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Background Note

Ministerial Roundtable Geothermal Heat and Power: Building a Resilient Energy Backbone

Background

1. For over a century, geothermal energy has served as a reliable source of clean power and heat with a proven operational track record. In countries with access to hydrothermal resources, it supplies 24/7 renewable electricity and heat, offering a high-capacity factor, long operational life span and strong grid stability. Globally, the installed capacity stands at around 15.4 GW_e for electricity generation and approximately 177 GW_{th} for heating and cooling. However, largely confined to regions with volcanic or tectonic activity, geothermal has remained a niche player in the global energy landscape, attracting only 8.8 billion dollars in investment to date - a fraction of the trillions invested in solar PV and wind. Today, as energy systems face rising electricity demand and growing pressures for secure, reliable, and low carbon solutions, the combination of technological innovation and energy security requirements is set to drive geothermal energy into a new era.
2. Next-generation geothermal technologies are breaking the geographical barrier and expanding applications. The subsurface approaches like Enhanced Geothermal Systems (EGS), closed-loop or Advanced Geothermal Systems (AGS), and deep drilling toward superhot conditions aim to access heat beyond naturally permeable fields. These innovative solutions can leverage existing oil and gas wells and know-how, shorten supply lines and bring steady, local and clean energy where the demand is highest.
3. On the heating and cooling side, geothermal can anchor district heating networks by pairing low- to medium-enthalpy resources with large heat pumps and underground thermal storage to balance seasons and peaks, integrating near urban and industrial loads to cut emissions at scale and deliver predictable, long-term costs for municipalities and network operators. These innovations, coupled with tailored policies, risk-mitigation tools and standardised offtakes for power and heat, can revolutionise the sector and bring it forward at scale.
4. Furthermore, the rapid rise of AI-driven digitalisation is fuelling unprecedented, constant electricity demand from data centres, with consumption comparable to mid-sized cities. Geothermal energy is increasingly seen as an ideal solution for powering these centres, especially since they can be located near the heat source and not only in cities where conventional demand is¹. By enabling geothermal projects and standardized, bankable long-term contracts, countries can attract large off-takers², lower system cost and strengthen national energy security and investment confidence.

¹ Meta has signed a 150 MW geothermal PPA with Sage Geosystems to supply its U.S. data centres. The project utilizes innovative closed-loop geothermal technology, expanding geothermal access beyond traditional geographic limitations.

² Recent corporate deals, such as Google scaling its geothermal supply in Nevada from ~3.5 MW to 115 MW and Microsoft sourcing power from the 51.4 MW Te Huka Unit 3 plant in New Zealand, show tech buyers will commit when enabling policies and contracting pathways are in place and demonstrate growing big-tech investment in geothermal energy.

5. Unlocking scale requires more than technology, to seize these opportunities governments are encouraged to integrate geothermal more explicitly into their nationally determined contributions (NDCs) and long-term energy strategies, positioning it as a core complement to other renewable energies. Early investment in pilot projects can help validate technologies in diverse market and geological contexts, reducing perceived risk and catalysing private capital. Financial instruments such as concessional loans, loan guarantees, and power purchase agreements tailored to baseload renewables are essential to anchor investment. Equally important is capacity building, training a geothermal workforce, improving subsurface data availability, and supporting regulatory reforms that create clear pathways for development.
6. The [Global Geothermal Alliance](#) (GGA) plays a crucial role as a multi-stakeholder platform coordinated by IRENA, bringing together 56 member countries and 59 partners across the globe dedicated to advancing geothermal energy. The GGA encourages collaboration among public, private and governmental stakeholders to accelerate the deployment of geothermal energy, including electricity production, heating and cooling and agri-food applications. Through capacity building, policy support and knowledge sharing, the GGA aims to unlock geothermal potential as a key contributor to sustainable energy transitions.

Objectives

- IRENA, as the coordinator of the Global Geothermal Alliance (GGA), will convene a high-level Ministerial roundtable that aims to set a shared vision for promoting geothermal power and heat solutions aligned with energy security, climate and socio-economic development goals. Governments and industry will exchange views on effective ways to address policy, regulatory and finance challenges to unlock geothermal development.
- Discussion will focus on next-generation geothermal, regulatory barriers, de-risking and finance solutions while exploring pathways to maximize synergies between the geothermal and oil & gas sectors.

Associated Publications

- [Renewable Energy Solutions for Heating Systems in Mongolia: Developing a strategic heating plan](#)
- [Global Geothermal Market and Technology Assessment](#)
- [Powering Agri-food Value chains with Geothermal Heat](#)
- [Integrating Low-temperature Renewables in District Energy Systems](#)