Spain is a southern European country, therefore defined by a heating and cooling sector where cooling is more important than in most other European markets. For this reason, shallow geothermal systems, which are a proven solution for renewable heating and cooling needs, are quite relevant for the Spanish market. However, Spain also has significant deep geothermal resources, for heating and to some extent for electricity, allowing for deployment of these technologies in the coming decade.

Estimates for the size of the shallow geothermal market in Spain are likely below the reality of the sector, but the trend does at any rate appear to be going toward an acceleration of developments. Moreover, Spain also has several large-scale geothermal cooling systems, for large buildings or district cooling, with several others as ongoing projects. These projects are typically undertaken by private developers/

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>N.A</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>1500</td>
<td>120</td>
</tr>
</tbody>
</table>

Policies and Regulations

Legislative framework

The National Renewable Energy Action Plan 2011-2020 (NREAP) and the Renewable Energy Plan 2011 – 2020 (REP) form the basis of Spain renewable energy policies to 2020 to achieve 20.8% of share of energy generated from renewable sources in gross final energy consumption.

The PER has a specific focus on geothermal, estimating a gross potential of 3,000 MWe to be harnessed through conventional or enhanced geothermal systems for the generation of electricity. And a target of at least 50 MWe generated in 2020.

In addition, the plan estimates that geothermal energy potential for thermal uses could exceed 50,000 MWe, with production mostly driven by the use of heat pumps.

Support schemes

Spain has currently no specific support schemes for geothermal electricity or geothermal heat.

Key public institutions

- Ministerio de Economía y Empresa – Ministry of Economics and Business
- Ministerio para la Transición Ecológica (MITECO) – Ministry for the Ecological Transition
- Instituto para la Diversificación y Ahorro de la Energía (IDAE) – Energy Agency
Spain's deep geothermal resources are identified only to some extent, and more exploration is likely needed to more clearly identify the country’s geothermal potential. For geothermal electricity, although there are likely some prospects for EGS in mainland Spain, the Canaries Islands are likely home to the largest resource for a rapid deployment with well documented high temperature resources. For deep geothermal heating and cooling, more exploration is required, but some resources are already well identified, notably in the North of the country where the climate is more temperate, and heating needs greater.
PERSPECTIVE TO 2030, AND POTENTIAL DEVELOPMENTS

Geothermal energy is a major prospect for the Spanish heating and cooling sector, notably as shallow geothermal is a proven solution to provide renewable cooling at scale. Moreover, Spanish cities tend to be densely populated which can be an opportunity to deploy large scale heating and cooling solutions such as deep geothermal projects. However, this would require long term planning, involving the private sector and public authorities to ensure the availability of the heating and cooling infrastructure.

More generally, Spain has a significant potential to deploy geothermal energy both for electricity and heating and cooling. In the former case, the Canaries islands have a large potential to develop geothermal electricity for the energy independence of the islands. Deep geothermal heating and cooling has a large potential in many areas of the country. Shallow geothermal can be developed in most places of Spain.

<table>
<thead>
<tr>
<th></th>
<th>Baseline (ongoing projects, commissioned by 2025)</th>
<th>Market slow down</th>
<th>Current trend</th>
<th>Moderate market acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating &amp; Cooling</td>
<td>+5MWth</td>
<td>+10MWth</td>
<td>+50MWth</td>
<td>+100MWth</td>
</tr>
<tr>
<td>Electricity</td>
<td>+5MWe</td>
<td>+10MWe</td>
<td>+50MWe</td>
<td>+150MWe</td>
</tr>
<tr>
<td>Shallow geothermal</td>
<td>+1500units</td>
<td>+1200 units</td>
<td>+10000 units</td>
<td>+30000 units</td>
</tr>
</tbody>
</table>

KEY RECOMMENDATIONS

▷ Set ambitious objectives-based resources not historical trends;

▷ Set the regulatory and policy framework fit to attain these objectives, based on best practices that have proven able to deliver at the European level;

▷ Establish a long-term local planning of heating and cooling investments according to local resources.

▷ Continue and set financial support tools to increase geothermal development for heating and cooling and CHP, notably with a robust framework for geothermal risk mitigation scheme for attracting private investors and developers.

▷ Introduce measures that encourage users/consumers to use geothermal heat and electricity, reflecting the lower emissions in the market price (e.g. reduction of VAT for geothermal district heat...)

▷ For shallow geothermal, the policy, financial and regulatory framework should be not be a barrier to market uptake considering the technology’s benefits compared to other technologies (i.e. higher investment, lower operating costs, reduction of winter peaks in electricity consumption...)

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