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The Energy Transition Is No Straight Line - How Can Geothermal Help?

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ABSTRACT

Global geothermal power, direct use markets are set for massive growth in the coming years as the importance of energy sovereignty increases within economies. With an installed capacity of 17.2 gigawatts electric (GWe) today, the global power generation market is poised to grow to around 25 GWe by the end of the decade, marking a steep rise from previous years. The medium-deep to deep heating and cooling market today stands at an installed capacity of around 27.5 gigawatts thermal (GWt), and it is expected to continue growing at a compound annual growth rate (CAGR) of 8 % between 2025 and 2030. The geothermal industry in the past has been restricted by various factors including resource availability and subsurface conditions, which has led to a handful of countries dominating the market share. The advent of disruptive technologies such as enhanced geothermal systems and advanced geothermal systems promises to tackle these issues and make geothermal deployable virtually anywhere in the world. Moreover, geothermal is also gaining popularity among the tech giants of the world looking for clean, firm electricity to power their campuses and data centers in line with their decarbonization commitments. In this paper Rystad Energy takes a closer look at the role that geothermal will play in the future energy system, which countries will be driving its growth, the impact of government policies in promoting project development, how co-location projects are reigniting interest from developers, the impact of disruptive technologies on the market, and much more.

1 INTRODUCTION

Geothermal energy is set to play a small but significant role in the future power mix, building on its currently modest 0.3 % share of the world's power supply. As global economies ramp up efforts to decarbonize, the importance of renewable baseload energy sources such as geothermal are expected to increase. Installed geothermal power generation capacity is expected to reach 17.2 GWe worldwide by the end of 2025 according to Rystad Energy's project-by-project database of more than 3,500 projects globally (Figure 1).

Geothermal energy is currently used for power generation in more than 35 countries, with 10 of them making up more than 90 % of the total installed capacity. Asia continues to dominate the global geothermal market, accounting for 31 % of installed capacity. Indonesia, with 2.8 GWe, is the second-largest geothermal producer worldwide, trailing only the United States.

Geothermal heating projects can be applied in various industries such as greenhouses, fish farms and balneology. However, the most prevalent use of geothermal heating is for district heating. Rystad Energy classifies the heating and cooling market into four primary segments: full district heating, partial district heating, district cooling, and applications in agriculture and aquaculture, where wells deeper than 500 meters (1,640 feet) are accessible.

Compared to the electricity market, the deep geothermal heating sector has a lower installed capacity, largely due to the significant difference between 1 megawatt electric (MWe) and 1 megawatt thermal (MWt) in terms of energy output. Geographically, this sector is more concentrated, with notable activity in Europe and mainland China.

Globally, the direct use market has an installed capacity of around 27.5 GWt today, and it is expected to continue growing at a CAGR of 8 % between 2025 and 2030 (Figure 1). China currently dominates the market, accounting for around 70 % of the total installed capacity. While much of mainland China may not have the high thermal gradients necessary for electricity generation, the country is focusing on geothermal heating as part of its broader efforts to decarbonize the heating sector and reduce local pollution. Reservoir temperatures of between 50 °C and 100 °C are well-suited for geothermal district heating, aligning with China's environmental goals. In Europe, the geothermal heating market is expected to follow a steady growth trajectory, led by Germany, the Netherlands, Iceland, and France. However, Central European nations such as Poland, Hungary and Croatia

have emerged as new markets in the last few years. District cooling has become a big topic of interest in Middle Eastern countries such as Saudi Arabia and UAE in recent times.

Total capital expenditure for geothermal developments is increasing steadily toward the end of this decade, driven by a combination of resource expansion, inflationary pressures, and broader adoption across emerging markets. Globally, average capex is set to rise by roughly 20 % per annum, with the distribution of spending remaining relatively stable across development categories. On average, slightly more than half of capex is directed toward surface facilities, followed by about 47 % allocated to subsurface investments, and about 2% pre-FID costs (Figure 2). This balance underscores the inherent capital intensity of geothermal developments, where upfront exploration and drilling remain primary cost drivers.

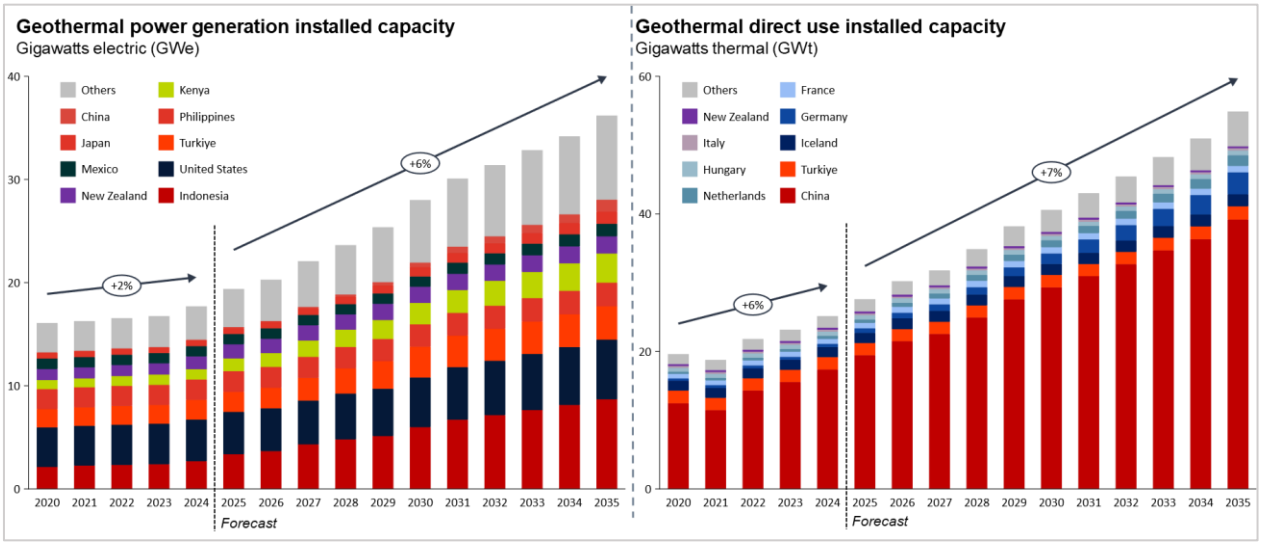


Figure 1. Rystad Energy power generation and direct use installed capacity outlook between 2020-2035.
Note: Geothermal direct use includes end-uses of agriculture, aquaculture, horticulture and district heating and cooling where wells deeper than 500 meters are used.
Source: Rystad Energy Geothermal Solution

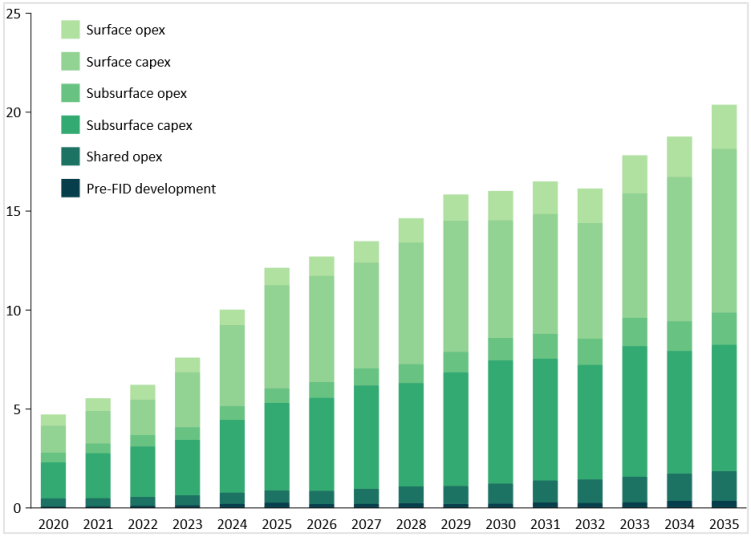


Figure 2. Rystad Energy power generation and direct use capex and opex estimates in billion USD.

Note: Geothermal direct use includes end-uses of agriculture, aquaculture, horticulture and district heating and cooling where wells deeper than 500 meters are used.

Source: Rystad Energy Geothermal Solution

2 GEOTHERMAL POWER GENERATION

2.1 Present day challenges and mitigation strategies

The geothermal industry in the past has been restricted by various factors including resource availability and subsurface conditions, which has led to a handful of countries dominating the market share. Today, more than 90 % of all geothermal projects worldwide are located along the Pacific Ring of Fire, owing to its high enthalpy zones and availability of optimal subsurface conditions. Due to this, geothermal energy has been viewed as a niche solution, deployable only in select geographies. The advent of disruptive technologies such as Enhanced Geothermal Systems and Advanced Geothermal Systems promises to tackle these issues and make geothermal deployable virtually anywhere in the world.

Some of the biggest challenges for the geothermal industry are permitting and project financing. Based on Rystad Energy's analysis of the market, the typical timeline for a geothermal power project, from the time the exploration license is applied for to the time of commercial start-up, is around seven to eight years – a significant portion of which is wasted due to permitting delays. These extended timelines end up delaying the project further, adding to project costs and resulting in countries missing their capacity goals. Streamlined regulations are vital in putting geothermal energy on the same playing field as other renewable energy sources and would help smoothen some of the project hurdles.

Geothermal projects are often considered high risk due to the many uncertainties involved, such as subsurface conditions and recoverable resource volumes – similar to an oil and gas project. Risk sharing is one of the ways in which the burden on the developer can be lessened. The Kenyan government a couple of years ago rolled out a public-private partnership plan called the 'Build, Own, Operate' program, where the project risk is distributed among multiple partners, including the state-owned Geothermal Development Company, an international developer, the utility company KLPC, and the government itself. The program has been a huge success, with the first 35 MWe unit of the Menengai project already operational and the second unit expected to start up in 2026.

Moreover, unlike other renewable energy sources, there have not been major breakthroughs in increasing project yield until recently (Figure 3). The average productivity per well (within a project) for a power generation project stands at around 5.5 MWe per well, and this number has remained largely unchanged in the past couple of decades. Unlike the trends often observed in other renewable energy sources such as solar and wind where there has been significant improvement in the productivity of the panels and turbines respectively, geothermal energy's technology development trajectory has until recently been rather flat.

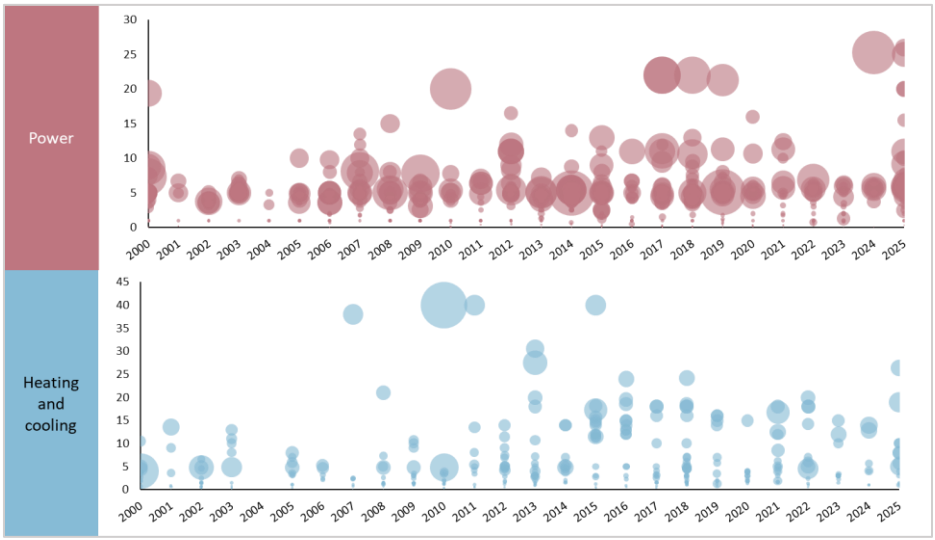


Figure 3. Average nameplate well capacity (within a project); MWe/MWt per production well on y-axis, project start-up year on x-axis, bubble size corresponds to the total installed capacity on a project level. Note: Geothermal heating and cooling include end-uses of agriculture, aquaculture, horticulture and district heating where wells deeper than 500 meters are used; China excluded for heating and cooling. Source: Rystad Energy Geothermal Solution

2.2 Key regions driving market growth

2.2.1 North America

Geothermal is enjoying a period of support from the current US administration, with push from the Department of Defense (DoD) and legislative support from the recently passed One Big Beautiful Bill Act (OBBBA). Geothermal has emerged as one of the big winners in the OBBBA, having maintained production tax credits and investment tax credits from the previous administration's Inflation Reduction Act (Figure 5). Although there are new thresholds added for compliance with Foreign Entities of Concern regulations (Figure 4), there still are clear wins to take away from the OBBBA. The FEOC restrictions have posed some concern for developers because, starting in 2026, they will face escalating local content sourcing requirements, with companies required to source at least 40 % of project costs from non-FEOC providers. The decision to preserve tax credits for geothermal have largely been credited to Department of Energy Secretary Chris Wright, who has been noted to be sympathetic to geothermal, especially considering Liberty Energy's investment in Fervo Energy during his tenure as CEO. The Energy Department's budget for geothermal has increased to $ 150 million, from $ 115 million, in contrast to sweeping cuts made for other renewables such as solar and wind.

FEOC material assistance threshold	
2026	40%
2027	45%
2028	50%
2029	55%
2030-2033	60%

Figure 4. Overview of the Foreign Entities Of Concern (FEOC) material assistance threshold for geothermal.
Source: One Big Beautiful Bill Act

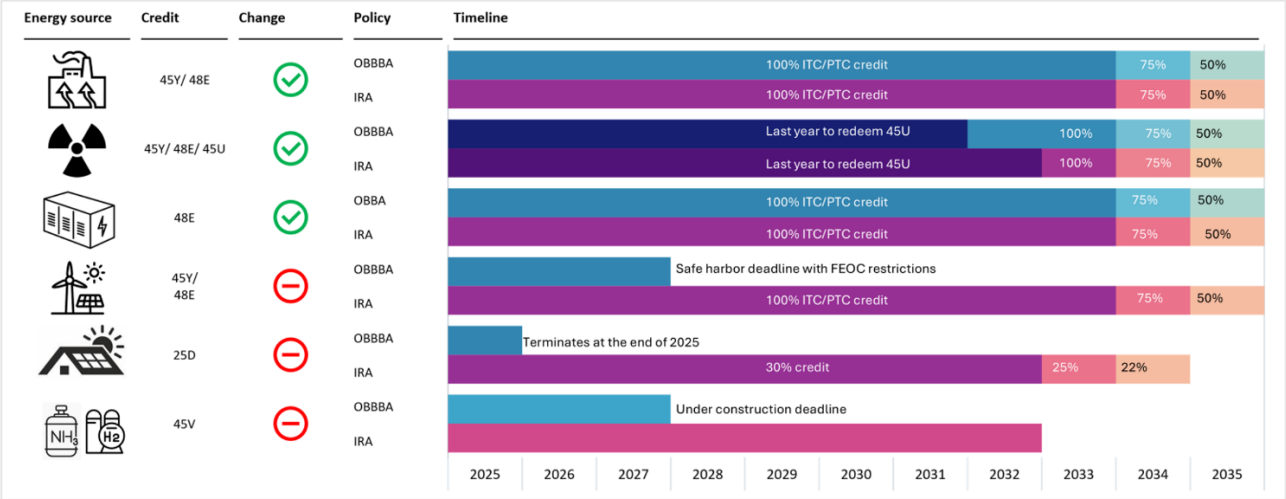


Figure 5. Overview of the timelines of clean tax incentives under the Inflation Reduction Act and One Big Beautiful Bill Act.
Source: Rystad Energy research and analysis, Inflation Reduction Act, One Big Beautiful Bill Act

The US Department of Defense is preparing to integrate emerging geothermal technologies at military bases to boost energy resilience and meet increasing power needs. To move this forward, the Defense Innovation Unit (DIU) is partnering with the Army, Navy, Air Force, and Marine Corps, along with six geothermal firms: Eavor, Fervo Energy, Greenfire Energy, Sage Geosystems, Teverra, and Zanskar. The DIU is also joining forces with the Department of Energy, the Department of the Interior, industry groups, utilities, and state energy agencies to accelerate geothermal adoption and strengthen the sector overall. Fervo Energy has finalized initial plans to deploy its EGS technology at Naval Air Station Fallon in Nevada. GreenFire Energy is creating tailored geothermal designs with advanced subsurface modeling at Naval Air Facility El Centro and will also assess geothermal potential at Marine Corps Air Ground Combat Center Twenty-Nine Palms and Sierra Army Depot in California. Sage Geosystems, working with the University of Texas Bureau of Economic Geology, has completed reservoir modeling and conceptual designs for its geopressured geothermal system at Army Garrison Fort Bliss and Naval Air Station Corpus Christi in Texas. Teverra is preparing exploration and drilling plans at White Sands Missile Range in New Mexico, and Zanskar Geothermal and Minerals is gathering geophysical data and applying AIdriven models to guide drilling strategies at Mountain Home Air Force Base in Idaho. Eavor was contracted to do

feasibility analyses as well as the potential installation of its EavorLoop at a military facility in San Antonio, Texas. Historically, the DoD has played a key role in advancing emerging technologies, using substantial investments to accelerate their development and reduce time to market.

2.2.2 Asia

Indonesia's move to launch a tender for 10 new geothermal areas in September contributes to the country's goal of expanding its installed geothermal capacity by another 5.2 gigawatts (GWe) under the National Electricity Supply Plan (RUPTL) between 2025 and 2034. While promising, developers will need to weigh several factors before deciding whether to bid for such tenders, including the business processes, pricing schemes, regulatory workflows and project timelines. Indonesia's geothermal potential is dominated by high-enthalpy fields, given its location along the Ring of Fire, yet the latest tender show a shift: six out of ten areas offered are low- to-medium enthalpy. Installed capacity currently stands at around 2.8 GWe, mostly from high-enthalpy projects, and this trend is expected to continue through 2034. Still, low-to-medium enthalpy prospects are gaining ground, supported by growing adoption of ORC/binary technology to extend the life of depleted fields.

2.2.3 Africa

Ambitious geothermal targets in Africa could see installed capacity rise from around 1 GWe in 2023 to 13 GWe by 2050, well past the 10 GWe milestone. This growth will be driven by Kenya and Ethiopia, which together account for close to 90 % of forecast capacity. While Kenya is already home to one of the world's largest geothermal fields, Ethiopia is yet to prove it can scale the technology. The International Energy Agency's (IEA) latest policy review reaffirms Kenya's position as Africa's geothermal leader. However, a closer look at the data and policy landscape reveals a sector entering a new, more complex phase. While the foundational success—anchored by nearly 1 GWe of installed capacity at Olkaria and other sites—is secure, the next chapter will be defined less by resource discovery and more by strategic diversification, effective policy execution, and the ability to maintain Kenya's low-cost advantage amid evolving energy markets. Nonetheless, the sector faces emerging challenges. The IEA notes a broader policy shift from administratively set feed-in tariffs to competitive auctions. While this may enhance cost efficiency for solar and wind, its suitability for long-cycle, capital-intensive geothermal projects remains uncertain. Preserving Kenya's cost leadership will depend on predictable regulation, bankable PPAs, and continued concessional financing from development finance institutions (DFI). Any erosion in policy clarity or financial support could raise the cost of capital and undermine the model that enable Kenya's leadership.

3 GEOTHERMAL DIRECT USE

3.1 Present day challenges and mitigation strategies

The global geothermal heating capacity today stands at approximately 27.5 GWt, of which 71% can be attributed to mainland China. While China is expected to maintain its bullish pace in drilling new wells in the coming years, the biggest driver of growth in this segment will be Europe. Western European nations such as Germany, France and the Netherlands have already pledged to ramp up their geothermal district heating infrastructure in an effort to move towards energy sovereignty, while sticking to their emission reduction goals.

3.2 Key regions driving market growth

3.2.1 Asia

While much of mainland China may not have the high thermal gradients necessary for electricity generation, the country is focusing on geothermal heating as part of its broader efforts to decarbonize the heating sector and reduce local pollution. Reservoir temperatures between 50 °C and 100 °C are well-suited for geothermal district heating, aligning with China's environmental goals. Medium-deep to deep geothermal district heating market in China emerged around the 2008 Beijing Olympics where geothermal was one of the proposed solutions for heating the Olympic village. Although due to a lack of detailed sub-surface data and time, the plan didn't see fruition. However, it led to massive country-wide studies to map out the total potential for both shallow and deep geothermal for district heating applications. China has since seen record volumes of drilling, with activity reaching record highs of 750 wells in 2021. Since then, the market has continued at a robust pace of approximately 620 wells drilled annually and is expected to maintain this rate between now and 2035.

3.2.2 Europe

The growing interest in geothermal energy from the government of Germany is caused by its long-term heating strategy, known as Wärmewende, which aims to reduce emissions and transition to renewable heating sources. The Heat Planning Act (Wärmeplanungsgesetz) came into force in January 2024 and marks the most important

piece of legislation around the future of geothermal energy. This legislation requires municipalities and heating network operators to provide detailed plans around the expansion and decarbonization of their heating networks. Required to be completed by 2026 for municipalities with more than 100,000 inhabitants and by 2028 for municipalities with 100,000 inhabitants or less, these plans must show how they will adapt their heating networks to meet the government's requirement. By 2030, 30 % of annual net heat generation in heating networks must come from renewable energies or unavoidable waste heat. After 2030, the target is increased to 80% by 2040 and by 2045 this number should be 100 %. As Germany embarks on a 20-year journey of fully transitioning to renewable heating sources, district heating and geothermal projects will play a key role. With the current announcements and legislation, Rystad Energy estimates that Germany could see spending on geothermal wells reach $ 100 billion between 2025 and 2045 in the most aggressive scenario and hold at $ 65 billion in a more balanced scenario.

In recent times, interest from the Central European nations has also seen a marked rise. Hungary, Poland, Austria, and Croatia have emerged as the key new markets to look out for, following a marked uptick in geothermal activity in these countries in the last two years. By 2050, Rystad Energy expects Hungary, Austria, Poland, and Croatia to achieve 10.8 terawatt-hours (TWh) of medium-deep to deep geothermal heat generation – a five-fold growth from current levels.

In April 2024, Hungary's Ministry of Energy Affairs announced the National Geothermal Strategy to double the generation by 2030 (including shallow geothermal), which meant increasing the medium-deep to deep generation levels from 1.55 TWh to 3 TWh. Geothermal accounts for 6.5 % of the country's gross heat production and is available in 11 settlements. This ambitious goal translates to a demand of 73 new projects in these five years and with the current pace of project development in the country, we expect that Hungary will miss this target by a significant margin, instead reaching close to 1.77 TWh by the end of this decade and reaching the 3 TWh goal by 2040. Moreover, during its six-month term in the presidency of the European Council in 2024, Hungary called for an EU-wide strategy, in collaboration with Poland, to accelerate the growth of the geothermal sector in the region.

Geothermal activity in Poland has historically been quite limited, with a handful of projects making up close to 110 MWt capacity. However, this trend appears to be changing, with 2024 marking a record high in project announcements. The National Fund for Environmental Protection and Water Management (NFOSiGW) is a government initiative aimed at significantly reducing the financial risks of geothermal exploration, encouraging local governments to pursue geothermal energy for district heating. Between 2020 and 2028, the initiative has allocated a total of $ 187.1 million (PLN 708 million), with $ 173.9 million (PLN 658 million) designated for grants and $ 13.3 million (PLN 50 million) for loans. We believe the funding program has been pivotal in bringing about this ramp up in drilling activity and will go a long way in helping the Poland meet its long-term goals.

In June 2023, the Croatian Hydrocarbon Agency (AZU) concluded successful bidding round where it managed the tender process for six geothermal exploration sites, attracting 16 offers from 11 different bidders for five of those areas. This brings the total number of exploration blocks offered in Croatia in the last 10 years to 26. Some of the country's exploration licences awarded in prior rounds have reached the development phase, the most recent example of which is the multi-phase 98 MWe geothermal power project in Legrad by Istanbul-headquartered Soyak Group. Other examples include the Slatina 2, Slatina 3 and Ernestinovo projects.

Although recent industry developments in Central Europe are centred around policy changes and exploration activity, the impact of these trends will be experienced in the late 2020s and early 2030s in terms of steady capacity growth. These trends further demonstrate how support from the government plays a vital role in incentivising project development in a country.

3.2.3 Middle East

Direct use applications in the Middle East historically have been centred around Turkiye, which boasts significant geothermal district heating and greenhouse infrastructure. However, post the stagnation in the market in 2021 and a shift towards shallow geothermal drilling for greenhouses (projects requiring drilling of wells that usually are in the depth range of 300 to 400 meters and often yield fluid temperatures of around 40 °C to 60 °C), the spotlight has moved to the new entrants in the market: Saudi Arabia and UAE. In Saudi Arabia, geothermal development is expected to be spurred by the nation's landmark city developments like the NEOM city and Red Sea projects. In 2024, King Abdullah University of Science and Technology (KAUST) and TAQA Geothermal broke ground for the drilling of a shallow, 400-meter well in the KAUST campus as a test case for the monitoring and surveillance of future geothermal energy extraction in Saudi Arabia. The data gained from the well site will be used for the planning and risk mitigation of deeper geothermal wells, thus providing insight for

the future of geothermal energy extraction potential below KAUST. UAE's Tabreed, in collaboration with state-owned ADNOC, successfully implemented a geothermal district cooling system in Masdar City in 2023. The project now supplies 10 % of Masdar City's cooling needs.

4 DISRUPTIVE TECHNOLOGIES

4.1 Enhanced geothermal systems

Enhanced geothermal systems (EGS) are defined as artificial reservoirs created to extract economical amounts of heat from low-permeability and/or low-porosity geothermal resources. These systems can be deployed in areas where high temperature geothermal brine is not available. This is done by using hydraulic fracking to allow fluid movement within the artificially created reservoir to extract the heat from dry hot rocks. Notable companies involved in this space include Fervo Energy and Sage Geosystems. To date, Fervo has gotten the farthest in terms of commercializing EGS technology. According to recent reports, the company has recorded a 70 % reduction in drilling time as compared to its first horizontal well drilled at Project Red in 2022. According to the announcement, this improvement has resulted in a reduction from $ 9.4 million to $ 4.8 million per well which aligns with the US Department of Energy's (DoE) 2035 goal of reducing the cost of EGS projects in the US by 90 %. Additionally, with Fervo's modular approach, combined with recent legislations in the US Senate enabling faster permitting for geothermal projects, we can expect shorter development times in the future.

4.2 Advanced geothermal systems

AGS offers the potential to tap into deep heat resources in areas without naturally occurring water or permeability, vastly increasing the number of viable geothermal sites. Companies such as Eavor Technologies, Quaise Energy and GreenFire Energy are pioneering commercial AGS projects, demonstrating its ability to provide scalable, baseload renewable energy. The modular and flexible nature of AGS systems makes them well-suited for distributed energy applications, further enhancing their commercial appeal. Additionally, because AGS operates in a closed-loop system with no interaction between the working fluid and the surrounding environment, it can significantly reduce the need for extensive environmental studies and permits. Its low water usage further strengthens its position as a sustainable and adaptable geothermal solution.

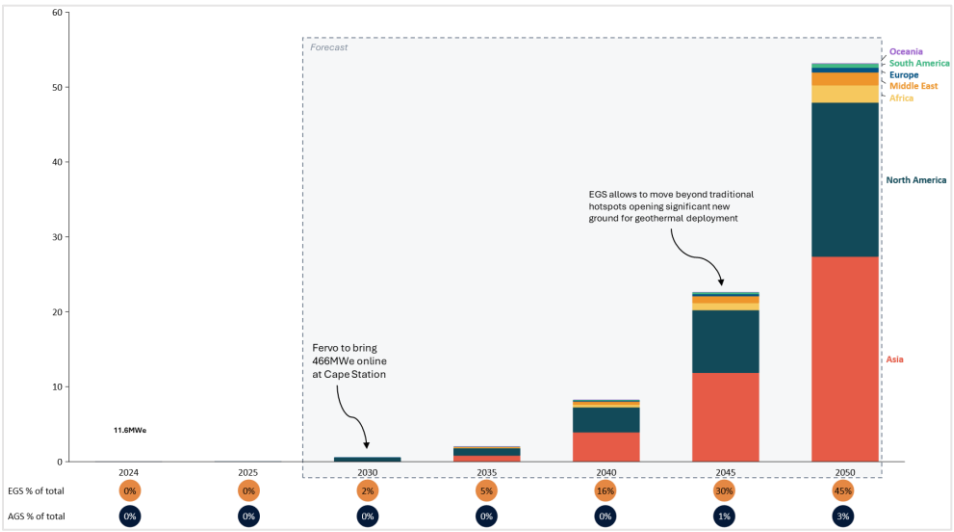


Figure 6. EGS and AGS installed capacity for power generation in megawatts electric (MWe). Source: Rystad Energy Geothermal Solution

4.3 Superhot rock geothermal

Superhot rock (SHR) geothermal refers to a high-temperature enhanced geothermal energy system that extracts heat from subsurface rocks at or above 400 °C. At this point, water reaches a supercritical state, becoming more energy dense and efficient for power generation than conventional geothermal resources. In these systems, injected water absorbs a large amount of heat and returns as superheated steam to generate electricity or drive industrial processes. The main technical challenges for deploying superhot rock geothermal systems include deep drilling in extreme temperature and pressure conditions, well construction material limitations, temperature management for downhole tools, and engineering sustainable heat extraction.

5 GEOTHERMAL AND THE INDUSTRY

5.1 Lithium extraction

With the growing importance of developing rare earth minerals infrastructure, direct lithium extraction (DLE) from geothermal brine can help shoulder some of the soaring demand for battery grade lithium. With over 20 licenses secured throughout the region, Vulcan Energy Resources aims to gradually expand beyond its Landau hub, positioning itself to supply energy to local markets as well as lithium to Europe's battery supply chain. Its co-production model—focused on harnessing both geothermal heat and critical minerals— offers a potentially scalable blueprint for merging geothermal energy development with resource extraction, particularly in geologically advantageous basins. French company Arverne Group, through its subsidiary Lithium de France, has announced the start of construction of its DLE demonstration plant in Alsace, France. Initiated in 2024 with studies and pre-orders, construction of the demonstration plant is supported by BPI France, a project financed by the government as part of France 2030 and by the European Union – Next Generation EU as part of the France Relance plan. Arverne's 2031 roadmap involves reaching a production capacity of 27,000 tonnes of lithium and 4 TWh of geothermal heat from the wells.

5.2 Data centers

The US alone is on track for a record spike in electricity demand from the data centers sector, with demand skyrocketing to over 1,000 terawatt hours (TWh) by 2035 in Rystad Energy's unrisked scenario, almost triple the levels seen this year. As the technological race for artificial intelligence (AI) abundance continues, and with the electricity demand far outpacing the supply, data center companies are scrambling to source firm power for their facilities. This surge in demand has resulted in lengthy lead times for procuring key infrastructure such as gas turbines. Heavy-duty turbines (rated for 400-500 MW) required for upcoming hyperscalers have a lead time of approximately 36-62 months, with some suppliers even reporting wait times of up to seven years. Additionally, based on Rystad Energy's latest estimates, the levelized cost of electricity (LCOE) for new-build gas turbines will be in the range of $ 60-147 per MWh, driven by this increased demand, rising capital expenditures (capex) and costs of feedstock. Historically, gas turbines were the preferred solution for tech companies due to their lower costs and high reliability. However, these current trends, combined with tech companies' net zero or carbon-free commitments, challenge the reasons for favoring combined cycle gas turbine (CCGTs) and have shifted the conversation to "clean+firm" solutions for powering the data centers.

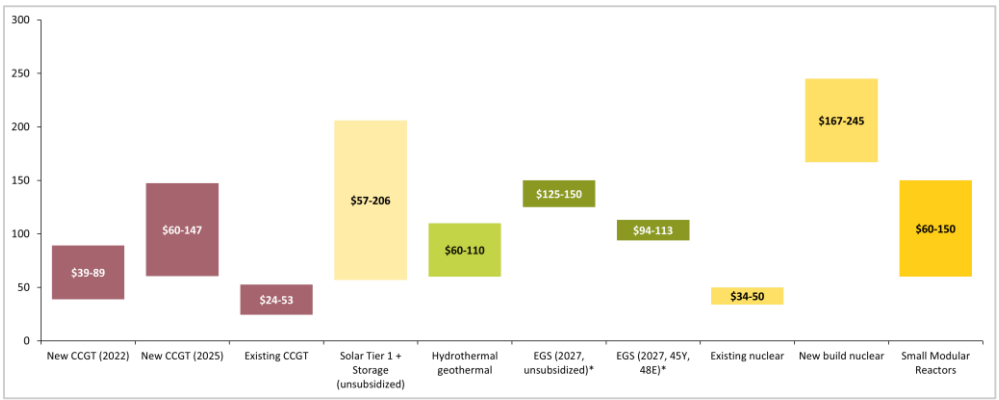


Figure 7. Levelized cost of electricity comparisons for various energy sources in USD per MWh, calculated with 8% cost of capital assumption.
***Based on latest available estimates from NLR on learning curves**
Source: Rystad Energy research and analysis, United States Power Solution, Geothermal Solution, NLR, EIA 860m

In the past, geothermal was not seen as a viable solution due to the following reasons: high costs and long development times. However, with recent breakthroughs that Fervo Energy has had in terms of improving drilling efficiency and lowering costs, the first barrier can now be crossed. If the company's current learning curves improve, the EGS sector in the US is on track to meet the Department of Energy's forecasted 2035 LCOE of $ 45 per MWh, making it cheaper than nuclear and become cost competitive to CCGTs. Additionally, with Fervo's modular approach, combined with recent legislations in the US Senate enabling faster permitting for geothermal projects, we can expect shorter development times in the future. As the economics of geothermal energy improve, we have been seeing a surge in the signing of power purchase agreements (PPAs) between developers and tech companies globally. Tech companies have already shown a willingness to pay a premium for securing

geothermal power for their data centers, as evidenced by Ormat's announcement of negotiating PPAs worth over $ 100 per MWh with hyperscalers in recent months.

However, a key bottleneck for the geothermal sector that remains to be resolved is the location of the data center facilities versus the highest potential sites for EGS development. A significant portion of upcoming data centers are located mainly in states such as Illinois, Virginia, North Carolina, Georgia and Texas. In contrast, the historical hotspots for geothermal have been the western states of California and Nevada. EGS development in the US for now is focused on near-field development, i.e. projects located close to known geothermal resources. This is a limiting factor for front or behind the meter connections to these data centers. To combat this, there will need to be more discussion around the potential for data centers to be clustered around these EGS hotspots. By opting to build data centers in regions where tech companies can leverage the highest quality geothermal resources in a self-supply approach, data center developers and operators stand to face even lower costs for geothermal electricity.

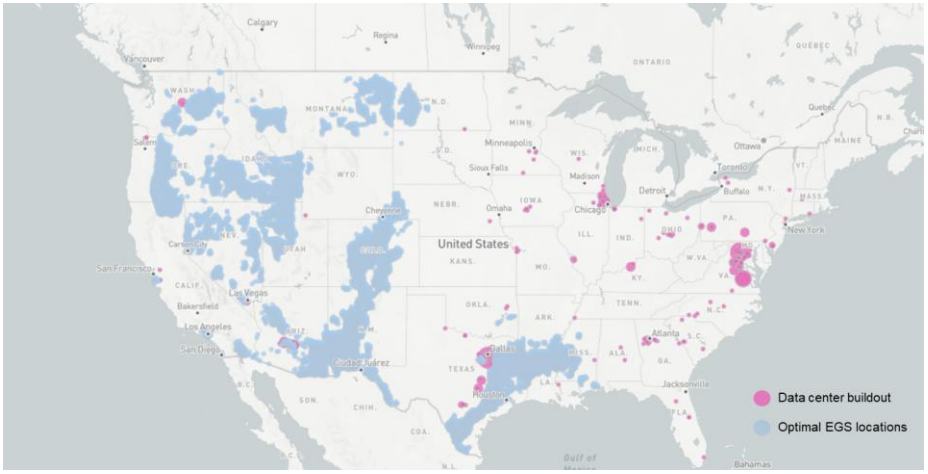


Figure 8. Upcoming data centers (start-up between 2025-2035) and potential sites for Enhanced Geothermal Systems.
Source: Rystad Energy United States Power Solution; NLR

The EGS potential in the US is sufficient to support gigawatt scale data centers in many US states. According to surveys conducted by the US Geological Survey in the past, EGS has the potential to supply 530 GWe of electricity to the US power mix. The steep learning and cost reduction curves, modular approach to power plant construction and availability of domestic supply chains make it a great fit for the growing data center market in the US. Additionally, once deep-field EGS becomes commercially proven, the scalability and location restriction issues can also be alleviated.

CONCLUSION

The geothermal industry today sits at a tipping point, with momentum building up for a massive breakout. Rystad Energy's base case scenario estimates the power generation sector to reach approximately 110 GWe by 2050 and the direct use sector to achieve 105 GWt capacity by mid-century. These ambitious growth plans, supported by interest from developers, law-makers, the tech industry and a rising need for clean baseload energy relies on four key pillars:

1. Continued support from governments: effective and streamlined regulations to improve development timelines, and funding incentives that can further the technology and reduce developers' costs.

2. Disruptive technologies: innovative technologies such as EGS, AGS and SHR that can mitigate the scalability barrier, and advances in drilling technologies that can improve efficiency.

3. Co-location opportunities: applications such as lithium extraction, green hydrogen production, silica extraction, and carbon capture and storage, which serve as additional revenue sources for the developer. Collaboration with the tech industry to supply geothermal power and cooling to data centers.

4. Collaborations with the oil and gas industry: knowledge-sharing opportunities to make geothermal drilling more effective and diversify company portfolios by moving into green revenue streams.

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