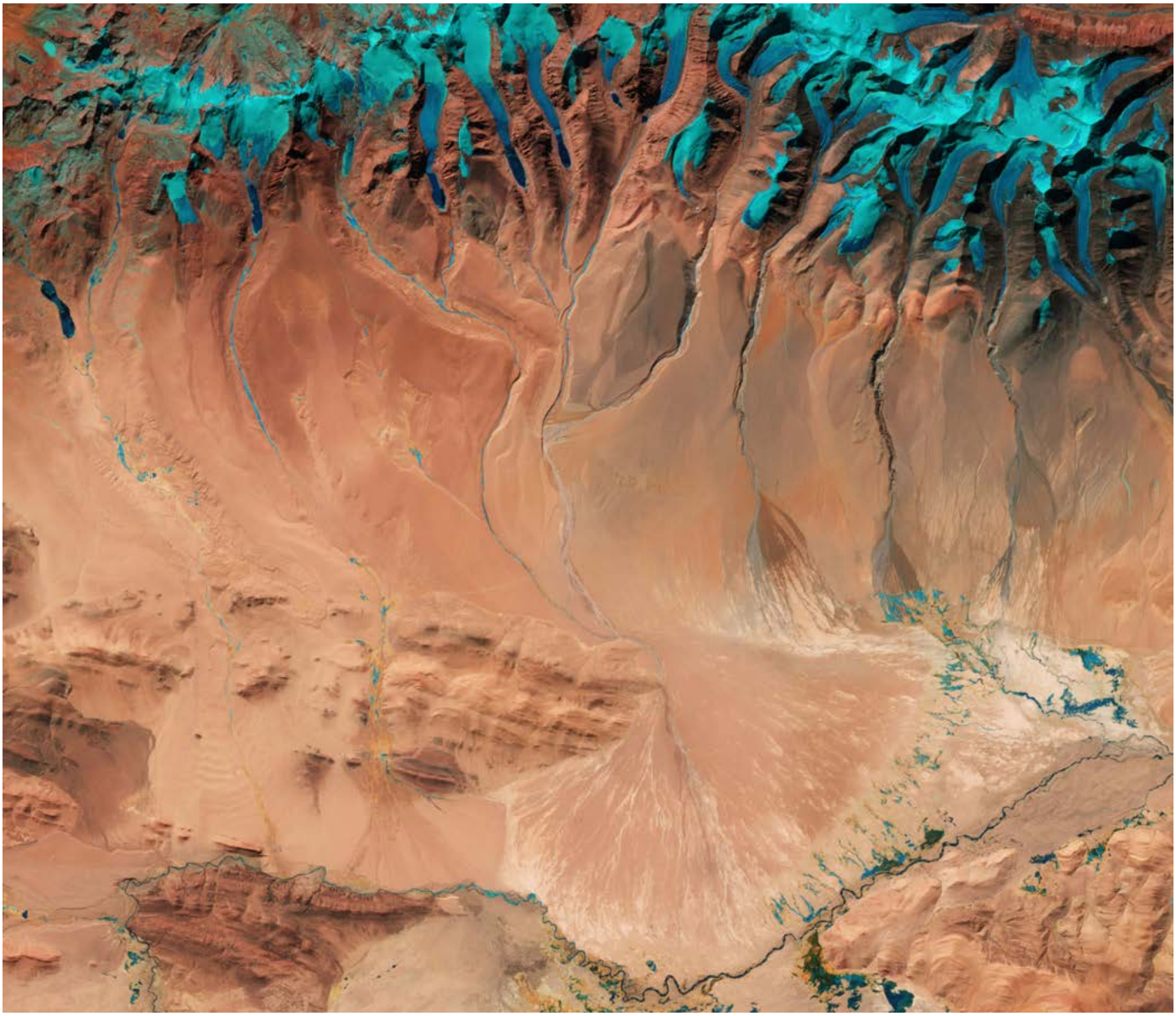


WHITE PAPER

Old Data, New Value: From Oil & Gas Expertise To Multi-Resource Mastery

Datasets from oil & gas, assisted by AI, are poised to unlock value in other critical resource sectors

October 2026
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Introduction: Millions of years and petabytes of data

The distribution of natural resources was fixed by geological processes that took place millions, and sometimes billions, of years ago. As the energy transition advances and resource security becomes more contested, nations and companies need a more integrated view of their subsurface endowments, including critical minerals, hydrocarbons, geothermal resources, natural hydrogen, helium, CO_2 storage, hydrogen storage, and strategic aquifers.

Oil & gas companies hold some of the world's richest subsurface datasets, built over decades through seismic acquisition, drilling, well logging, core analysis, fluid sampling, pressure testing, and production monitoring. Historically, these datasets have been interpreted through a hydrocarbon lens. Yet the same data often contains information relevant to broader resource systems — particularly in sedimentary basins where minerals, brines, fluids, reservoirs, seals, and structures are geologically linked.

AI is creating opportunities to revisit these legacy datasets at speed and scale. By extracting, structuring, and cross-referencing seismic, well, geochemical, fluid, and legacy report data, AI-enabled workflows can reduce the cost of testing new geological hypotheses and accelerate strategic resource screening. Minerals are the central use case in this paper, but the same logic extends to adjacent subsurface opportunities.

The strategic implication is significant. Repurposing oil & gas data can shift companies from single-resource development toward basin portfolio optimization, turning sunk exploration costs into a monetizable data asset, while moving competitive advantage upstream toward those who control high-quality datasets and can integrate AI with deep geoscience expertise.

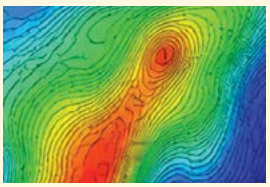
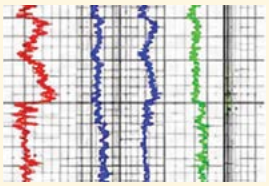
This paper examines how AI-enabled reinterpretation of oil & gas subsurface data can support faster, lower-cost, and more disciplined exploration. The opportunity is not to eliminate geological risk, but to reduce the search space, improve early-stage targeting, and strengthen the evidence base for investment decisions.



EXHIBIT 1

Illustration of key oil & gas data sets

Illustrative & Non- exhaustive

Gravity & Magnetic Data	Primarily includes gravity and magnetic measurements, which detect variations in the Earth's gravitational or magnetic fields. Commonly used in mineral exploration. Min Resolution: 1-10s km	
Seismic data	Generated by transmitting acoustic waves into the Earth and measuring the reflections from rock layers. This builds maps of subsurface structures, rock types, and even fluid variations. Min Resolution: 10-100s m	
Well data (logs)	Collected by lowering logging tools into a wellbore. These measure the physical properties of geological formations, such as acoustic, resistive, and natural radioactivity properties. Min Resolution: 1-10s cm	
Well data (core)	Core samples are retrieved during drilling. They provide detailed data on rock characteristics and the depositional environment. Min Resolution: 1-100s µm	
Reservoir Fluid Samples	Brine (water) samples are retrieved after drilling. They provide detailed data on basin fluid properties, chemistry, and dissolved minerals. —	

The World's Most Valuable Subsurface Dataset

Decades of oil & gas exploration and production has created subsurface datasets of extraordinary richness and depth. Yet today, these datasets remain largely underused in the context of modern and evolving computational capabilities. This represents a massive, untapped opportunity to inform decision-making across multiple subsurface-dependent sectors. (Exhibit 1: the data stack).

Across the industry professionals are highly skilled at using sophisticated workflows to combine seismic, well, gravity and magnetic data, constructing 3D earth models that accurately map rocks, geological structures and fluids kilometers below surface. It's these models that then underpin billions of dollars of drilling and development decisions each year. Two million wells have been drilled since 2000 at an estimated cost of over $6 trillion, and approximately $300bn has been spent on seismic services globally since 2010 alone (Rystad).

Yet despite its richness, more than 90% of the subsurface volume imaged and drilled for oil & gas is typically underutilized (as it is not economically relevant for the sector) and has never been reinterpreted for any other purpose.

A typical exploration well penetrates 3,000–5,000 meters of stratigraphic section, yet detailed petroleum geoscience analysis is concentrated on the reservoir interval — commonly 50–300 meters of net pay, representing as little as 5–10% of total penetration depth. The remaining section is logged and recorded but rarely reinterpreted for any other purpose. At the basin scale, subsurface data acquisition has been concentrated spatially on hydrocarbon targets: a systematic review of UK onshore legacy data found that deep borehole and 3D seismic coverage was clustered around known oil & gas fields, with limited spatial coverage for non-petroleum purposes.

The consequence is that the overwhelming majority of subsurface information encoded in legacy datasets — in the vertical column above and below reservoir intervals, and in basin areas far from productive fields — has never been interrogated for non-hydrocarbon resource signals.



Strategic Advantage of Multi-Resource Subsurface Data

The strategic advantage is not simply better exploration: it is the ability to convert a legacy hydrocarbon dataset into a basin-scale portfolio asset. The same seismic, well, core, pressure, temperature, fluid, and production data can support multiple resource hypotheses, reduce marginal screening cost and create optionality across commodities, storage, water, and heat.

For companies that control large legacy datasets, value may come through three routes: internal exploration uplift, data licensing or reinterpretation products, and JV structures where proprietary subsurface insight substitutes for part of the capital commitment. Competitive advantage therefore moves upstream, toward those who control high-quality data and can integrate AI with deep geoscience.

When we look closer, we find that oil & gas datasets provide high-resolution, basin-wide context that other resource explorers typically lack in early stages, where poor resolution, shallow imaging, and sparse drilling pose unavoidable challenges.

Oil & gas workflows can materially improve early-stage screening, but they should not be treated as a direct analogue for mining exploration success. Petroleum systems are often risked through play elements such as source, reservoir, seal, trap, charge, and timing. Mineral systems are different: value depends on orebody geometry, grade continuity, mineralogy, metallurgy, processing route, and infrastructure, many of which are controlled by heterogeneity at scales below seismic resolution. Oil & gas data therefore does not 'solve' mineral exploration risk. Its strongest contribution is at the basin and system scale: mapping stratigraphy, structures, fluid pathways, thermal history, brine evolution, and redox architecture. The value is better screening, faster exclusion of non-prospective areas, and more disciplined capital allocation.

Many economically significant resource systems coexist naturally alongside oil & gas within sedimentary basins (see Exhibit 2). The key insight is that this co-location is not coincidental, but geological in nature. The geological link shared fluid systems (migration, trapping, chemical evolution), common structural frameworks (faults, basins, traps) and linked depositional environments.

This is where oil & gas datasets provide unique value:

- Basin-scale seismic provides insight into structure and architecture
- Well data provides insight into lithology, fluids, geochemistry
- Basin models provide insight into thermal and fluid history

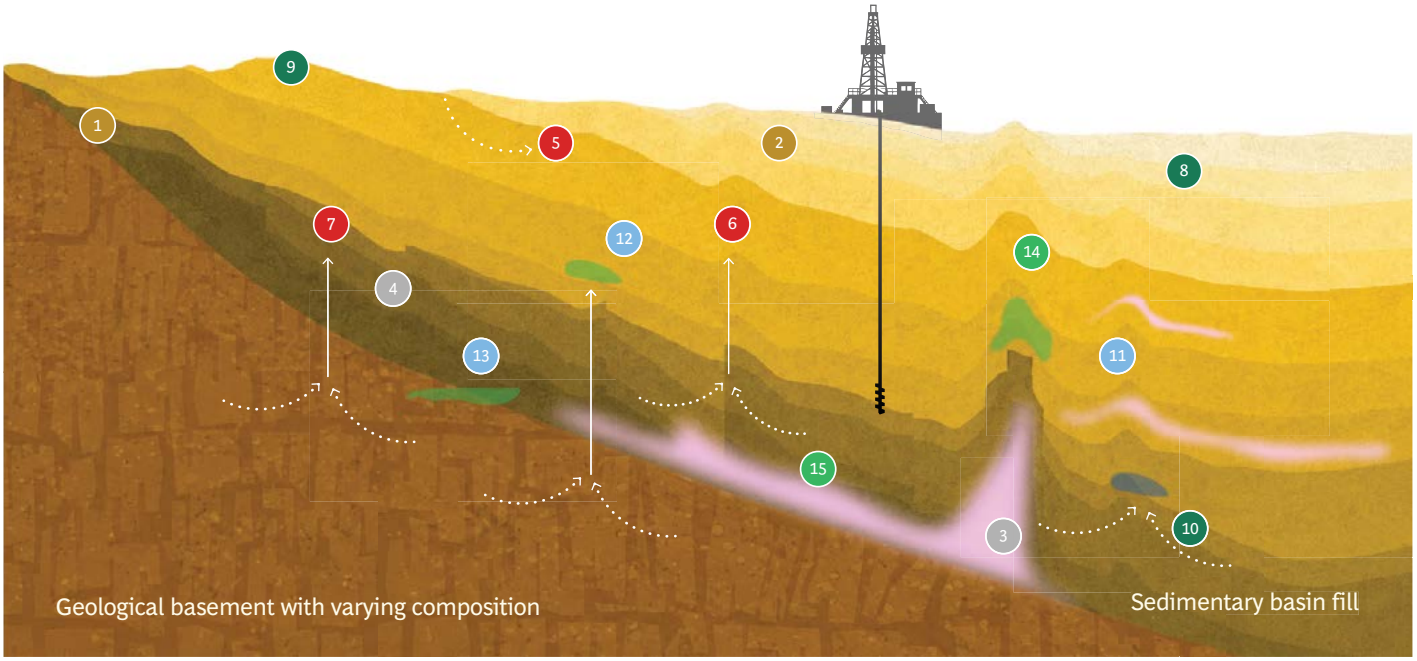
Oil & gas workflows can transfer directly to these areas: basin modeling, seismic attribute analysis, structural interpretation and stratigraphic mapping can all be adapted to identify metal source rocks, brine pathways, geothermal sweet spots, migration systems for hydrogen/helium, and CO_2 storage traps.

EXHIBIT 2

Subsurface Systems and Geological Processes Underpinning Critical Resource Potential

Illustrative & Non- exhaustive

Seismic database coverage



Target Category	Play and Product		
Surficial ore forming processes	1 Laterites (Al, Ni, Au, PGE, Cu)	2 Calcretes (U, K)	
Sedimentary ore forming processes	3 Evaporites (Li, Mg, Br, K); Phosphorites (P)	4 Placer deposits (Au, U, Zn)	
Hydrothermal ore forming processes	5 Meteoric fluids (U, V)	6 Connate fluids (Pb, Zn, Cu, Ag)	7 Metamorphic fluids (Au)
Naturally occurring materials	8 High purity silica deposits	9 Construction materials (Limestone, sand)	10 Helium
Energy	11 Oil & Gas	12 Hydrogen (White)	13 Geothermal
Storage/disposal	14 Carbon Capture & Storage	15 Nuclear waste disposal	

Fluid/Flow · Evaporite · Oil/Gas field

Representative sedimentary basins demonstrate that petroleum subsurface datasets can support a much broader range of resource opportunities beyond hydrocarbons, including critical minerals, geothermal, hydrogen, water systems, and geological storage. In many cases, the same reservoirs, seals, pressure systems, and formation-water networks that enabled hydrocarbon accumulation also create favorable conditions for adjacent resource development.

As shown in **Exhibit 3**, decades of investment in seismic, wells, logs, cores, pressure data, and production history have created a transferable subsurface intelligence layer that can accelerate exploration and de-risk emerging subsurface opportunities. Basins with extensive legacy oil & gas datasets may therefore hold a structural advantage in enabling integrated multi-resource exploration and development.

Formation water chemistry is a highly valuable and underused data stream for multi-resource screening. Brine samples collected through drill stem tests, MDT surveys, or production are routinely analyzed for salinity and ionic composition, then archived in well records. These fluids are not passive: they record rock-fluid interaction, diagenesis, hydrothermal circulation, and basinal brine evolution.

Signals such as divalent cations, pH, and total dissolved solids are relevant not only to oil & gas operations but also to mineral enrichment. A clear example is the Smackover Formation in Arkansas, now a focus for direct lithium extraction: it was identified partly because decades of petroleum records already showed lithium-rich brines.

For companies with large formation-water archives, the opportunity is immediate. Reanalyzing produced-water data requires no new acquisition, only tools to extract, normalize, and cross-reference legacy geochemical records. In carbonate basins, these archives can function as geochemical maps for lithium, bromine, iodine, and geothermal screening. The data already exists; it simply needs to be queried differently.

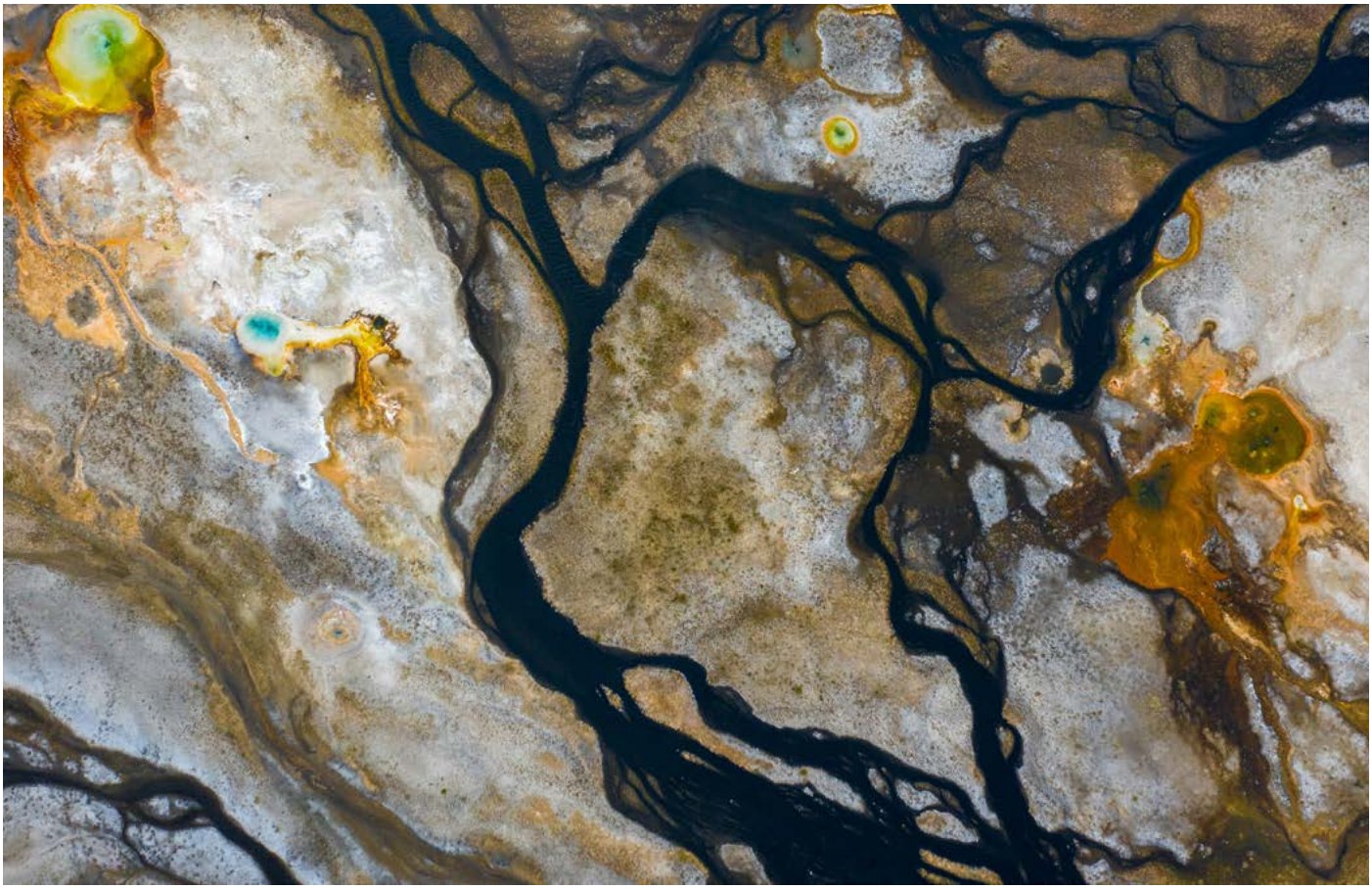


EXHIBIT 3

Representative Sedimentary Basins Where Petroleum Plays Overlap with Adjacent Mineral, Energy, Water, and Storage Opportunities

Illustrative & Non- exhaustive



1 Western Canadian Sedimentary Basin

Resource: Lithium brines, geothermal, helium, natural H_2 potential
Geology: Direct brine/geothermal/gas-data reuse; strong, though commercial maturity varies by resource
Data: Oilfield brine chemistry; produced water/flowback data; wells/logs; core; pressure; production history; BHT; DSTs; gas composition; geothermal atlas data

2 Smackover / Arkansas-Gulf Coast brine fairway

Resource: Lithium, bromine, iodine brines
Geology: Same fluids and reservoirs are directly relevant; this is the clearest mineral/brine reuse case
Data: Produced-water chemistry; formation-water samples; DST/MDT data; well logs; cores/cuttings; pressure data; production/injection history; seismic; BHT

3 Permian Basin / Carlsbad potash area

Resource: Potash, evaporites, salt/H_2 storage, Li/Br/I brine, CO_2 storage, geothermal
Geology: Strong mixed-resource case with direct co-development history; strongest for evaporites/storage/brines
Data: 2D/3D seismic; well logs; formation tops; density/neutron/gamma logs; core/cuttings; produced-water chemistry; DST/MDT; pressure/injection history; BHT

4 Paris Basin

Resource: Geothermal, CO_2 storage, H_2 storage, aquifers, natural H_2 observations
Geology: Very strong geothermal/ aquifer reuse case; storage and natural H_2 should be caveated by maturity
Data: Legacy oil and geothermal wells; logs; core; seismic; flow tests; pressure tests; water chemistry; temperature logs; reservoir models

5 Middle East carbonate basins

Resource: CO_2 storage, H_2 storage, sulphur, aquifers, evaporites, helium potential
Geology: Strong direct storage/sour-gas reuse but best presented as regional archetype, not a single basin case.
Data: Seismic; carbonate core; image logs; petrophysics; gas composition; produced-water chemistry; pressure/production history; injection data; geomechanics; well integrity.

6 Sichuan Basin

Resource: Lithium, potassium, bromine brines; geothermal
Geology: Strong literature-backed integrated gas-brine example; commercial pathways unclear
Data: Formation-water chemistry; produced-water chemistry; DST/MDT samples; wells/logs; core/cuttings; seismic; pressure; production; BHT

7 North Sea

Resource: CO_2 storage, H_2 storage, geothermal, aquifers, trace brine minerals
Geology: Same reservoirs, seals and pressure systems are reused; strongest non-mineral energy-transition case
Data: 3D/4D seismic; wells; logs; core; petrophysics; pressure history; production/injection data; reservoir models; well integrity; BHT; water chemistry

AI + Human Geoscientific Expertise = A New Subsurface Discovery Engine

A key historical barrier to reusing oil & gas datasets has been the opportunity cost. AI helps because oil & gas data is large, heterogeneous, and only partially interrogated for non-hydrocarbon purposes. Seismic volumes, well logs, cores, well tests, production histories, fluid samples, and legacy reports often contain signals relevant to mineral systems, but these signals are distributed across fragmented and unstructured archives. AI can extract, normalize, cross-reference, and rank these signals at basin scale. Its role is not automated discovery, but faster and more consistent hypothesis generation, allowing experts to focus on geological plausibility, mineral-system fit, and where new data should be acquired.

For example, today, a regional seismic interpretation that once took months can be completed in days using AI-assisted tools. This is already resulting in a massive uplift in productivity while reducing the opportunity cost of testing datasets for new targets.



Multi-format and Multi-dimensional

Oil & gas datasets are large, fragmented and multi-format, and this has historically limited cross-resource interpretation. However, new AI and RAG (retrieval augmented generation) capabilities can extract, normalize and cross-reference seismic, well, fluid, pressure, temperature, gas and legacy report data at basin scale, identifying relationships that would be impractical to detect manually. The value here is not automated discovery, but faster evidence ranking, shorter interpretation cycles and lower-cost testing of geological hypotheses.

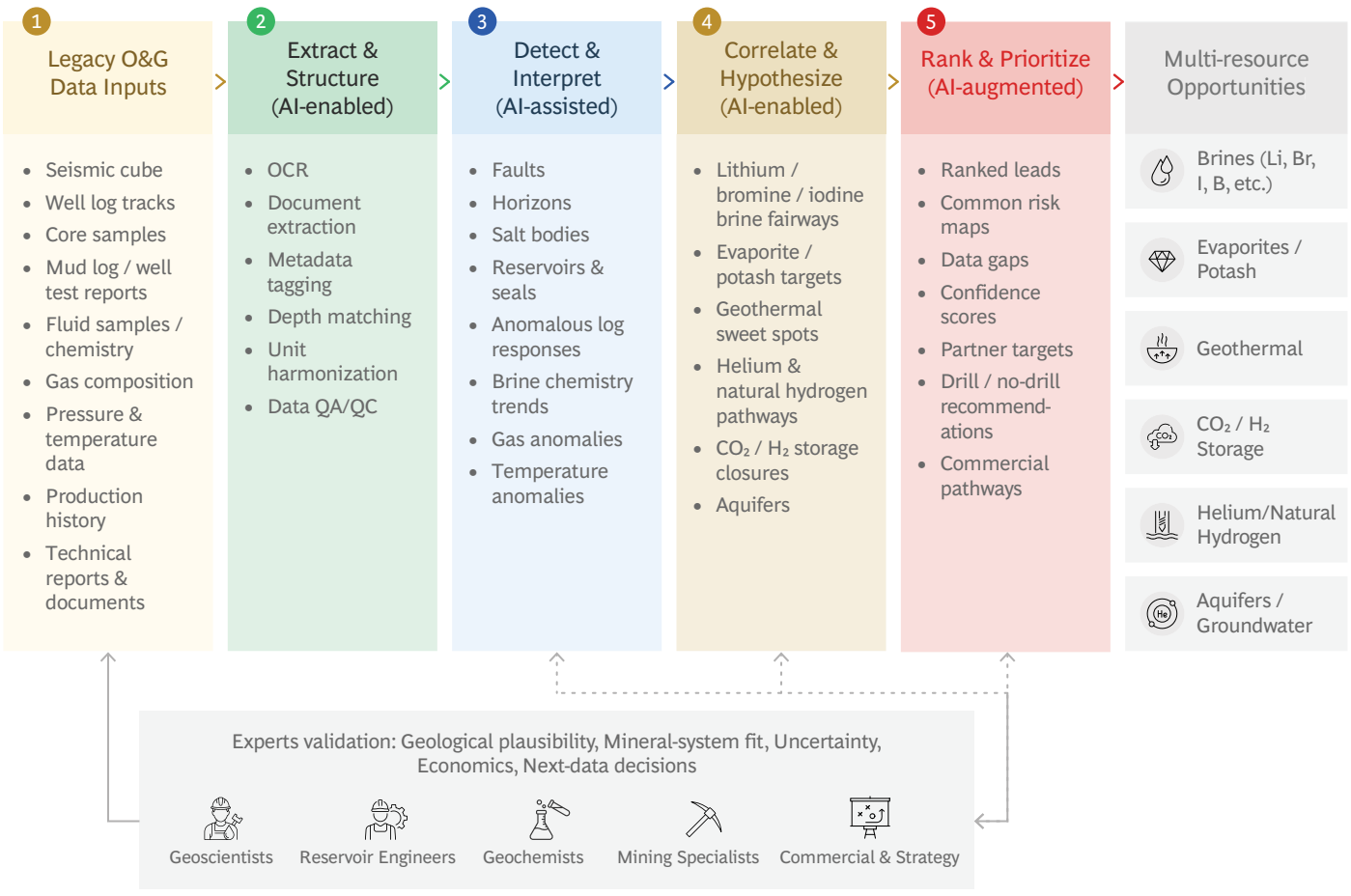
AI does not replace geoscience — it amplifies it. Its primary impact is to reduce interpretation cycle time, enable cross-domain data integration, and lower the cost of testing new geological hypotheses.

The combination of AI + basin-scale datasets + domain expertise creates a new exploration paradigm — but only where underpinned by sound geological understanding. Exhibit 4 illustrates how AI-enabled workflows convert fragmented legacy oil & gas data into ranked multi-resource opportunities by extracting, structuring and correlating evidence across seismic, wells, fluids, pressure, temperature and historical reports.

EXHIBIT 4

An AI-enabled workflow to convert legacy data to new resource insights

Illustrative & Non- exhaustive



Challenges to Realizing the Opportunity

The opportunity is significant, but execution is constrained by technical, regulatory and commercial complexity. Subsurface datasets are often fragmented across operators, vintages and formats, displaying variable quality and inconsistent standards. Integrating seismic, wells, fluids, geochemistry and mineral data into coherent multi-resource interpretations requires capabilities beyond traditional oil & gas workflows.

Regulatory and ownership issues add further friction. Rights to hydrocarbons, minerals, water and storage are often governed by different regimes, while data licensing and permitting constraints can limit transferability across resource types and jurisdictions.

Economic uncertainty also remains material, while geological co-location creates a screening opportunity, not an investment case. Commercial value still depends on grade, volume, deliverability, processing route, infrastructure, permitting and market depth.

These barriers reinforce the need for an integrated strategic, technical and commercial approach. Advantage will accrue not simply to those with the largest datasets, but to those able to curate them, prioritize the most attractive resource systems, manage regulatory constraints and build partnerships that convert subsurface insight into investable opportunities.



Steps to Multi-Resource Mastery

Capturing the value of legacy oil & gas datasets requires more than the application of new technology to old workflows. It will demand a focused operating model that combines geoscience, AI, commercial strategy and partnership execution.

1. **Prioritize strategic resource targets**

   Identify the resources and basins with the strongest combination of geological potential, strategic relevance and commercial value. Focus investment where legacy data can materially reduce uncertainty.

2. **Build a multidisciplinary subsurface team**

   Combine oil & gas interpreters, mining geoscientists, reservoir engineers, geochemists and AI/ML specialists into a focused exploration team. This enables faster data reinterpretation and more robust cross-resource problem solving.

3. **Develop AI-native workflows**

   Redesign workflows around AI-enabled data extraction, seismic-to-well feature detection, mineral-system screening and common risk segment mapping. Scalable agents and repeatable workflows can then be applied across large legacy datasets.

4. **Generate a multi-resource prospect inventory**

   Translate subsurface insights into ranked prospects and leads, with resource-specific estimates of scale, risk, uncertainty and commercial potential. This creates a portfolio view across minerals, brines, geothermal, storage, hydrogen, helium and aquifers.

5. **Define commercialization pathways**

   Assess ownership, licensing, development routes, required capabilities and monetization models. Options may include internal exploration, data licensing, farm-outs, joint ventures or strategic partnerships.

6. **Partner strategically**

   Select partners that bring complementary technical, commercial or regulatory capabilities. Partnerships can reduce risk, accelerate validation and convert subsurface insight into investable opportunities.

Conclusion: Opportunities to be taken

Legacy oil & gas data represents one of the most extensive subsurface knowledge bases ever assembled. Until now, much of that knowledge has been interpreted through a hydrocarbon lens. AI-enabled workflows create an opportunity to revisit these datasets at speed and test new resource hypotheses across minerals, brines, geothermal systems, natural hydrogen, helium, aquifers and geological storage.

The prize is not automated discovery. It is better screening, faster prioritization and more disciplined capital allocation. By reducing the search space and strengthening the evidence base for early-stage decisions, repurposed oil & gas data can help organizations identify where to invest, where to partner and where to avoid unnecessary exploration spend.

Capturing this opportunity requires more than technology. It demands a shift from single-resource thinking to basin portfolio optimization, supported by multidisciplinary teams, fit-for-purpose AI workflows and clear commercialization pathways.

Organizations that combine proprietary data, geoscience depth, AI capability and commercial execution will be best positioned to turn old data into new resource value.



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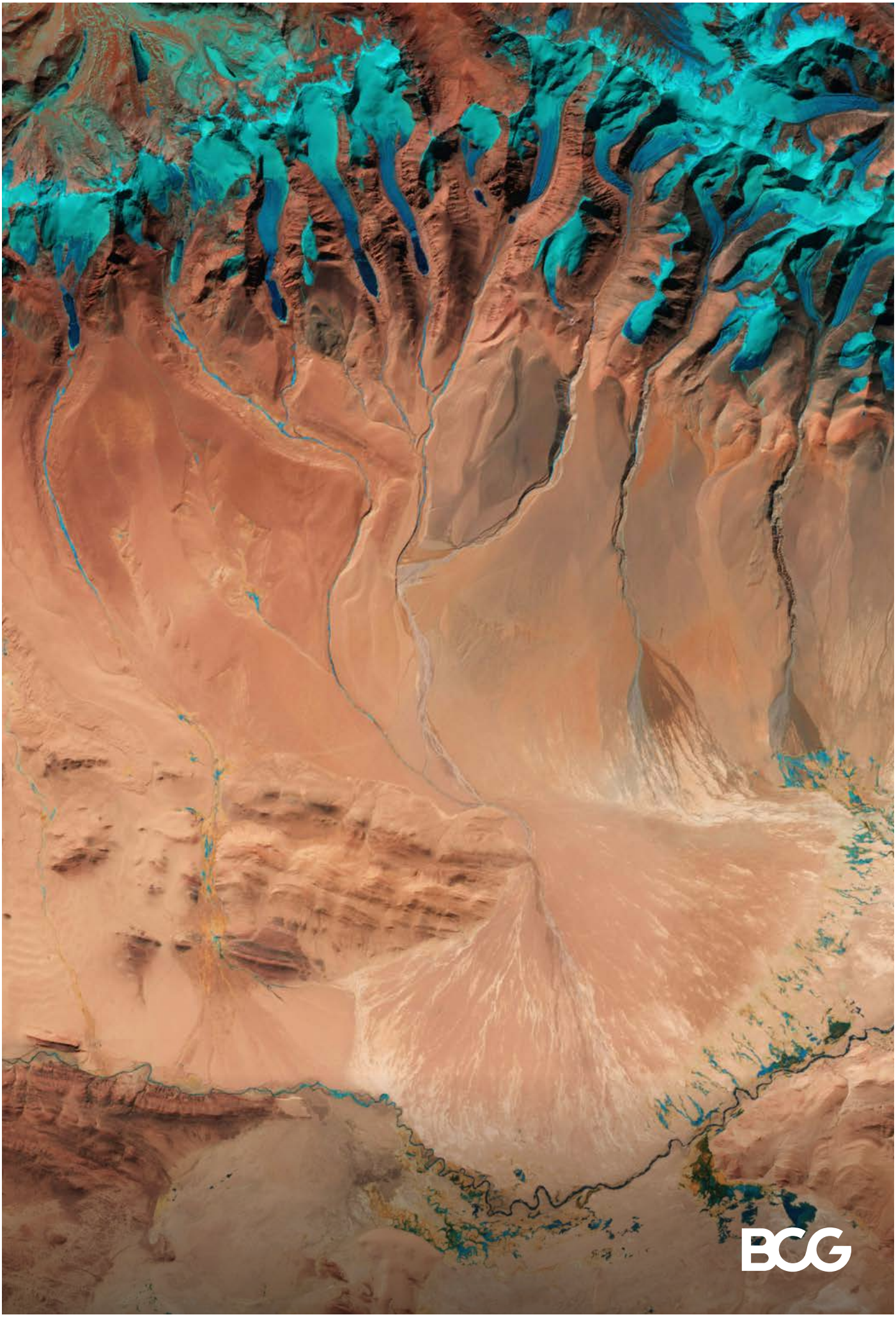
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