The French geothermal district heating industry is well established and experienced as many of the 74 existing installations have been installed in the 80s. Developments were anew for the past 15 years, benefiting from the new ADEME Heat Fund. They supply heating and sanitary hot water to around 300 000 households. In the Paris area, it is 200,000 households that are supplied by geothermal heat, which amounts to more than 240 000 tonnes of CO2 avoided annually.

Despite this installed capacity in GeoDH, France has been slowly caught up by other European countries, and on current trends, it likely to be passed by Germany in the role of first EU country in terms of installed geothermal district heating capacity.

In terms of shallow geothermal systems, the French market is on a negative trend as a result of a shift in the support framework. In general, the market for heating systems in France remains dominated by fossil fuels, in particular fossil gas or oil boilers. The structure of incentives tends to also disproportionally benefit air-based heat-pumps.

For deep geothermal, the French market is notably carried by the large French energy groups and their subsidiaries, but several smaller companies and SMEs are also key in geothermal development. In addition, the role of specific financial institutions, most notably the “Caisse des Dépôts et Consignations”, should be underlined as it has been instrumental in allowing some recent developments in innovative technologies.

### Geothermal Market Conditions

<table>
<thead>
<tr>
<th>Deep Geothermal for Heating &amp; Cooling capacity (GeoDH)</th>
<th>Number of GeoDH systems installed</th>
<th>Geothermal electricity capacity</th>
<th>Number of Geothermal power plants</th>
<th>Number of individual shallow geothermal systems (&lt;50kW)</th>
<th>Sales of individual shallow geothermal systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>586 MWh</td>
<td>74</td>
<td>17 MWe</td>
<td>2</td>
<td>200 000</td>
<td>2 500</td>
</tr>
</tbody>
</table>

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RESOURCES

The identified geothermal resources for France are well distributed across the territory which raises the prospect of a large contribution of geothermal energy to France’s decarbonisation effort. A particularly important contribution can be provided in the Paris area for heating and cooling, in Alsace or overseas territory for electricity. Shallow systems can be installed all across the country, for heating and cooling.

More resources are likely to be identified and developed, but greater exploration efforts should be made.
POLICIES AND REGULATIONS

Legislative framework

The Energy transition for green growth Act, provides the main legal framework of France renewable energy policy, setting objective of 23% RES by 2020 and 32% by 2030. In 2030 renewable energy sources should account for 40% of total electricity generation and 38% of final heat consumption.

The Multiannual Energy Planning (Programmation Pluriannuelle de l’Energie or PPE), to be adopted by the end of 2019, sets out specific targets for geothermal development:

• for electricity production, it indicates an increase from the 8 MW of installed capacity in 2018 to 24 MW in 2023
• for heating consumption (district heating+geothermal HP), a projection of 7.5TWh for 2023 is planned.

SAF Environnement Fund is a guarantee fund for geothermal district heating covers geological risk and protects operators against the risk faced during the exploration and exploitation phases of geothermal projects.

Support schemes

France has put several instruments in place to forward geothermal energy utilisation for electricity as well as for heating and R&D.

Electricity

Geothermal mostly benefits from the new feed-in premiums regime introduced in 2016, consisting of a premium paid to the producers of RES electricity to top up the revenues they receive from the sale of their electricity directly on the market. However, this operational support to geothermal electricity production (246€/MW) is not secured for the coming years.

Heating and cooling

Geothermal heating and cooling is mostly financed by the Heat Fund through regional aids or specific call for projects, while the SAF environment fund insures investors against the geological risks related to high-investments projects. Additional measures to support heating and cooling (notably for shallow systems) include Energy transition tax credit, 0% interest loans, Energy saving certificate scheme, 5,5% VAT for renewable district heating.

Innovation

Regarding Innovation and R&D, the Investments for the Future programme is the main financial instrument for the geothermal sector, increasing the potential of exploitable geothermal resources for heat and electricity.

Key public institutions

• Ministry for Ecology, setting the legislative framework;
• French Energy Agency (ADEME), financing renewable energy projects, notably on heating and cooling;
• National Agency for Research, funding RD&I projects;
• Prefectures, setting the day to day regulatory framework of project development;
• Commission for Energy Regulation (for electricity and gas);
• Caisse des Dépôts et Consignations, France’s Public Development Bank
• National Investment Bank (BPI), focusing on SMEs investments ;
• National Geothermal Association, French geothermal association of professionals (AFPG), Syndicate of renewable energy (SER)
PERSPECTIVE TO 2030, AND POTENTIAL DEVELOPMENTS

<table>
<thead>
<tr>
<th>Ongoing projects in 2018, to come online before 2030 as project development lasts 5-7 years</th>
<th>Ongoing projects</th>
<th>Capacity addition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Geothermal for heating and cooling</td>
<td>16</td>
<td>160 MWth</td>
</tr>
<tr>
<td>Geothermal for Electricity</td>
<td>12</td>
<td>72 MWe</td>
</tr>
</tbody>
</table>

Geothermal district heating capacity grew by 7% annually in France for the past decade. Future objectives should factor in this rapid growth rate and consider the current market trend to set a trajectory that accelerates the geothermal market development. The French geological risk insurance scheme is a key tool for the development of geothermal industry.

Ambitious objectives must be laid out in the French NECPs. Building on experience from the past decade, the regulatory and financing framework should be stable and provide for a level of support that allows the delivery of geothermal capacity.

French geothermal resources can be developed to meet a significant part of France’s heating and cooling needs by 2030, in particular in the Paris Basin, but also in other metropolitan area and to provide renewable heat in smaller cities and rural areas.

Geothermal energy in 2030 can also start to play a significant role in the electricity sector as well – notably at the regional level, for instance in Overseas Departments and in mainland France (Alsace, Aquitaine, Rhône valley...) if the feed-in-Premiums remains.

**Baseline** (ongoing projects, commissioned by 2025) | **Market slow down** | **Current trend** | **Moderate market acceleration**
---|---|---|---
Heating & Cooling | +160MWth | +662MWth | +896MWth | +1440MWth
Electricity | +72MWe | +87MWe | +100MWe | +120MWe
Shallow geothermal | +33000 units | +52000 units | +91000 units | +150000 units

**KEY RECOMMENDATIONS**

- France must remain and improve its positions as a European leader on deep geothermal, with a robust sector able to implement ambitious policy objectives

- Geothermal in France has been scaling up rapidly, objectives to 2030 must reflect this dynamism and be ambitious despite not being on track to meeting 2020 renewable energy targets and the sectorial objectives laid out in the NREAPs, including for shallow and deep geothermal.

- The right framework must be put in place to allow for the French geothermal industry to scale up and allow France to meet its renewable targets. This means:
  - Maintain the Guarantee Fund for project developers (i.e. geological risk mitigation);
  - Creation of a new scheme devoted to EGS projects (GEODEEP SAS)
  - Planning and identification of resources at the National, Regional and Local levels
  - Stability of support frameworks
    - Shallow geothermal: incentives aligned with the technology’s benefits compared to other technologies (i.e. higher investment, lower operating costs); implementation of a network of geothermal regional coordinators (AFPG, BRGM))
    - Deep geothermal: stable incentives in line with the degree of technology maturity.