
Geothermal Solutions
RELIABLE. AFFORDABLE. RESPONSIBLE.
Energy Without Compromise
NABORS

About Nabors

Nabors Industries is a leading provider of advanced technology for the energy industry.

By leveraging its core competencies, particularly in drilling, engineering, automation, data science and manufacturing, Nabors aims to innovate the future of energy and enable the transition to a lower carbon world.

ACTIVE IN MARKETS COMPRISING

70%

OF GLOBAL O&G PRODUCTION

LOCATED IN

20+

COUNTRIES, WITH A DIVERSIFIED CUSTOMER BASE

COUNT OF

300+

PREMIER LAND AND OFFSHORE RIGS GLOBALLY

Nabors' Geothermal Partners

GA Drilling

HEPHAE ENERGY TECHNOLOGY

QUAISE

SAGE GEOSYSTEMS

Geothermal History at Nabors

1989	Acquired Westbourne Drilling	Inherited three rigs drilling under a geothermal program
1990	Acquired Loffland Brothers	Loffland Brothers had done much of the California geyser geothermal drilling
1997	Acquired Cleveland Drilling	Cleveland Drilling drilled wells in the Salton Sea and in The Geysers
1998 - 2004	32 Geothermal Wells Drilled	Drilled 32 geothermal wells in the US 26 in California, 2 in Nevada, 2 in New Mexico, 1 in Louisiana, 1 in Texas
2004 - 2015	Optimized and Scaled Rigs	Designed, commercialized and scaled PACE programmable rigs to optimize drilling in all markets
2021 - Present	Investing in Geothermal	Invested in Geothermal companies and formed NET-V division providing support, service and rigs to Geothermal partners for pilot testing
2021 - Present	Established NETS	Announced strategy for decarbonizing rig operations with Energy Transition Solution (NETS) group.

Geothermal Rigs

The Nabors rig fleet represents one of the world's youngest and most advanced fleets in the oil and gas drilling and land drilling industries.

Nabors has conceptualized a geothermal rig because geothermal operations require special wellbore designs and completions to deliver the heated fluid efficiency to the surface, which may call for a rig with a larger load capacity.

NABORS' RIGS CAN HOLD UP TO

1.2 M

POUNDS OF LOAD

Nabors' rigs have advanced walking capabilities for batch drilling multiple wells on a single pad. They create more value with a combination of integrated surface and downhole technologies, proprietary software and pad-optimal features.

RIG OPTIONS AND CAPACITY

PACE® - X

1 Million LBS

PACE® - R

800,000 LBS

PACE® - M

0.8 - 1.2 Million LBS

F – Rig

800,000 LBS

B – Rig

800,000 LBS

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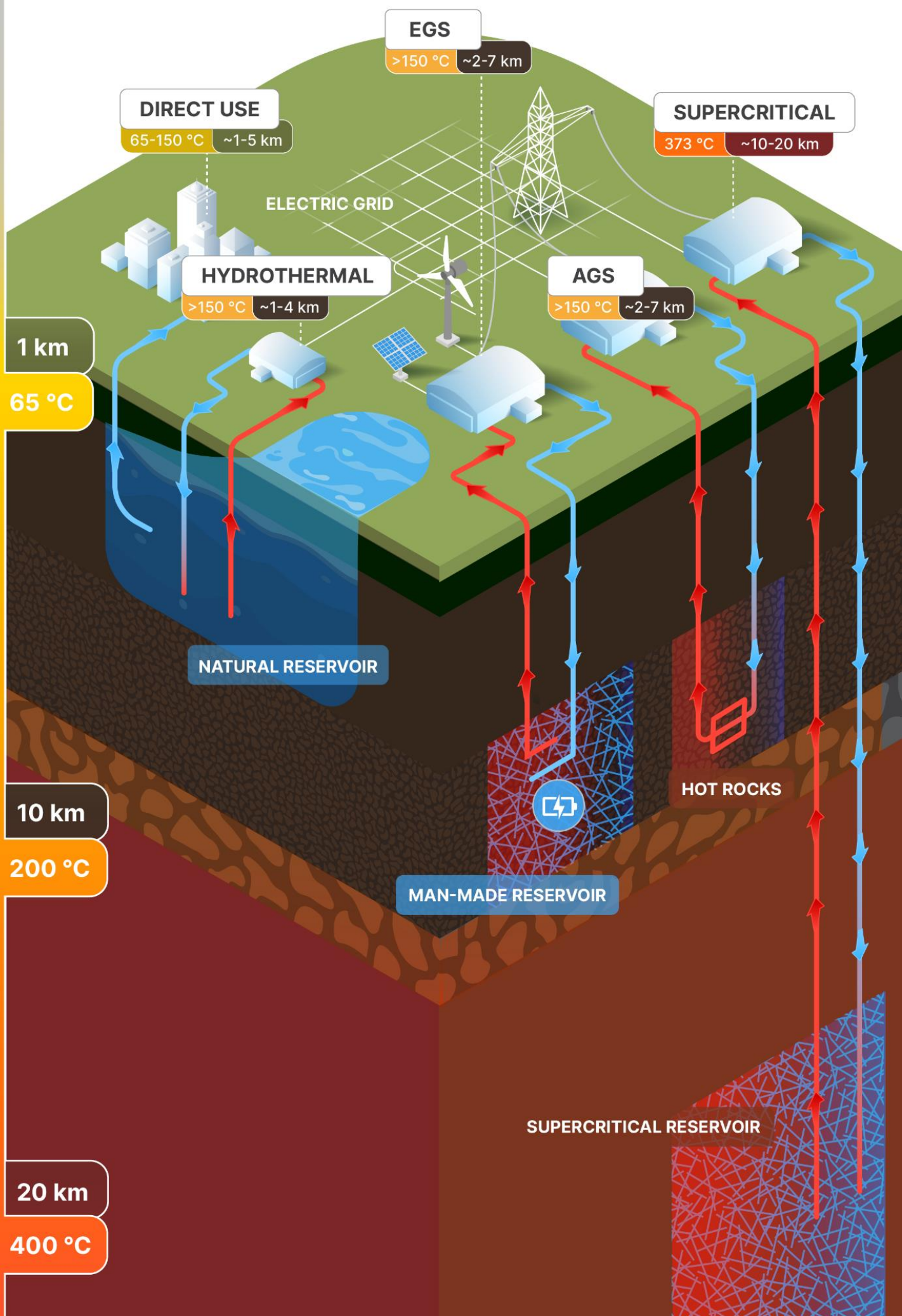
Geothermal Resources & Technologies



Geothermal Resources & Technologies

Direct use

Uses the Earth directly for applications such as space heating, industrial heating, agricultural processing, and Hydrogen production. The depth of direct-use wells can vary depending on the application, but they are typically shallow.

Hydrothermal

Conventional hydrothermal systems use naturally occurring hot aquifers to generate electricity in a binary or flash power cycle. Hydrothermal wells are typically deeper than direct-use ones, but still close to the surface where easily accessible.

Enhanced geothermal systems (EGS)

Where heat is present but there is a lack of fluid and permeability, an engineered system is used to create reservoir networks in hot, dry rock. In an EGS, the working fluid is injected, which carries the heat to the surface to produce electricity. The single or multiple well designs can vary based on the engineered approach.

Advanced Geothermal System (AGS)

Single or interconnected wells drilled into hot rock create a subsurface heat exchanger where a working fluid is circulated through a closed-loop system. The heat gets harvested on the surface from the working fluid which does not come in direct contact with the formation.

Supercritical Geothermal

Once water exceeds 373°C and 220 bars of pressure, it becomes supercritical. Supercritical water has a much higher energy per unit mass than water or steam. This behavior promises high power generation with fewer wells drilled, but it is geographically limiting to enable supercritical geothermal energy anywhere as it requires a depth of ~10-20km.

	Direct Use	Hydro-thermal	EGS	AGS	Supercritical
Heat	✓	✓	✓	✓	✓
In-situ Fluid	✓	✓	Inject Fluid	Introduce working fluid	Inject Fluid
Permeability	✓	✓	Soft hydraulic stimulation	Closed loop, Downhole heat exchanger	Hydraulic stimulation
Depth	~1-5 km (~3000’ -16,00 ft)	~1-4 km (~3,000’-13,000 ft)	~2-7 km (~6,500’-22,000’)	~2-7 km (~6,500’-22,000’)	~10-20 km (~32,000’-65,000’)
Temp	65-150 °C (150-302 °F)	> 150 °C (302 °F)	> 150 °C (>302 °F)	> 150 °C (>302 °F)	> 373 °C (>704 °F)

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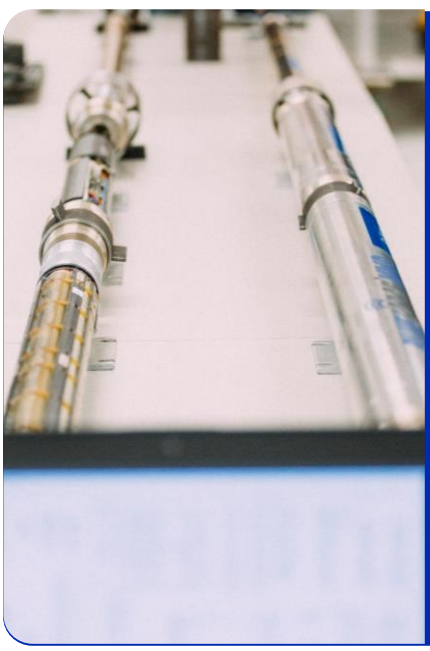
Integrated Technologies for Geothermal Drilling

SAFE, EFFICIENT, FLEXIBLE AND CONSISTENT PERFORMANCE

Tubular Running and Managed Pressure Drilling Services

Geothermal wells can encounter unstable formations and complex geology. Our Managed Pressure Drilling (MPD) can reduce risk of wellbore instability. Also, our Tubular Running Services (TRS) has changed the way casing is run today. We deploy a superior process of getting the casing to total depth while our automated solution improves safety and efficiency of operations.

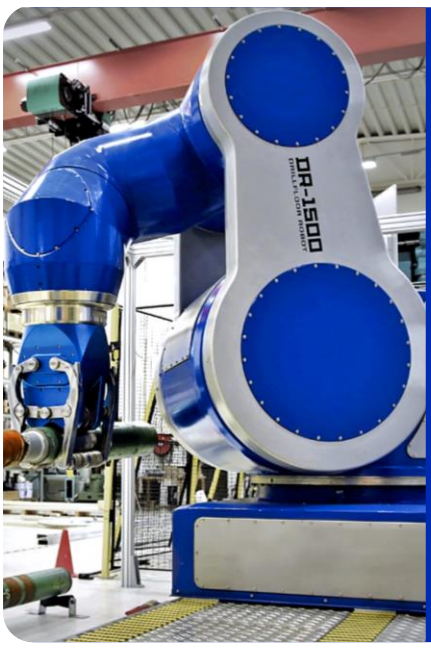


Directional Drilling Services

With our cutting-edge advanced directional drilling services, geothermal drilling projects can proceed with greater accuracy and precision, minimizing the risk of errors or accidents. By relying on Nabors' directional drilling expertise, geothermal projects can get off to a strong start, setting the stage for successful and efficient operations.

Drilling and Directional Automation

Nabors Smart Suite products are engineered to provide unparalleled levels of automation, ensuring that geothermal drilling projects can be carried out with precision and accuracy. With Smart Suite services, your geothermal operations will meet the highest standards of quality and efficiency. These services are flexible and versatile solution for all your geothermal drilling needs.



Canrig Robotics

Canrig Robotics' automated drilling equipment, delivers unparalleled levels of efficiency, performance, and safety to a wide range of industries. In geothermal drilling applications, our advanced robotic systems help reduce the risk of safety hazards associated with high-temperature drilling operations, and create a safer, more secure work environment.

Automated Pipe Handling

Drilling high temperatures means hands-off tubular handling. Canrig's automated pipe handling eliminates human interaction, preventing accidents during what has historically been a high-risk activity. This is impactful for Geothermal operations as it provides the optimum in personnel safety and operational efficiency. All automated pipe handling is applicable for use on Nabors rigs and/or third-party.

Top Drives

Top drives are critical components of any drilling operation, and they play a particularly important role in high-temperature geothermal environments. Canrig offers a premier line of top drives that are designed to meet the unique challenges of geothermal drilling operations. With Canrig's top drives, you can expect consistent, reliable performance that is tailored to the specific requirements of your geothermal project.

Spec Sheet

Product	Direct Use	Hydrothermal	AGS	EGS	Supercritical
Tubular Running and Managed Pressure Drilling Services					
Casing Running	✓	✓	✓	✓	×
Automated Casing Running	✓	✓	✓	✓	×
Managed Pressure Drilling	✓	✓	✓	✓	×
Non-Stop Driller	✓	✓	✓	✓	×
BOP Testing/VBRs	✓	✓	✓	✓	×
Rotating Control Devices	✓	✓	✓	✓	×
Remote Control Chokes	✓	✓	✓	✓	×
Direction Drilling Services					
Motors	✓	✓	✓	✓	×
BlueForce MWD Pulse	✓	✓	✓	✓	×
LWD FracView®	✓	✓	✓	✓	×
LWD SpectraView®	✓	✓	✓	✓	×
LWD DrillView ®	✓	✓	✓	✓	×
Drilling and Directional Automation					
ROCKit®	✓	✓	✓	✓	✓
REVit®	✓	✓	✓	✓	✓
SmartROS®	✓	✓	✓	✓	✓
SmartDRILL®	✓	✓	✓	✓	✓
SmartPLAN®	✓	✓	✓	✓	✓
SmartNAV®	✓	✓	✓	✓	✓
SmartSLIDE®	✓	✓	✓	✓	✓
Canrig Robotics					
Drill Floor Robot	✓	✓	✓	✓	✓
Robitic Roughneck	✓	✓	✓	✓	✓
Robotic Pipe Handler	✓	✓	✓	✓	✓
Robotic Pipe Deck Handler	✓	✓	✓	✓	✓
Red Zone Robotics (RZR) Module	*(a fully automated module made up of different components that is scalable on any AC rig)*				
Automated Pipe Handling					
iRacker®	✓	✓	✓	✓	✓
Floor Wrench	✓	✓	✓	✓	✓
Catwalk	✓	✓	✓	✓	✓
Casing Drive System	✓	✓	✓	✓	✓
Top Drives					
Canrig Sigma Top Drive	✓	✓	✓	✓	×
Electric Top Drives	✓	✓	✓	✓	×
Hydraulic Top Drives	✓	✓	✓	✓	×

Disclaimer: These integrated technologies can be applied to automated rigs and are designed to improve the efficiency and productivity of geothermal drilling operations but have not all been specifically tested on geothermal rigs. The actual results may vary depending on several factors, including the specific rig configuration, geological conditions, and other operational parameters.

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