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Financing Deep Geothermal Energy: Strategies to Mitigate Exploration Risk in Europe

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ABSTRACT

Deep geothermal energy represents a key pillar of Europe's heat transition, offering sustainable, base-load renewable energy but requiring exceptionally high upfront capital commitments. The majority of investment is concentrated in early project phases when geological uncertainty and long lead times create a risk profile that limits access to conventional debt finance. In Germany, recent policy and financial innovations aim to address these structural barriers and improve the bankability of geothermal projects. Exploration risk schemes, conditionally repayable grants and subsidized loans from regional development banks, together with regulatory reforms under the Geothermal Acceleration Act, are designed to reduce exploration risk, streamline permitting, and attract institutional capital. These measures collectively mark a shift toward a more predictable and investment-friendly environment, positioning Germany and Europe as a competitive location for deep geothermal development.

1 INTRODUCTION

The accelerating pace of climate change and the geopolitical volatility of global energy markets underscore the urgent need for a profound transformation of Europe's energy system. To meet the targets of the Paris Agreement and the EU Green Deal, a rapid decarbonization of heat and power supply is essential. Additionally, the EU and the rest of the continent must reduce its dependence on imported fossil fuels, which has proven to be a strategic vulnerability in recent years. Achieving both climate neutrality and energy sovereignty requires the deployment of secure, scalable, and reliable renewable resources. While the transition to renewable electricity is well under way the transition from fossil-based heating to renewable/climate neutral heating is trailing behind.

In this context, deep geothermal energy emerges as a promising option providing CO2-free, baseload capable energy supply usable in district heating systems.

Around 50 % of final energy consumption in the EU stems from the heating and cooling sector which remains largely dependent on fossil fuels. This is represented by a share of renewables in this sector of about 23 % in 2021 where deep geothermal energy still plays only a marginal role (Publications Office of the European Union, 2023).

Across Europe, deep geothermal currently provides only a small share of total heating demand, yet its technical potential is vast. As of 2023, Europe's deep geothermal district heating and cooling systems account for roughly 6 GWth of installed capacity, distributed among more than 400 operational plants in 29 countries, with approximately 300 located in EU Member States (European Geothermal Energy Council, 2024). This represents well below 1 % of total European heat supply.

In contrast, Europe's broader district heating sector - largely fossil-fuel-based - comprises an estimated 300 GWth of installed capacity, accounting for about 13 % of total heat demand (State of Green, 2024). The geothermal contribution to the heating mix therefore remains marginal even though more than one-quarter of the EU population live in areas with suitable geological conditions for geothermal district heating. These figures underline both the scale of the challenge and the strategic opportunity: by tapping its extensive deep geothermal resources, Europe could substantially reduce fossil-fuel dependency and provide secure, climate-neutral heat for millions of households.

Europe possesses substantial unexploited geothermal potential: for example, Germany's deep geothermal resources are estimated to be able to provide more than 300 TWh of heat per year, equivalent to approximately 70 GWth of installed capacity (Bracke & Huenges, 2022). European deep geothermal energy potentials are spread across the continent with multiple high-potential areas, including multiple highly suited areas in

Germany (Figure 1, (Flensburg, Halmstad and Aalborg Universities, 2018)). Despite these favorable geological conditions in many regions, deployment remains limited, leaving large parts of Europe's heating infrastructure still reliant on fossil fuels and its deep-geothermal potential underutilized, even though it offers a secure heat supply.

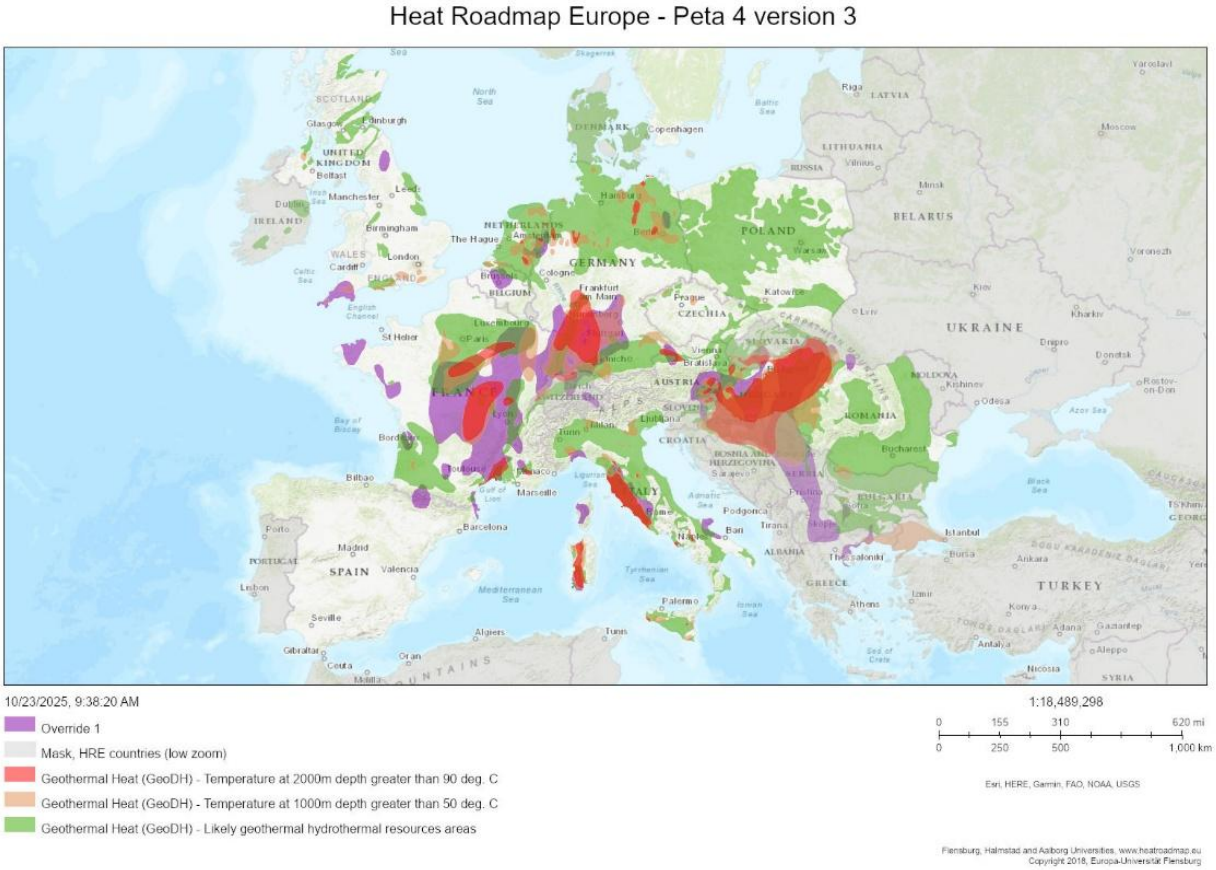


Figure 1: Geothermal Energy Potentials - Pan-European Atlas (Flensburg, Halmstad and Aalborg Universities, 2018)

The leading European countries in deep geothermal heat deployment are those combining favorable geological conditions with consistent policy support. Iceland remains the global frontrunner, with its capital Reykjavik heated almost entirely through geothermal district heating, and most rural areas likewise supplied by direct geothermal systems. France follows as a European best practice, particularly in the Paris Basin, where dozens of geothermal district heating plants operate in sedimentary aquifers. The country counts roughly 70 active district heating systems connected to geothermal plants, many of which have replaced fossil-based networks in urban areas (European Geothermal Energy Council, 2024). In Germany and Austria, the Molasse Basin around Munich and Salzburg hosts a growing number of geothermal heat and combined heat-and-power plants, making these regions examples for well-integrated deep geothermal systems in densely populated areas. The Netherlands successfully utilize deep aquifers for greenhouse heating where geothermal energy already supplies about 10 % of total demand and is expanding the use of "warmth networks" for urban heat supply (Bracke & Huenges, 2022). According to the European Geothermal Energy Council, Iceland and France currently represent the most mature geothermal district heating markets in Europe.

Europe's best-performing regions demonstrate that geothermal energy can supply a substantial share of heat demand through district heating systems. In contrast, geothermal deployment in North America is predominantly oriented toward electricity generation rather than heating. In 2023, geothermal energy in North America produced approximately 23 TWh of electricity, representing roughly 1.6 % of total renewable electricity generation (International Energy Agency, 2023) and 42 GWh for heating and cooling (International Geothermal Association, 2024). Consequently, deep geothermal heating remains negligible across the continent. Europe therefore leads globally in harnessing deep geothermal resources for district heating applications, whereas North America still possesses largely untapped potential in this domain.

To better understand the financing challenges, the concrete project process from planning to energy generation is important. The development of deep geothermal energy projects follows a structured process designed to manage geological, technical, and financial risks. Uncertainty is progressively reduced and enables investment decisions. The project lifecycle can be divided into three main stages: project planning, project execution, and plant operation.

A typical deep geothermal energy project in Germany can take from 5 up to 9 years of time from the beginning of project planning to the delivery of the first kWh of energy. Compared to EU-averages the project duration in Germany is slightly worse compared to North American standards.

2 STRUCTURE AND CHALLENGES OF DEEP GEOTHERMAL PROJECTS

The development of deep geothermal energy projects follows a structured process designed to manage geological, technical, and financial risks. Uncertainty is progressively reduced and enables investment decisions. The project lifecycle can be divided into three main stages: project planning, project execution, and plant operation. A typical deep geothermal energy project in Germany can take from 5 up to 9 years of time from the beginning of project planning to the delivery of the first kWh of energy. Compared to EU-averages, projects in Germany take about one year longer. Deep geothermal energy project development in the US (Robins, et al., 2021) and Canada (Graham, Quigley, Janzwood, & Homer-Dixon, 2022) can take up to 10 years from initiation to delivery.

2.1 Project Planning

The planning phase defines the technical, geological, and economic feasibility of a geothermal project and lays the foundation for all subsequent activities.

2.1.1 Securing Drilling Grounds

Often, the first step of a geothermal project in Germany is to secure the drilling grounds not uncommonly years before planning further steps for the project. This includes the selection of promising locations based on available geological data and previous projects and the acquisition of required exploration and drilling permits from the relevant authorities. In Germany, exploration and drilling rights are governed by the Federal Mining Act executed by the State Mining Authorities in each state.

2.1.2 Preliminary Investigations

Once the exploration area is defined, the project developer conducts geophysical and geological surveys to characterize the subsurface. In parallel, a conceptual design for the geothermal system is developed, including drilling routes, energy potential configurations and possible energy supply options. A preliminary business plan is also established, including cost and revenue estimates, project timelines, and the identification of funding sources. The aim of the preliminary investigation is to attract investors and qualify for state-backed funding programs.

2.1.3 Feasibility Study

The results from preliminary investigations are consolidated. It evaluates the reservoir temperature, permeability, and flow rate that defines the project's economic parameters, including capital needs and expected returns. Only if this study confirms technical and financial viability, technical planning will commence.

2.2 Project Execution

Proceeding with a successful project planning phase, the execution phase creates a physical energy asset.

2.2.1 Technical Planning

Detailed technical planning of underground facilities is finalized while the detailed planning of overground facilities starts. Due to the uncertainty of success of the drilling, overground facility planning can only be finalized after the drilling. At this stage, procurement and contracting are finalized, mostly through tendering to comply with financing and funding regulations.

2.2.2 Drilling Phase

This phase represents the project's most critical and capital-intensive step. It includes the acquisition or lease of the drilling sites and surrounding infrastructure. The actual drilling of deep geothermal wells (extraction and injection well) follows the preparation of the drilling site and the set-up of the drilling rig. Afterwards, the well productivity is tested. Thermal parameters determine the success of the exploration ranging from full discovery

(productive reservoir) to partial discovery (reduced productivity) and a dry well (no commercial potential). Whereas a full discovery confirms the pre-planning and construction of surface facilities can immediately follow, a partial discovery poses challenges in that opportunities to raise the yield need to be estimated and tested. In case of a dry well, the project is terminated.

2.2.3 Plant construction

Pump systems, heat exchangers and/or power generation units, district heating connections and auxiliary infrastructure are installed after a productive reservoir has been confirmed.

2.3 Plant Operation

The operational phase focuses on the sustainable, efficient, and economically viable utilization of geothermal resources.

2.3.1 Energy Supply Integration

In Germany, geothermal energy is usually fed into district heating networks or directly to local industrial heat consumers. However, the sale of electricity stemming from geothermal energy plants is also possible and facilitated.

2.3.2 Operation and Maintenance

Technical and economic operation and maintenance ensure long-term success of the project. Monitoring well performance, reinjection and reservoir pressure management are important for long term sustainability.

The step-by-step approach of geothermal development differs from other renewable projects, since high uncertainties make holistic planning of the project impossible. This iterative approach of deep geothermal projects offers opportunities to tailor the plant components perfectly to the specific nature of a project but also poses risks as to the fact that investment costs and revenue streams can only be estimated in advance.

3 FINANCING OF DEEP GEOTHERMAL POWER PLANTS

3.1 Financing Structure

High upfront capital expenditures (CAPEX) and the distinct risk profile (Figure 3) across the project phases, necessitate a blended capital structure combining multiple financial instruments. Around 10 % of investments are made in the pre-planning and exploration phases, whereas 60 % are accounted for during drilling and possible well stimulations. 25 % of overall investments are needed for building the above-surface infrastructure directly connected to the well (Böttcher, 2014). The rest can be accounted for other soft-costs. Once drilling is proven successful, deep geothermal projects can achieve competitive heat generation costs. According to Fraunhofer ISE heat production costs of approximately 25-30 €/MWh can be expected at costs of 1.8 – 2.2 Million €/MW of installed capacity for an average power plant (Bracke & Huenges, 2022). However, the exploration risk poses challenges for project execution. Historically, 73 % of deep geothermal drillings have been successful at the first try, while only 11 % have proven not to be productive even after stimulation measures (Tönnis & Merz, 2025).

The key actors and capital stack layers for financing geothermal power plants are project developers providing equity, commercial banks providing senior debt and development banks offering promotional debt and risk mitigation. Therefore, the capital stack is usually comprised of different forms of public and private debt, managed under a project finance structure. The financial viability of a geothermal project is quantitatively assessed through a discounted cash flow model which projects future revenues against CAPEX, OPEX and financing costs. The unique cash flow structure of a geothermal energy project (Figure 2) with a distinct negative cash flow peak during the drilling phase, followed by decades of steady revenue makes the Weighted Average Cost of Capital the most important metric for financial project viability. The WACC has a high sensitivity on the corresponding net present value and levelized cost of energy due to the long operation life time of at least 20 years. As a result, financing conditions (cost of debt, debt-to-equity ratio) and the availability of grants are important.

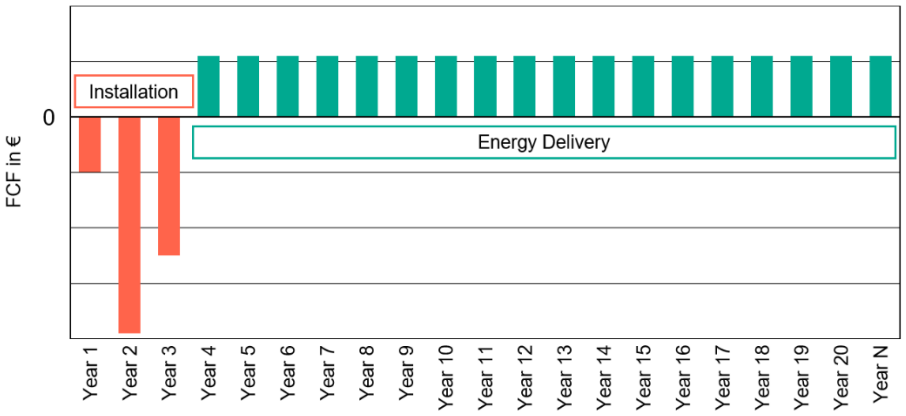


Figure 2: Exemplary Cash Flow Projection of Deep Geothermal Projects

The availability of capital stack layers, however, differs throughout the lifecycle of the project. As illustrated in Figure 3, the type of capital employed is largely determined by the project's maturity and corresponding risk profile. The early phases of financing (Exploration and Drilling) are characterized by high geological uncertainty and substantial upfront costs, making them unsuitable for classic debt financing. Consequently, they rely heavily on equity contributions, risk capital, or public support mechanisms to absorb potential losses. Once the geological resource potential and revenue streams are de-risked, the project becomes eligible for classic debt instruments and institutional capital, decreasing equity intensity. At this stage, senior loans, green bonds or infrastructure funds can replace early-stage equity to optimize the capital structure and lower the overall cost of financing.

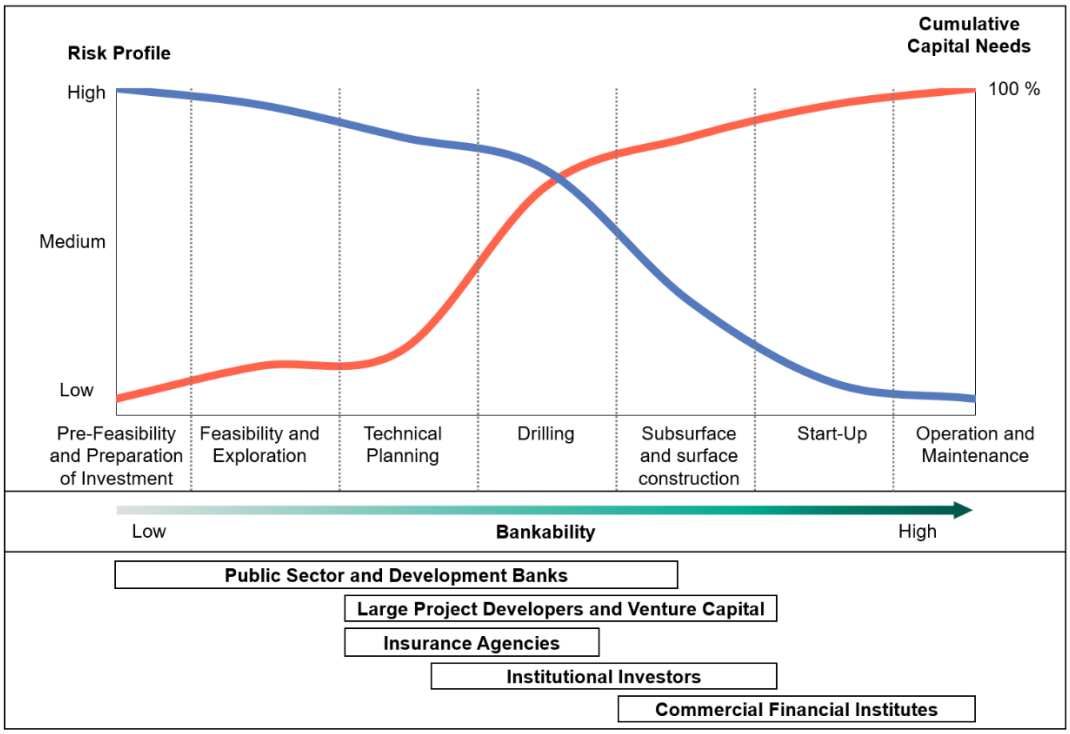


Figure 3: Risk, Capital Needs, Bankability, and Financing Actors for Deep Geothermal Projects

3.1.1 Equity sources

A typical source of equity for geothermal energy generation in Germany is equity provided by the utility or sponsor equity, sometimes in the form of an industrial company or similar deciding to invest into local heat production and act as a principal customer. In some cases, these equity models result in public private partnerships. This model is mostly utilized in areas of almost certain drilling success. Regionally, crowdfunding plays an important role for renewable power development like PV and wind turbines. For geothermal projects, however, the potential of allowing local citizens to participate as investors has not been exploited yet. Venture capital and private equity offer another possibility to raise capital in the German geothermal expansion. For VCs and PEs,

the market is still unexplored, offering great opportunities for high yield investments into deep geothermal energy.

3.1.2 Subsidized debt sources

In Germany, subsidized debt instruments, such as low-interest loans and conditionally repayable grants, are a central element of clean-energy financing. The federal development bank KfW and its regional counterparts—such as LfA Förderbank Bayern, L-Bank Baden-Württemberg, or N-Bank Niedersachsen—operate in close coordination with federal and state ministries to support geothermal investment. These programs typically provide preferential financing for drilling and surface-plant construction, combined with repayment grants that partially offset exploration or infrastructure costs, thereby reducing project risk and the overall cost of capital.

3.1.3 Commercial senior debt

Commercial bank loans offer a standard source of debt for the later stages of plant construction since they usually require physical backing for the loan in case of credit default and are unwilling to bear the exploration risks. However, instruments such as public exploration risk insurance or guarantee schemes can serve as financial bridges, transferring part of the geological risk from developers to public institutions and thus unlocking commercial lending for better conditions.

3.1.4 Mezzanine Financing

Another standard capital source for geothermal projects is mezzanine capital. Mezzanine financing instruments bridge the gap between equity and conventional debt. They are often used to raise capital flexibly without changing the equity structure and offer both parties various combinations of risk, return, and leverage. Mezzanine capital is therefore highly suitable for risky projects like geothermal energy projects, where traditional debt capital is not sufficient.

These traditional financing solutions in conjunction with the associated risk profile lead to an unattractiveness for private capital to invest in the early and capital-intensive project stages. To facilitate private financing and enable large-scale market growth, new risk mitigation mechanisms have recently been introduced, and the regulatory framework is currently undergoing reform – both aiming to create a more predictable and investment-friendly environment for deep geothermal development by lowering the average cost of capital.

3.2 Challenges in Financing and Risk Management Solutions

As previously described, the distinct project nature of deep geothermal energy projects leads to challenges in financing in early and capital-intensive project phases. Financing structures must therefore overcome three challenges: Huge upfront capital, with most cost incurred before any revenues; Resource uncertainty - if an exploration well fails, the equity invested is largely sunk; Long lead time, delaying returns. To reduce the financial risks associated with the planning and exploration phases of deep geothermal projects, different public and semi-public/private solutions have emerged in recent years in Germany and across Europe. These measures significantly decrease the risk associated with deep geothermal projects and offer more risk-averse investors the opportunity to participate in projects with improved risk-adjusted returns.

3.2.1 Cost of Capital and Risk Reduction Instruments in Germany

Planning Phase: During the planning phase, grants for carrying out a feasibility study can be awarded to up to 50 % of the study costs, reducing the financial burden on project developers in the early stages of planning with high uncertainties regarding the possibility of project execution.

Exploration Phase: According to Munich Re, out of 45 geothermal energy projects in Germany built from 1999 to 2024, merely 11 % of projects suffered a total loss due to unsuccessful drilling. 16 % were therefore partially productive by implementing stimulation measures while the majority of 73 % were found to be successful directly after initial drilling. As part of Munich Re's efforts to reduce the risks and enable financing more projects, also in undeveloped areas, the reinsurer and the German Development Bank KfW in cooperation with the German Federal Ministry for Economic Affairs and Energy have developed an exploration-risk insurance scheme for municipal and regional project sponsors. The insurance is set to debut in fall 2025 but has not been reported in use at time of submission for this paper. The key principle is the following: If a discovery is made, the project continues as planned, and the insurance premium is kept by the insurer. If no discovery is made, Munich Re pays out the full sum insured, and the project is terminated. For cases of partial discovery, individual contracts are necessary and possible stimulation methods, including heat pumps or a conversion to deep geothermal probe might have to be carried out.

Moreover, there have been first cases of regional development banks offering subsidized loans for test drillings, also in combination with conditionally repayable grants as a risk-mitigation measure. These grants are reimbursed to the development bank if the project proves successful; however, in the case of failure, repayment obligations are waived (Ministry of Economic Affairs, Industry, Climate Action and Energy of the State of North Rhine-Westphalia, 2024). By responding to the needs of the energy industry, such measures facilitate the financing of subsequent project phases by sharing exploration risk with the federal state, which in turn leads to a reduction in the overall cost of capital.

Surface Construction and Use Phase: For surface installations and heat-distribution infrastructure, public grants are available under the Federal Funding for Efficient Heating Networks (BEW). Up to 40 % of eligible investment costs for necessary parts for renewable heat distribution can be granted. It is administered by the Federal Office for Economic Affairs and Export Control (BAFA) and funded by the Federal Ministry for Economic Affairs and Energy (BMWE).

3.2.2 Best Practices from European Partners:

In France, the exploration risk mitigation framework for deep geothermal energy combines long-established and evolving instruments to support developers through financial risk reduction and investment incentives. The Fonds SAF guarantee system, historically providing geological risk coverage of up to 90% for drilling failure, is still active but undergoing reshaping and expansion to align better with France's ambitious geothermal development goals (French Association of Geothermal Energy Professionals, 2025). ADEME, the French environment and energy agency, is modernizing the SAF fund with regional geological risk segmentation, aiming to provide more targeted and increased coverage, especially in emerging geothermal zones . Alongside this, ADEME’s Renewable Heat Fund (Fonds Chaleur Renouvelable) operates as a complementary, long-standing support mechanism for renewable heat generation. This fund provides investment grants that partially cover the capital costs of renewable heat projects, including geothermal installations for district heating and industrial use to reduce upfront investment costs (Schmidlé-Bloch, et al., 2022). This combined approach reflects a balance of risk-sharing (via the SAF guarantees) and direct financial aid (via ADEME grants) designed to encourage investment while maintaining robust risk management.

Switzerland has run a geothermal guarantee scheme since 2008, reimbursing up to 50% of subsurface development costs in case of resource failure. This scheme was overhauled to cover 60% of costs and now includes prospecting expenses, running until 2030 with possible extension to 2035. Since 2018, exploration subsidies cover up to 60% of prospection and drilling costs for power and heat projects, funded by network surcharges and fossil fuel levies, with annual caps of CHF 50 million and CHF 30 million respectively. Feed-in tariffs for geothermal power ended in 2022, replaced by up to 60% investment subsidies for surface installations, available until 2030 and potentially extended. These measures align with Switzerland’s Energy Strategy 2050 to reduce consumption, improve efficiency, and boost renewables (Link & Minnig, 2022).

Unlike France and Switzerland, Germany does not yet operate a dedicated national geothermal risk fund, but recent policy developments suggest that such mechanisms are under consideration within the responsible ministries.

The analysis of geothermal financing structures firmly establishes that successful deep geothermal project development is contingent upon the active assumption and moderation of subsurface risk by the public sector. The available risk mitigation systems allow private investors to provide capital at earlier stages of the project and enable them to participate earlier in the project lifecycle, thereby accelerating market growth.

Instruments such as the forthcoming Munich Re/KfW exploration insurance, conditionally repayable grants offered by regional development banks, and the long-term investment incentives provided by BAFA (BEW funding) are crucial for de-risking the high-CAPEX, early-stage project phases. By transferring a significant portion of the primary resource risk away from private investors, these mechanisms effectively lower the overall cost of capital for projects.

These financial instruments, however, are merely the products of political strategy and legislation. The subsequent chapter examines the statutory and strategic pillars that underpin them, investigating the regulatory status quo and giving an outlook on what to expect in the European and German deep geothermal energy policy.

4 REGULATORY FRAMEWORK FOR GEOTHERMAL ENERGY IN GERMANY AND EUROPE - STATUS QUO AND OUTLOOK

Deep geothermal projects in Germany remain subject to a dense body of sector-specific statutes and permitting requirements. At the Federal level, exploration and exploitation rights for subsurface resources are governed primarily by the Federal Mining Act (Bundesberggesetz), while project activities typically also require approvals under the Water Resources Act (Wasserhaushaltsgesetz. In practice, state mining authorities allocate exclusive exploration areas ("Erlaubnisfelder") which grant the holder the right to search for geothermal resources in a delimited underground field; in Lower Saxony, for example, the State Office for Mining, Energy, and Geology (LBEG) publishes and administers such exploration areas and related licenses. These multi-layered rules reflect the technical and environmental complexity of drilling and subsurface operations and explain why permitting has historically been slow and risk intensive.

Since 2022, the federal government has signaled a clear political priority to scale up deep geothermal deployment. The BMWK's geothermal initiative sets an ambition of at least 100 additional geothermal projects by 2030, explicitly tying geothermal expansion to the heat transition and the goal of reducing fossil fuel imports. The initiative is backed by targeted R&D and funding calls and by inter-ministerial projects to improve site mapping and de-risking (Federal Ministry for Economic Affairs and Energy, 2022).

Building on that political agenda, the federal government approved the draft Geothermal Acceleration Act (Geothermie-Beschleunigungsgesetz, (Federal Ministry for Economic Affairs and Energy, 2025)) in 2025. The Cabinet's decision marks a key step toward modernizing and streamlining the legal framework for deep geothermal development. The draft aims to amend the Federal Mining Act (Bundesberggesetz) and related legislation in order to accelerate permitting procedures, grant geothermal projects the status of "overriding public interest", and harmonize approval processes across mining, water, and environmental law. In addition, it introduces provisions for digitalized application procedures, clear deadlines for authority decisions, and enhanced financial security requirements for potential mining-related damages. Once enacted, these reforms are expected to significantly reduce administrative lead times and improve regulatory predictability for investors.

In addition to these mining and permitting reforms, the operation of geothermal plants that produce electricity is supported under the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz- EEG 2023). Electricity generated from geothermal sources benefits from a fixed feed-in tariff for newly commissioned plants (§ 45 EEG). This tariff is subject to a small annual degression of 0.5 %, which may increase to 2 % once the total installed geothermal capacity exceeds 120 MW. The EEG framework ensures that electricity from geothermal plants can be sold into the grid at guaranteed conditions, providing a stable and predictable revenue stream and thereby reducing market risks for participants in such a project.

At the EU level, the Commission and industry stakeholders have signaled an intention to provide a coordinated framework for geothermal scaling. The European Geothermal Energy Council and other actors expect a formal EU Geothermal Action Plan in Q1 2026 (European Commission, 2025) that will likely address permitting bottlenecks, cross-border mapping and funding/de-risking instruments (e.g., guarantee facilities, blended finance), and recommendations for Member State implementation (Council of the EU, 2024). Complementary to this, EU state-aid rules and the Commission's guidelines on energy and environmental aid will remain a binding constraint: national support schemes (grants, guarantees, conditionally repayable instruments) must be designed to comply with state-aid frameworks or seek Commission approval where necessary. However, EU state-aid regulation adds a structural layer of complexity to the design of national geothermal support schemes. Within the European Union, all forms of public financial support are subject to strict state-aid control intended to prevent governments from distorting competition in the internal market. As a result, any public subsidy, guarantee, or fiscal incentive must either comply with the Guidelines on State Aid for Climate, Environmental Protection and Energy (CEEAG) or receive prior approval from the European Commission.

For developers of innovative energy technologies such as deep geothermal energy, this can pose a significant challenge. The authorization processes are often lengthy and complex, creating uncertainty that may delay or discourage investment. Moreover, the existing framework tends to classify geothermal energy alongside more mature renewables such as wind and solar, without sufficiently accounting for its distinct financial and geological risk profile. This lack of differentiation makes it difficult to design and approve targeted risk-mitigation instruments – for instance, public guarantees or exploration-risk coverage – precisely where they are most needed. A potential remedy could lie in adapting the CEEAG guidelines to explicitly recognize high-risk technologies such as deep geothermal energy. Doing so would enable faster and more tailored approval of de-risking measures, strengthen innovation capacity, and accelerate the sustainable transformation of Europe's heating sector.

The evolving EU-level state-aid landscape (including new clean-industry frameworks) means Member States will have widened but still tightly governed options for supporting geothermal de-risking.

The existence of other EU member state acceleration programs emphasizes the growing interest of politics in deep geothermal energy, both for decarbonizing the heating sector and decouple from foreign energy resources (Cariaga, 2025).

5 CONCLUSION

Europe is emerging as an increasingly attractive environment for deep geothermal investment. National initiatives such as Germany's forthcoming KfW and Munich Re risk-mitigation program, along with the established French SAF and Swiss guarantee schemes, have already strengthened project bankability and reduced exploration risk. To build on this momentum, the industry proposes four EU-wide measures: the creation of a pan-European framework to hedge exploration risk, the harmonization of ownership and access rights to geothermal resources, the streamlining of authorization and permitting procedures across Member States, and the integration of deep geothermal applications into the CISAF framework beyond purely industrial uses. Together, these steps would enhance legal certainty, financing stability, and market transparency, making Germany and Europe increasingly competitive and secure locations for large-scale geothermal investment.

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