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Q4 2025

Europe's Heat Transition:
Why Heat is the Sleeping Giant

IGA INTERNATIONAL GEOTHERMAL ASSOCIATION

WGC 2026
FORGING GEOTHERMAL INNOVATION
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GLOBAL_GT REGION OF THE MONTH

This Month's Hot Spot

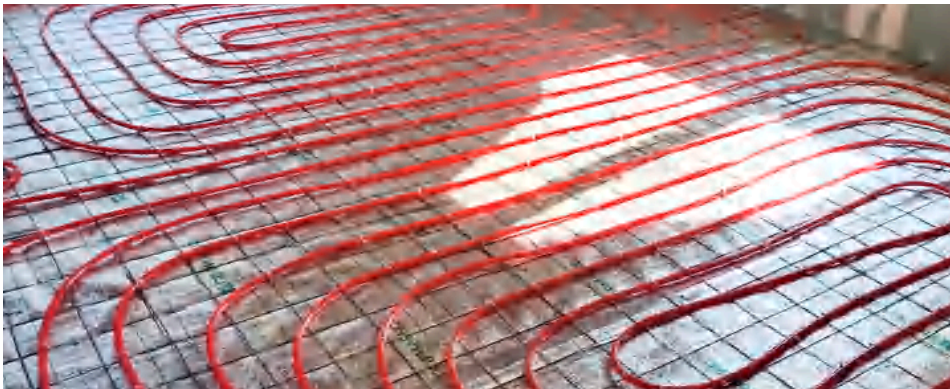
Focus on: Europe

Europe is moving from talk to trenches on clean heat. After a turbulent two years of price shocks and supply risk, governments and utilities are turning to the one resource that is local, 24/7, and already proven: geothermal. This month's spotlight shows what that shift looks like in practice: from Munich's city-scale build-out to mine-based geothermal. Let's get into it.

Geothermal District Heating Done Right

How a clear mandate, a capable utility, and the right basin created Europe's flagship

Munich did what many cities only discuss: it put heat at the center of its climate plan and chose geothermal as the backbone of a future-proof district energy system. The target was crisp—phase out fossil heat on a firm timeline—and the delivery model matched the ambition: treat geothermal not as pilots, but as critical infrastructure.



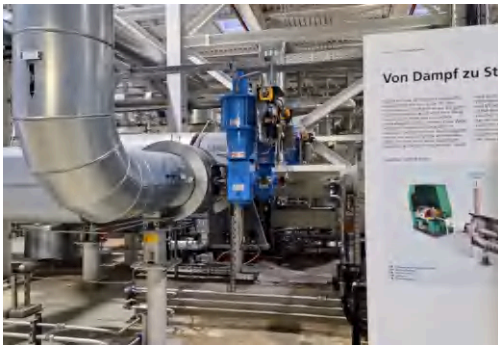
Programmatic Delivery, Not One-Off Projects

That mindset shift unlocked everything that followed. Instead of chasing scattered feasibility studies, Stadtwerke München (SWM) built a program: multiple prospects advanced in parallel, repeatable designs for plants and networks, and a financing approach that looks and performs like other regulated utility assets. Munich wasn't trying to "discover" geothermal; it was assembling a portfolio that normalises exploration risk and pulls capital to scale.

Geology Meets Governance

Ambition needs geology that can carry it. Munich sits above the Molasse Basin, a carbonate aquifer with flow and temperature profiles suited to large heat networks. But geology alone doesn't deliver projects—governance does. From the start, the city aligned heat planning, permitting, and customer conversion. Demand was mapped street by street; network build-out was sequenced; neighbourhood connection windows and indicative tariffs were published. Customers weren't left guessing - they could see when the pipes would arrive and what connection would mean.

System Architecture Built for Resilience



Technically, Munich leaned into modularity and resilience. Clusters of geothermal doublets feed standardised energy centres with high-efficiency heat exchangers and large thermal storage to balance seasonal loads. The system is hybrid by design: geothermal does the heavy lifting; industrial waste heat and high-capacity heat pumps add flexibility; peak/backup boilers ensure redundancy during cold snaps or maintenance. Crucially, water chemistry and scaling control—filtration, dosing, monitoring—were engineered into the base case, not retrofitted later.

Customer Conversion Made Simple

The “last mile” is where many district-heat plans stall. Munich reduced friction with a one-stop customer process, practical support for low-temperature heating upgrades, and clear timelines for each street. The message wasn’t “you must,” but “we’ll help.” That approach built trust and turned potential resistance into uptake. Because the work is local-drilling, civils, HVAC, controls - it also created visible jobs and skills pathways, reinforcing public buy-in.

Financing That Follows Clarity

By bundling projects, standardising designs, and anchoring them in long-term heat offtake, Munich attracted infrastructure-style capital. Public risk tools supported early exploration; municipal and private finance then scaled plants, storage, and networks. The result is a pipeline that de-risks as it grows, rather than a sequence of isolated bets.

What’s Next

Expect larger seasonal storage, tighter coupling with industrial loads, and digital twins that optimise fields and networks as one system. But the core lesson won’t change: when a city treats geothermal heat like the essential infrastructure it is, momentum replaces debate. Munich didn’t wait for the perfect project - it built a repeatable program. That’s why it has become Europe’s most convincing example of geothermal district heating done right.

Europe's Strategic Push:

Repurposing Mining for Geothermal

Across Europe's post-mining regions, flooded galleries are becoming low-risk geothermal resources and seasonal thermal stores. With industrial heat pumps and smart networks, mine water at 12–25 °C can be lifted to 60–90 °C for district heating, public buildings, and mixed-use developments - right where demand sits.

Closed or abandoned mines flood and stabilize at a steady temperature. Projects circulate that water through heat exchangers and use high-capacity heat pumps to deliver usable heat (and summer cooling). Operated bidirectionally, the mine becomes a subsurface thermal battery, smoothing peaks and improving system efficiency.

Why now

Three drivers have aligned: heat security, price stability, and local value. Mines come with known geometry and records, so exploration risk is low; access points often already exist; and the assets sit under cities, keeping networks short and affordable. Better subsurface modelling, cheaper renewables for pump power, and RED III-driven heat zoning have pushed the business case across the line.

Delivery model (and the few real risks)

Start with an anchor load (hospital, school cluster, civic buildings), then expand block by block. Capex concentrates in surface kit (heat pumps, exchangers, storage) and short network runs; drilling is often minimal. Opex is mainly electricity—routinely hedged with PPAs or on-site PV. The most durable structures sit with municipal utilities or PPP SPVs holding long-dated heat offtake..

Risks are practical, not existential: manage hydrochemistry with filtration, dosing, and materials compatibility; confirm hydraulic connectivity with monitoring bores and staged ramp-up; settle stewardship with mining authorities early; and baseline the environment before first heat.

Europe in motion

This is already happening. Heerlen (NL) pioneered mine-water heating/cooling and continues to scale. Northeast England and the Midlands (UK) are tying business parks and housing into mine-water heat with strong utility backing. In Germany's Ruhr and Saxony, flooded mines are paired with thermal storage for winter peaks. Upper Silesia (PL) is heating municipal buildings as part of a just-transition push. Ostrava (CZ) and Asturias (ES) are advancing hybrids that combine mine-water, heat pumps, and waste-heat recovery.

A 12-month playbook for cities

Screen nearby mines (depth, volume, temperature, proximity to loads) → map street-level heat demand → secure data/access with the mining authority → size heat pumps and storage in a bankable feasibility → line up grant/risk support → choose a delivery vehicle and clear tariff framework → procure early works (monitoring bores, a pilot heat centre) with a design–build team ready to scale after first heat.

Bottom line: Mine-based geothermal is fast, local, and socially resonant. It turns yesterday's liabilities into today's heat security—exactly the kind of practical scale-up Europe needs now.

GEOTHERMAL INNOVATION AT THE FOREFRONT

Highlights from Bentley's Year in Infrastructure 2025

The Year in Infrastructure 2025 showcased how geothermal energy is emerging as a real solution to energy security and driving the energy transition. With projects spanning the U.S., Türkiye, Dominica, and Indonesia, the event highlighted how geothermal is delivering energy security, economic resilience, and climate impact at scale.

The International Energy Agency (IEA) projects that geothermal could meet up to 15% of global electricity demand by 2050, driven by innovations in technology, AI-powered simulation, and integrated digital workflows.

These themes were echoed throughout YII, where award-winning projects demonstrated how digital tools are accelerating timelines, reducing costs, and unlocking deeper, hotter resources once considered inaccessible.

At Seequent, we're proud to be at the heart of this transformation—empowering the world's leading geothermal developers with the tools to model, simulate, and optimise the subsurface with confidence. We're committed to partnering with industry to unlock new frontiers in geothermal energy.

Award-winning projects showcasing global impact:

Fervo Energy – Cape Station, Utah, USA,

Winner – Subsurface Modeling & Analysis

Fervo's Enhanced Geothermal Systems (EGS) project set a new benchmark for digital-first geothermal development. Using Seequent's Oasis montaj, Leapfrog Energy and Central to build advanced 3D models for targeting horizontal wells and stimulation. Fervo drilled over 204,000 feet—including 105,000 feet through granitic basement rock—with a 100% well success rate and 18% under budget. The project is projected to deliver $1.1 billion in economic impact and demonstrates the scalability of EGS as a clean baseload energy source.

Flux Energy Solutions – Salihli, Türkiye

Finalist – Subsurface Modeling & Analysis

Flux used Volsung, Seequent's geothermal simulation platform, initially run 3000 coupled simulations to then facilitate running 10 million AI-driven scenarios in just 10 days, compressing a 5-year project into 1 year and reducing costs by 76%. The result: a dynamic, evolving digital asset that supports long-term geothermal field optimisation.

Ormat Technologies – Roseau Valley, Dominica

Founders' Honors

Ormat's 10 MW binary plant will supply 50% of Dominica's peak electricity demand, replacing diesel and lowering energy costs. Using Oasis montaj, Seequent Central, Leapfrog, and Volsung. The project exemplifies how integrated digital workflows can drive sustainable development in remote regions requiring energy independence to drive economic and societal resilience.

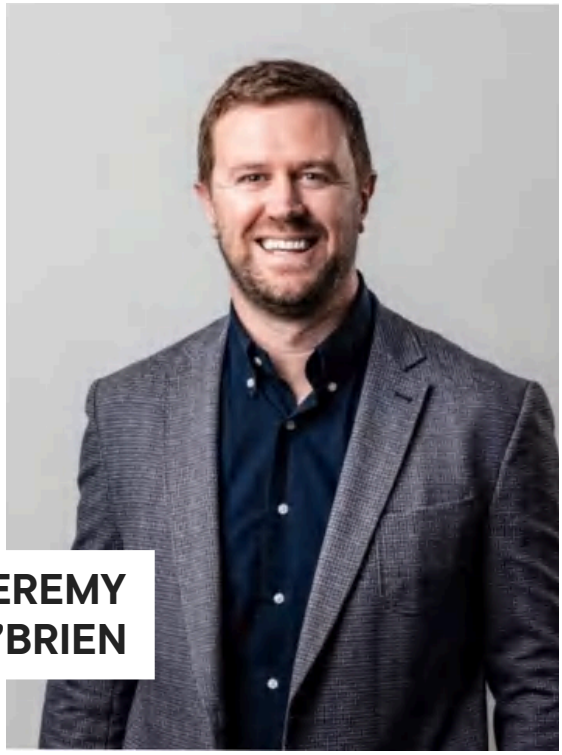
PT Pertamina Geothermal Energy – Lumut Balai, Indonesia

Founders' Honors

Pertamina's advanced geothermal modeling at Lumut Balai Unit 3 supports Indonesia's ambitious goal to scale geothermal capacity to 1.7 GW by 2034. The project reflects the growing role of digital tools in national energy strategies and the importance of local energy security.

YII key takeaways

- Geothermal has momentum- from island nations to global tech hubs, geothermal's value is becoming clear to the world.
- Digital tools are essential - AI, simulation, and subsurface modeling are transforming project timelines and economics.
- The future is now - with EGS, AI, and integrated platforms, geothermal will play a key role in providing energy security and support the energy transition



JEREMY O'BRIEN

"Geothermal shone at YII this year, with a truly global picture of its value on display. We're proud that Seequent technology supports over 50% of the world's installed geothermal power generation."

UPCOMING EVENTS

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