Geothermal Potential in Alaska: Policy Brief

By Launch Alaska and New Energy Alaska

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Alaska sits atop one of the largest undeveloped geothermal resource bases in North America. As the state confronts rising energy costs, declining natural gas production in Cook Inlet that currently fuels most Railbelt electricity, and increasing infrastructure stress from environmental and operational factors, geothermal can offer around-the-clock power and heat.

Advances in enhanced geothermal systems, superhot rock drilling, and closed-loop technologies are expanding development potential beyond traditional volcanic zones. Further exploration of how Alaska can deploy these emerging technologies closely aligns with President Trump's January 2025 Executive Order on Unleashing Alaska's Extraordinary Resource Potential, directing federal agencies to maximize development of Alaska's energy resources and expedite permitting.[1]

Geothermal is uniquely positioned to deliver on critical tasks such as powering Alaska's military bases and reducing remote communities' dependence on diesel. This brief outlines Alaska's geothermal resource potential, emerging applications, and targeted policy reforms that can unlock private investment, while strengthening energy security for our state.

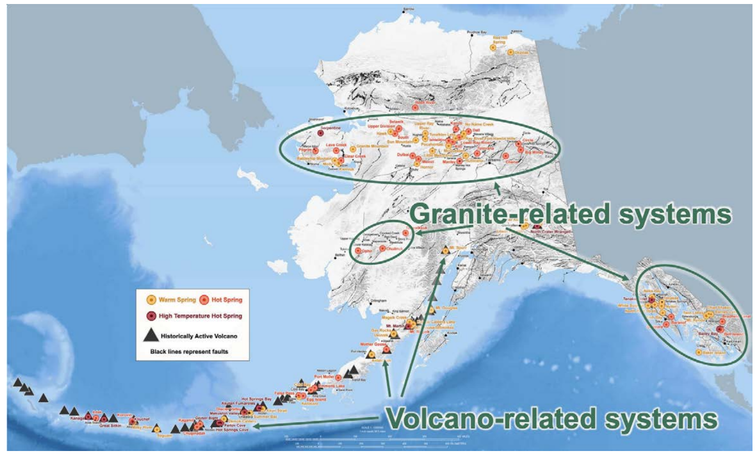
Policy Opportunities

1. LEGAL CERTAINTY
    - Clarify resource ownership and leverage existing infrastructure.
2. PERMITTING AND REGULATORY EFFICIENCY
    - Pursue state primacy of Class V injection wells.
    - Designate a geothermal project coordinator through Alaska's State Office of Project Management and Permitting.
    - Create exemptions for small and noncommercial uses.
3. RISK REDUCTION AND CAPITAL FORMATION
    - Establish a geothermal risk mitigation program.
    - Prioritize Alaska's participation in the DOE Geothermal Power Accelerator program.
    - Ensure grant timelines correspond with the needs of rural communities.
4. MARKET CREATION AND CAPACITY BUILDING
    - Build strategic defense partnerships and encourage collaboration between AEA and tribal independent power producers.
    - Extend funding for the State of Alaska Geothermal Energy Program beyond 2027.
    - Leverage Alaska's existing oil and gas workforce as a competitive advantage.
    - Pursue an ARPA-E SUPERHOT demonstration at Mt. Augustine.

More details are available on page 5

GEOTHERMAL RESOURCES IN ALASKA

Alaska has at least 97 documented thermal springs as well as extensive volcanic systems along the Aleutian Arc.[2] A 2023 preliminary modeling assessment found that as little as one percent of the state's superhot rock resource could represent approximately 624 gigawatts of technical generating capacity, far exceeding current in-state electricity demand.[3]



Map of geothermal systems across Alaska.
Source: [Alaska Department of Natural Resources]

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Moreover, up to 80% of the resources required in a geothermal project involves overlap with the oil and gas industry, including drilling techniques, specialized equipment, and project planning expertise.[4] With established geothermal resources and oil and gas know-how, Alaska is well-positioned to harness geothermal energy. From high-temperature volcanic systems in the Aleutian Islands to lower-temperature resources in the Interior and widespread shallow ground heat, Alaska has geothermal resources across a wide range of geologic settings.

Geothermal development in Alaska is regulated through a combination of land management, technical oversight, and environmental permitting. The Alaska Department of Natural Resources' Division of Oil and Gas manages geothermal leasing and prospecting on state lands. At the same time, the Alaska Oil and Gas Conservation Commission regulates geothermal wells to ensure safety, prevent waste, and protect resources. Additional oversight may come from agencies such as the Alaska Department of Environmental Conservation, the US Environmental Protection Agency (EPA), and the US Bureau of Land Management, depending on project location and activities.

> "90% of the skills oil and gas workers already possess are directly transferable to the geothermal industry."
>
> *— Mike Eros, Sage Geosystems*

BASICS OF GEOTHERMAL ENERGY

Geothermal uses heat naturally stored beneath the Earth's surface. At depth, rock temperatures increase substantially, heating subsurface water and creating reservoirs of hot water or steam that can generate electricity. Geothermal systems can provide continuous, 24-hour power.

All geothermal systems rely on three fundamental elements: a source of heat in the form of hot rock beneath the Earth's surface, a fluid such as water to transport that heat upward,

Steam rising from a fumarole at the summit of Spurr Volcano, located 75 miles west of Anchorage. Source: [Wyatt Mayo, Alaska Volcano Observatory/U.S. Geological Survey] and permeable pathways like fractures or openings that allow the fluid to circulate. With the heat brought up to the surface of geothermal reservoirs, energy can be produced.

Geothermal resources span a wide range of temperatures, and their practical uses depend strongly on how much heat, and therefore usable energy, they contain.

- At lower temperatures (below ~100°C), geothermal is effective for direct use applications such as space heating and cooling, greenhouse heating, providing heat for industrial processes, and heat pumps.
  - District heating using geothermal resources with temperatures of ~100°C can power thousands of homes, depending on factors such as the flow rate of the hot water and the permeability of geothermal reservoirs.
- As temperatures increase (~100–150°C), resources begin to support electricity generation while still serving heating needs.
- Above ~150–200°C, geothermal fluids can drive turbines for conventional power generation.
- As temperatures approach ~350–400°C, they reach the "superhot" range.

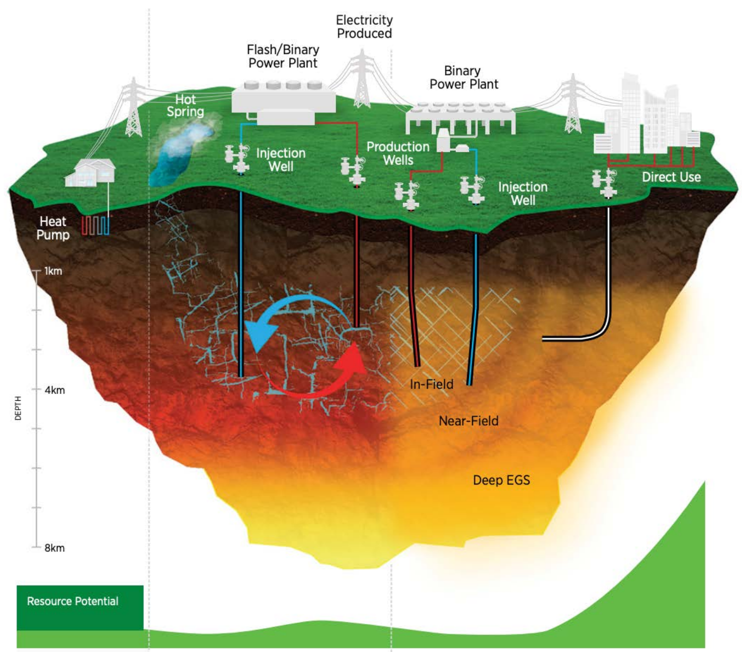
GEOTHERMAL ELECTRICITY GENERATION

Conventional Geothermal

Conventional geothermal power uses naturally heated underground reservoirs, typically found near volcanic or tectonic activity. Three types of geothermal power plants convert underground heat into electricity by producing steam that spins a turbine.

Enhanced Geothermal Systems

New technologies are expanding geothermal development beyond traditional volcanic regions. Enhanced geothermal systems (EGS) create underground pathways that allow water to circulate through hot rock, enabling geothermal energy production even in areas without natural hot springs or steam reservoirs.[5] EGS is sometimes referred to as engineered, advanced, or next-generation geothermal.



Applications of geothermal energy range from direct use to electricity generation. Source: [Department of Energy]

For example, geothermal developer Mazama Energy recently drilled to a record temperature of 331°C using EGS at a pilot site at Newberry Volcano in Oregon, a geothermal heat reservoir with qualities similar to those of volcanoes in the Aleutian Arc. Beginning with a 15 MW pilot, Mazama Energy will scale to a 200 MW project as they extend drilling into superhot rock temperatures. [6]

Under this umbrella of EGS, several specific configurations are emerging:

Closed-Loop Geothermal: Circulates fluid through sealed underground pipes without interacting directly with surrounding rock or groundwater. [7]

Geopressured Geothermal: Captures both underground heat and natural subsurface pressure, increasing overall power output.[8]

Superhot Rock is a separate technology path from EGS, which accesses temperatures ~350–400°C to produce more energy from fewer wells.[9] While EGS extends oilfield drilling methods into hotter rock, superhot rock goes deeper than EGS. It requires fundamentally new drilling and materials, as conventional technology begins to fail under such high heat.

POTENTIAL GEOTHERMAL APPLICATIONS IN ALASKA

These geothermal opportunities span varying levels of development and planning, showcasing both ongoing projects and emerging technologies with relevance to Alaska.

District Heating

- **Central Alaska Hot Springs Belt:** Pending further subsurface exploration, shallow ground heat and hot springs in the Interior could support district heating and geothermal heat pump systems by utilizing low-temperature resources.

Direct Use Greenhouse

- **Pilgrim Hot Springs:** Located near Nome, Alaska, and managed by Bering Straits Native Corporation and Kawerak, Inc., Unaatuq, LLC will construct a 75 kW geothermal power plant in 2026 with plans to build a greenhouse to grow food year-round.

Liquid Fuel Synthesis

- **Mount Augustine:** Situated near the Railbelt urban grid and major flight paths, a 2024 feasibility study suggests this site is a potential candidate for producing synthetic fuels using geothermal power.[10] Consequently, Augustine Island could support long-term fuel diversification for Anchorage's cargo airport hub. Synthetic fuels are a cleaner alternative to fossil fuels and can be produced via multiple methods and with multiple feedstocks, including hydrogen produced with renewable energy and carbon dioxide captured from the air.
  - Chugach Electric Association, the state's largest electric utility, issued a non-binding Letter of Interest to enter into a Power Purchase Agreement with GeoAlaska on this project in August 2025.[11]

Bathing pools at Pilgrim Hot Springs are naturally heated by geothermal energy. Source: John Cloud, National Ocean and Atmospheric Administration

An opening near the summit of Mount Augustine releases steam. Source: Peter Kelly, Alaska Volcano Observatory/U.S. Geological Survey

> "Mt. Augustine, if not certainly the best place in the United States, is one of the best places in the world to advance geothermal technology ... Geophysical evidence at Mt. Augustine gives an indication that you could get super hot at a shallow depth of only four kilometers."
>
> *– Dr. John Eichelberger, State of Alaska Geothermal Energy Program*

Industrial Mineral Recovery

- **Zanskar Geothermal:** Emerging projects, such as the collaboration between Zanskar Geothermal and Freeport-McMoRan in Arizona, demonstrate how geothermal heat can be integrated into mining operations to improve mineral recovery.
  - By supplying consistent, carbon-free heat, geothermal systems can accelerate processes like leaching and increase yields from lower-grade ore. In Alaska, where mining operations are often energy-constrained and rely on diesel or imported fuels, similar approaches could reduce costs, lower emissions, and make previously uneconomic deposits more viable.[12]

Energy Storage

- **Sage Geosystems:** This Texas-based startup company, and Launch Alaska portfolio company, is exploring a form of underground energy storage where water is pumped underground to build pressure, like compressing a spring, and later released to generate electricity.[13] This technology could help store excess energy to be released during the dark, high-demand winter months, as well as stabilize microgrids in rural Alaska reliant on diesel.

Although Alaska's geothermal opportunities are vast, technical and economic barriers must be overcome to achieve commercial power production:

- The most promising high-temperature sites, such as the Aleutian Arc, face a "volcano tax" characterized by extreme logistical complexity, limited drill rig availability, and a prohibitive distance to load. According to industry experts, transmission costs would likely reach $1M–$2M per mile.
- Accessible resources in the Interior are often lower in temperature, which results in diminished power plant efficiency and tighter margins.
- Reaching more efficient commercial temperatures of 275°C near the Railbelt would require drilling to depths of 22,000 feet, more than double the depth of typical North Slope wells.

Navigating these record-breaking depths, alongside the materials science and financing challenges of advanced technologies like EGS and Superhot Rock, will require a disciplined, phased approach to development.

POLICY OPPORTUNITIES

Although Alaska has modernized some elements of its geothermal framework through House Bill 50 (2024), the state's regulatory and capital architecture remains fragmented relative to its resource scale. Converting geological advantage into deployable projects may require reducing subsurface risk, shortening permitting timelines, clarifying property rights, and anchoring long-term demand.

The following recommendations focus on policy adjustments designed to reduce risk, improve clarity, and support private-sector participation.

1. LEGAL CERTAINTY

- **Clarify geothermal resource ownership.** Legal clarity for public and private land would reduce title disputes and developer liability risk, improving project bankability.Some states, including Texas, have clarified geothermal heat ownership in statute by recognizing subsurface heat as a real property interest tied to surface ownership.[14] Where ownership is divided between surface and subsurface estates, such as Alaska Native Claims Settlement Act (ANCSA) lands, establish default frameworks or optional unitization mechanisms to streamline joint development and reduce transaction costs.

- **Leverage existing infrastructure.** Allowing evaluation and potential conversion of certain orphaned or inactive oil and gas wells for geothermal use could lower capital costs and utilize existing infrastructure, subject to safety and environmental review. Similar statutory approaches have been adopted in Texas and New Mexico.[15][16]

2. PERMITTING AND REGULATORY EFFICIENCY

- **Pursue state primacy of Class V injection wells** from the EPA, enabling state-level administration of geothermal injection permitting. Centralizing review authority could improve coordination between federal and state review processes.
- **Designate a geothermal project coordinator through Alaska's State Office of Project Management and Permitting (OPMP).** This office already has authority to assign coordinators across state agencies by administrative directive, requiring no new legislation. A dedicated coordinator with standing familiarity across these agencies would serve as a single point of contact for developers, reducing friction and streamlining permitting. Building deeper geothermal expertise within OPMP would further equip the office to support new development.
- **Create exemptions for small and noncommercial uses.**
    - Clarifying that small-scale geothermal uses do not require a prospecting license or lease could incentivize homeowners and other noncommercial consumers to use geothermal. For example:
        - Water use rights permitting exemption for direct use greenhouses.
        - Reduce Alaska Oil and Gas Conservation Committee fees for geothermal projects under 1 MW, lowering funding barriers for rural communities.

3. RISK REDUCTION AND CAPITAL FORMATION

- **Establish a geothermal risk mitigation program.** Explore targeted financial risk-sharing tools used in other geothermal-producing regions with the State of Alaska Renewable Energy Fund or the Alaska Industrial Development and Export Authority (AIDEA). For example:
    - Small grant programs to support early-stage feasibility and pilot projects, as implemented in Colorado.[17]
    - Drilling risk mitigation funds, such as Iceland's model,[18] which provide partial cost recovery for unsuccessful exploratory wells, encouraging these early phases of investment.
    - AIDEA could backstop geothermal projects with loan guarantees or insurance.
- **Prioritize Alaska's participation in the Department of Energy's Geothermal Power Accelerator program,** launched in January 2026. This 15-state effort aims to advance geothermal deployment through public-private partnerships. [19]
- **Ensure grant timelines correspond with the needs of rural communities.** Grantmakers don't anticipate the high costs associated with supply chain challenges and a summer construction season.

4. MARKET CREATION AND CAPACITY BUILDING

- **Build strategic defense partnerships.** The Department of Defense has explicitly prioritized geothermal for energy resilience. Alaska's concentration of military installations positions the state as a prime candidate for geothermal pilot projects that anchor long-term demand. Long-term agreements with large institutional energy users, including military installations, could provide demand certainty for early geothermal projects.
- **Extend funding for the State of Alaska Geothermal Energy Program beyond 2027,** prioritizing high-resolution subsurface mapping in the Railbelt and Aleutians.
- **Encouraging collaboration** between the Alaska Energy Authority and tribal independent power producers on geothermal projects to support rural energy needs.
- **Leverage Alaska's existing oil and gas workforce as a competitive advantage.** According to the IEA, 80% of geothermal drilling and reservoir engineering competencies overlap with oilfield skill sets because both industries rely on similar drilling, reservoir engineering, and well management skills.[20] Targeted retraining programs could accelerate industry buildout while preserving high-wage employment.
  - Example: In 2024, Fervo Energy, Southern Utah University, and accelerator Elemental Impact established an apprenticeship program to train both an existing pool of oil and gas workers as well as a new workforce for the geothermal industry. [21]
- **Pursue an ARPA-E SUPERHOT demonstration at Mt. Augustine** as a second national geological testbed, complementing the existing Newberry Volcano program in Oregon. Mt. Augustine's shallow, superhot resource, potentially accessible at just 4 km depth, offers a distinct volcanic setting to demonstrate Alaska's proven geothermal resources and attract geothermal investment to the state.

With geological advantage, an experienced drilling workforce, and growing national demand for resilient power, Alaska has the natural assets and technical capacity to participate meaningfully in next-generation geothermal development. The extent to which that potential is realized will depend on regulatory clarity, investment conditions, and sustained collaboration across public and private sectors.

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This research was informed by input from experts at the following organizations:

- Sage Geosystems
- GeoAlaska
- Power Planet
- Project Innerspace
- Texas Geothermal Energy Alliance
- AECOM
- Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys, Geothermal Energy Program
- Alaska Center for Energy and Power
- Kawerak, Inc.
- Alaska Department of Natural Resources, Division of Oil and Gas

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