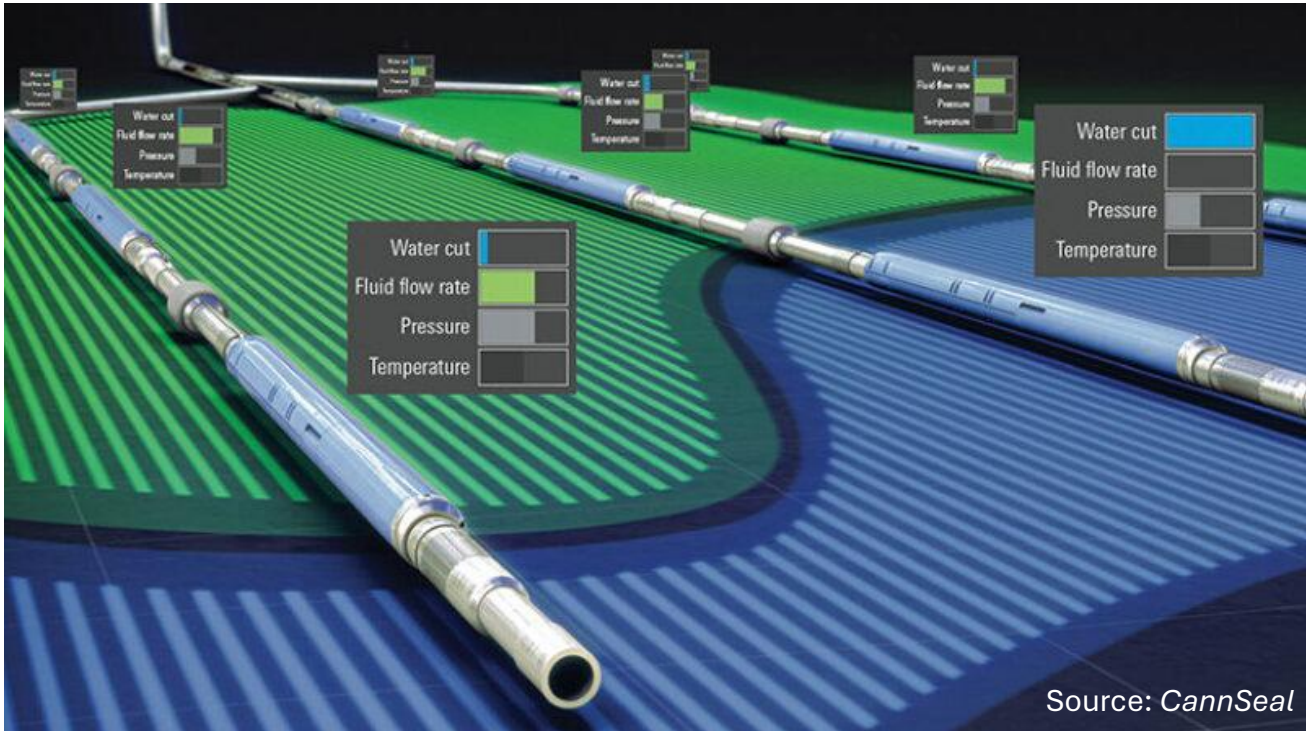
Will use sensors, autonomous systems and reservoir optimisation techniques alongside flow control and intelligent wells, developed in the upstream sector

Geothermal Application:

Optimize long term production from a stimulated ESG reservoir

Relevance to NZ:

Not sure?



Source: *CannSeal*

Geoheat development using petroleum data

A long standing, dual geoheat and oil producing basin

Petroleum Legacy:

Petroleum exploration identified geoheat potential, and allowed bypass of early stage geoheat exploration phase; instead petroleum data was used and parallel development occurred

Geothermal Application:

Geoheat developed near demand center (Paris)

Relevance to NZ:

Applicability to the Taranaki Basin

Petroleum exploration → 1950s



Oil discovered & production begins → 1958



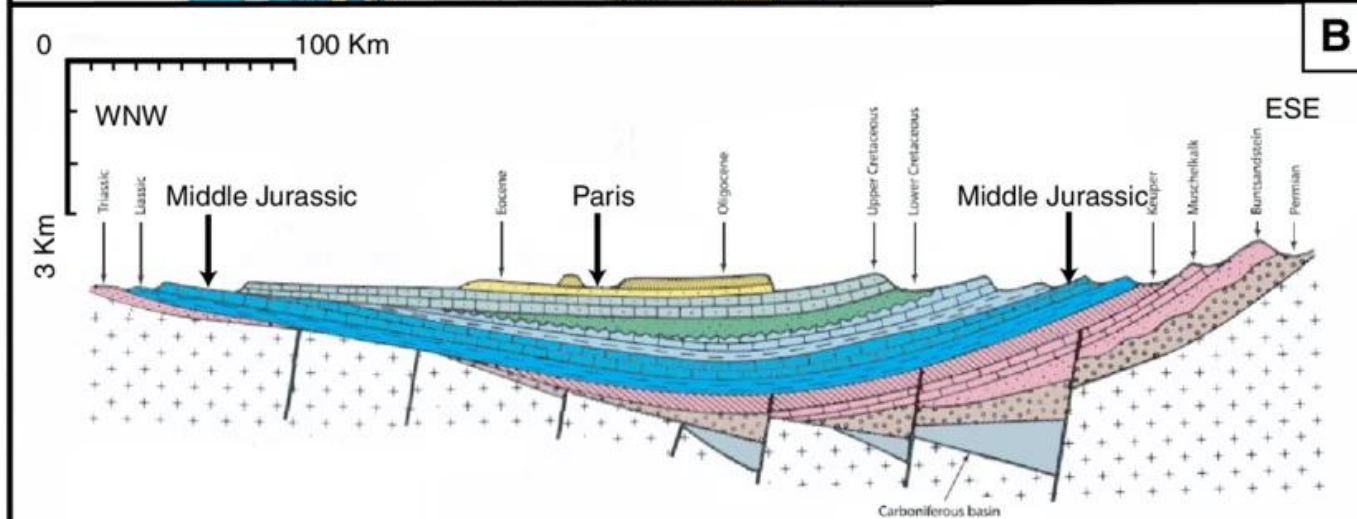
Petroleum drilling identifies the hot Dogger aquifer → 1950s



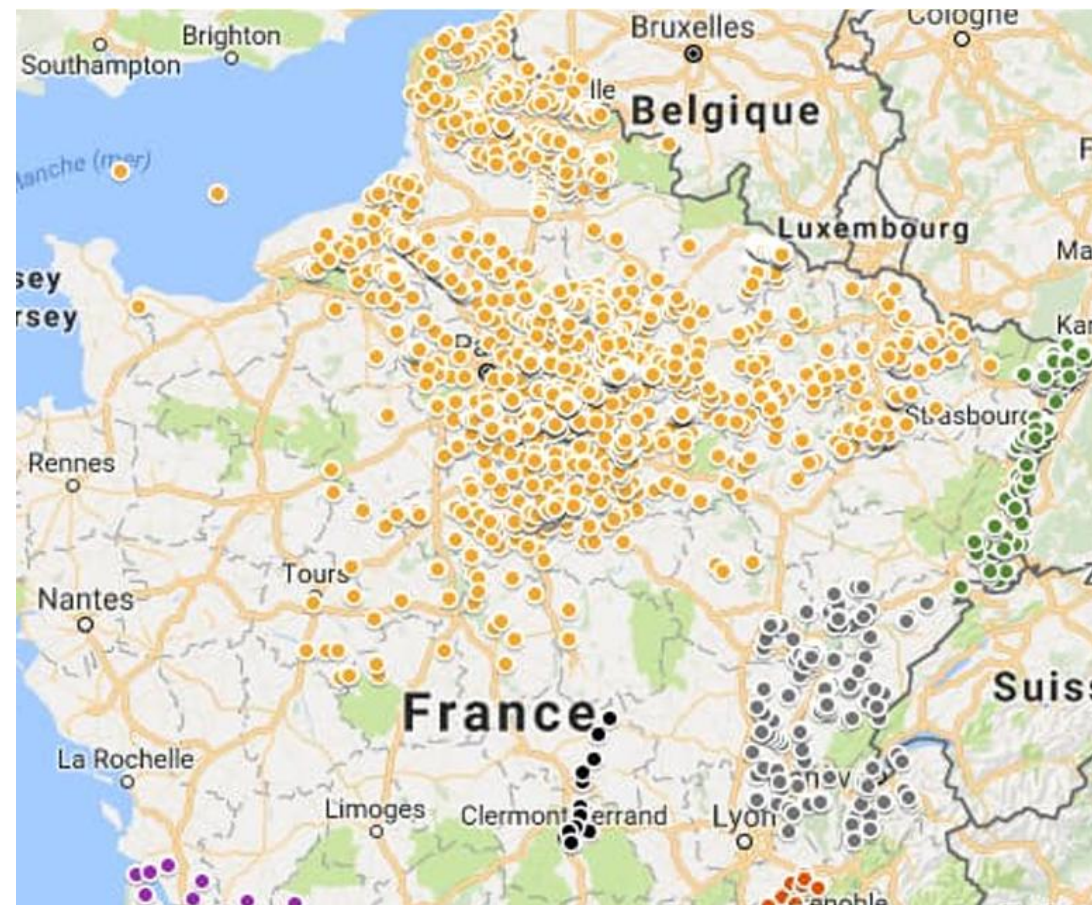
First geothermal district heating → 1969



Continued parallel development



Source: Beaudion et al, 2018



Source: l'Ineris

Paris Basin parallel-development

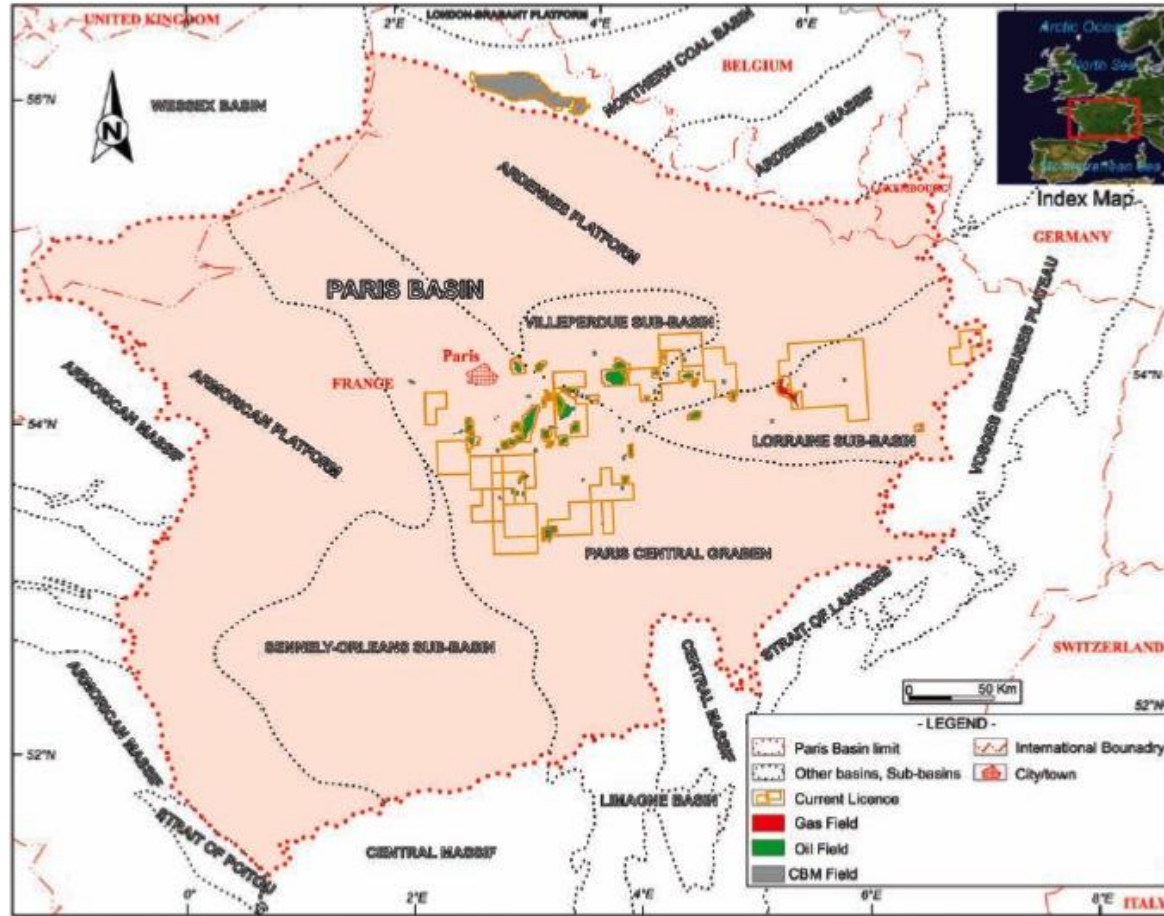
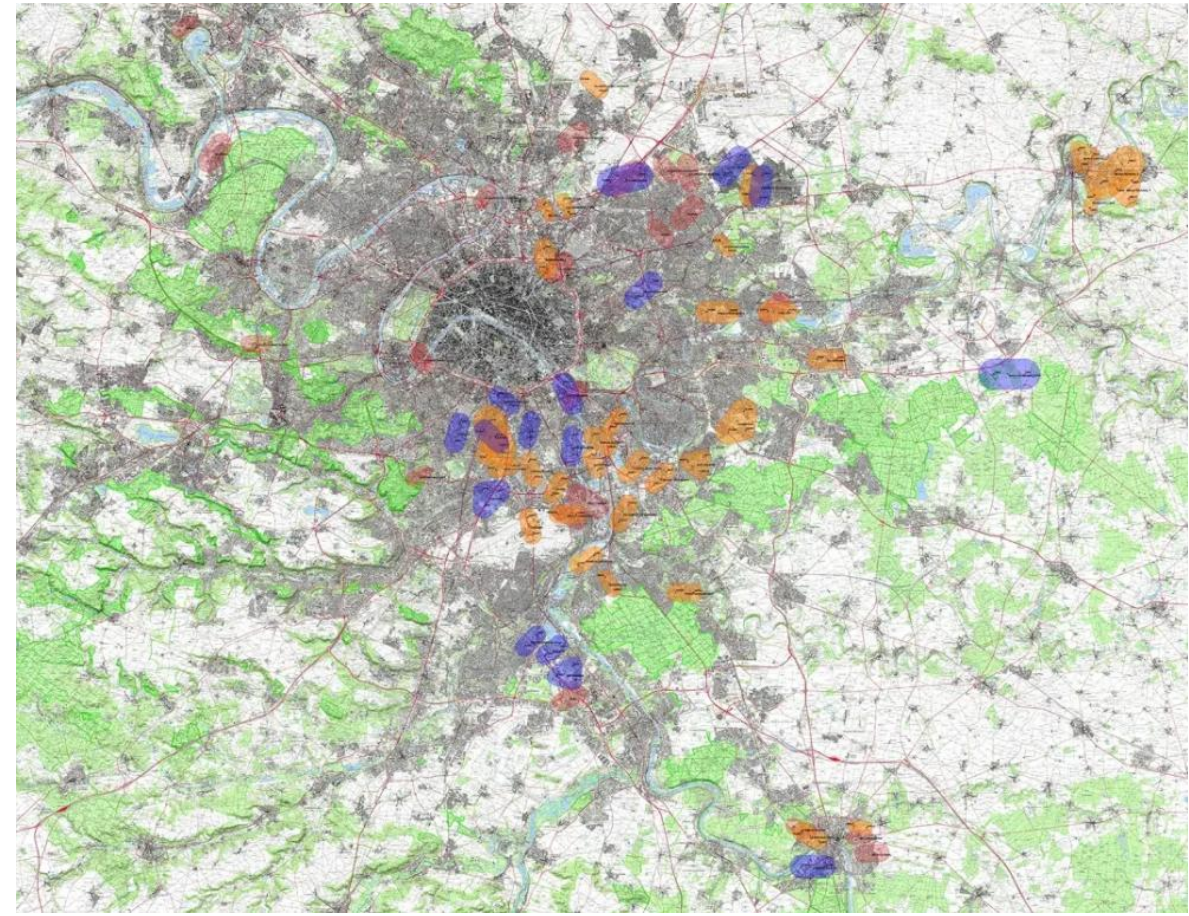


Figure 1 Location and hydrocarbon activity map of the Paris Basin (compiled from IHS data as of July 2008).

Source: IHS



Source: BGRM

Geoheat development stood up in a mature petroleum producing basin

Petroleum Legacy:

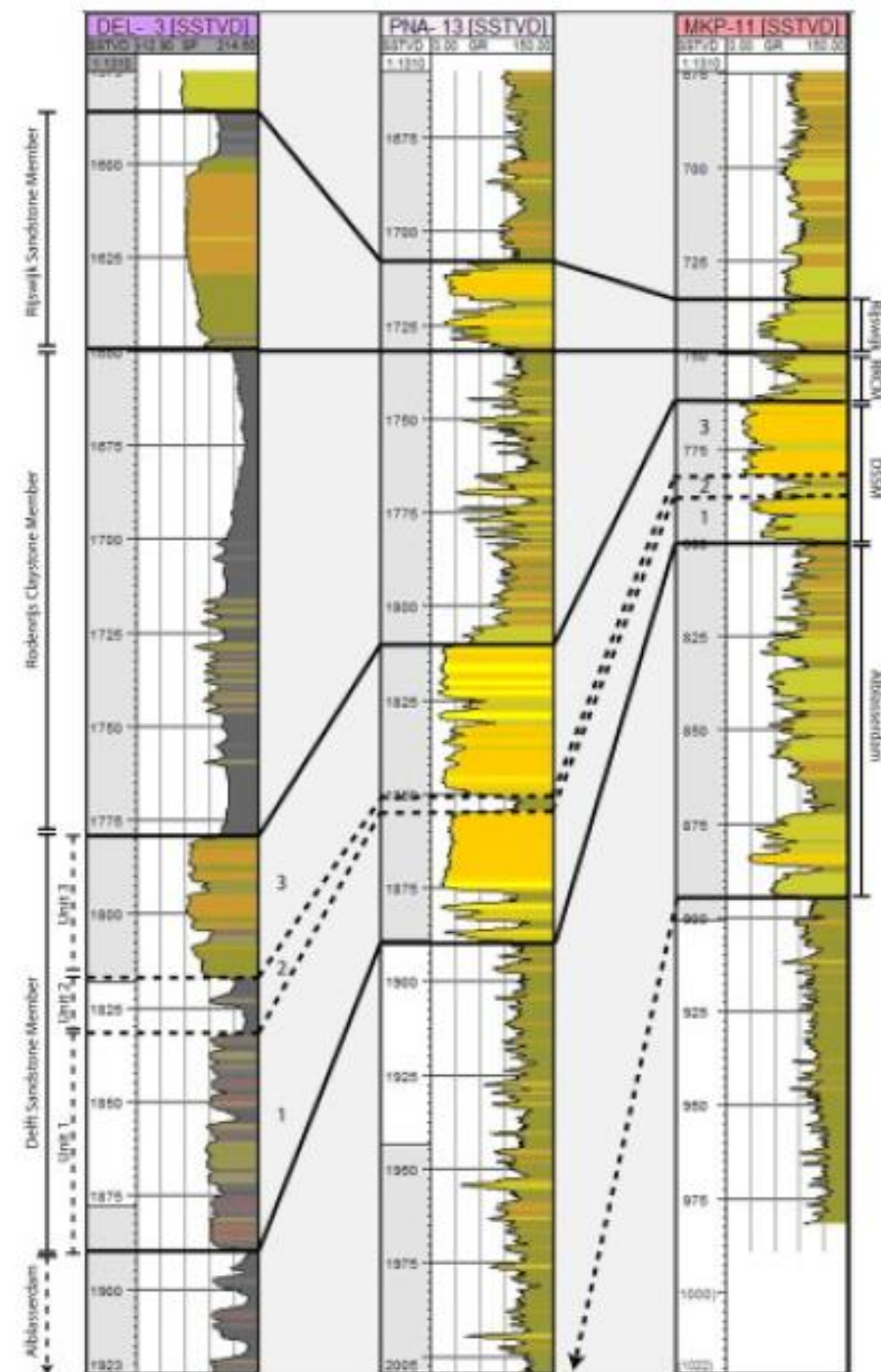
Petroleum data used to explore then develop commercial geoheat development

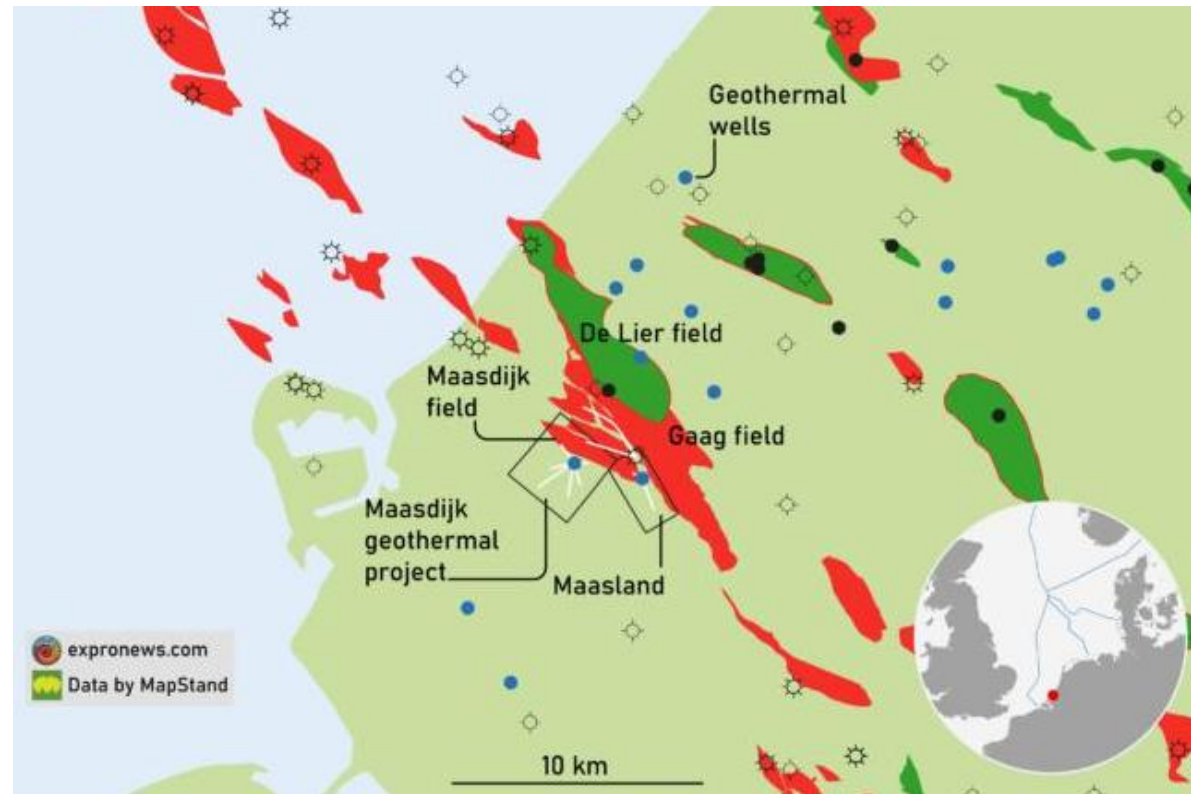
Geothermal Application:

Covered cropping and district heating

Relevance to NZ:

Direct applicability to the Taranaki Basin and possibly future geoheat development





Source: GeoExPro



Source: Peutz

Petroleum well redeployment

Screening petroleum wells viable for redeployment for geothermal

EU-funded, Central EU area - May 2023
– April 2026

9,000+ hydrocarbon wells across five countries

Use cases screened:

- Deep borehole heat exchanger
- Hydrothermal reuse
- EGS
- Aquifer thermal energy storage
- Borehole thermal energy storage

Site specific	No single best solution — match technology to well condition, geology, temperature and heat demand
Cost reduction	Suitable well reuse can cut geothermal investment costs by >50%
Main barriers	Technical: Well integrity, flow/temperature, retrofit cost and proximity to heat demand Non-technical: ownership, liability and permitting
Best near-term use	Heat often more viable than power — district, municipal and agricultural applications
Not every well works	Integrity, depth, diameter, temperature and proximity to demand determine suitability
Closed-loop option	Can enable reuse where natural formation flow is poor

Groß Schönebeck,

- Germany — closed loop
- *Existing ~4 km well → vacuum-insulated DBHE → direct geothermal heat*
- Field demonstration underway; modelling indicates heat potentially viable, electricity not

Mezőcsát-1,

- Hungary — open loop
- *1990s petroleum exploration well → ~57°C thermal water → heating 13 public buildings*
- Construction/procurement underway; performance yet to be proven



Developing the technology to repurpose petroleum wells

- UK, founded 2020
- Closed-loop geothermal retrofit for existing petroleum wells
- 2.1 km gas-well demonstration completed in 2023 - ~1.4km ambient heat network community heat project ongoing
- 2026 agreement to assess/repurpose up to 25 Star Energy wells



Petroleum and geoheat co-production

Swan Hills — extracting a second energy product from an operating oil field

- Swan Hills, Alberta — mature oil field producing since 1960
- Coproduction initiated in 2023 from hot produced water $>100^{\circ}\text{C}$ extracted with petroleum production
- Existing wells + pipelines + reinjection system reused for geothermal energy recovery
- 21 MW Electricity generated in hybrid plant exported to grid:
 - 15 MW natural gas turbine
 - 7 MW ORC geothermal + waste heat



Source: FutEra

Bringing it back to NZ

Case study	Details	Applicability to NZ
Fervo Energy + Birch	Petroleum (shale) knowledge and tech— long horizontal wells, DD, multistage stimulation, intelligent completions — can unlock next generation, tight geothermal resources	NZ has applicable applied petroleum expertise that could help us assess ESG in: • TVZ + Northland conventional field margins, super hot resources • Alpine fault corridor
Paris + West Netherlands Basins	Petroleum exploration in the Paris and West Netherlands basins created extensive subsurface datasets — including wells, seismic, core, logs and temperature information — that were used for streamlined/accelerated geothermal development, within the same basin and reservoir systems.	Taranaki basin; systematically re-analyse existing petroleum data to identify hot, permeable, water-bearing intervals • Reducing early-stage exploration cost and uncertainty • Targeting opportunities where suitable resources coincide with industrial, horticultural or community heat demand.

Case study	Details	Applicability to NZ
Transgeo+ CeraPhi	In some cases, legacy petroleum wells could become geothermal assets • Well condition, depth, temperature, flow potential and proximity to heat demand • Requires bespoke reuse pathways • Possible high benefits, with direct use most economic	Taranaki Basin; screen current suspended + shut wells prior to abandonment • Candidates that could be repurposed for geothermal heat could avoid geoheat drilling costs, recycle existing infrastructure and extending the productive life of subsurface assets.
FutEra	Geothermal value can be extracted while a petroleum field is still operating, by recovering heat from hot produced water before it is reinjected.	Taranaki basin; screen mature, high-water-cut oil and gas fields - both production stations and producing well pads: • Screen for temperature + flow rate over time, and existing reinjection infrastructure • Potential to add a second energy product, improve overall field efficiency and create a transition pathway before decommissioning.

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Thank you