Poland has a robust historical energy sector, mainly built around the coal, oil and gas industries, but the geothermal sector is now emerging, propelled by concerns about air quality and energy independence for the heating and cooling sector. Installed projects have mostly been built prior to the past decade. Existing projects are either located in the center or in the South of the country.

Besides, Poland is rapidly accelerating its deployment of shallow geothermal systems, the number of units installed having grown by 15% between 2015 and 2016 for instance.

Currently, the Polish geothermal sector is mostly propelled by the Municipalities which tend to be operators of the existing geothermal systems. In addition, most of the current development for energy uses (H&C, combined heat and power in some cases) is directly supported by the National government.

### POLICIES AND REGULATIONS

#### Legislative framework

According to the EU Renewable Energy Directive (2009) and the subsequent Polish Energy Policy to 2030, the share of all RES, including geothermal, in the country’s final gross energy consumption (electricity, heat and cold) shall reach 15% by 2020. Nevertheless, today Poland is still deriving most of its energy needs from the exploitation of coal (resources of which the country is abundantly endowed), oil & gas, the share of renewables being only 11% in 2017.

The Renewable Energy Act of 2016 provides the main policy framework to support the development of renewable energies in line with the strategic target. In particular, a new amendment to the act approved in June 2018 introduced significant changes in the supporting mechanisms for all RES technologies while removing significant roadblocks for investments in the sector and obliging the Energy Regulatory Office (URE) of Poland to organise and run auction rounds to bring new renewable power capacity into the system. The second basket of the new auction system is specifically targeted to hydro-energy, geothermal and offshore wind farm installations.

In 2018, a new Polish Policy to 2040 was introduced. It assumes a share of RES, including geothermal, of 21% of the country’s gross energy consumption in 2030.
Support schemes

Electricity

Electricity production in Poland is supported through two main supporting schemes: green-certificates, applicable to RES installation commissioned before 2016 (up to 15 years), and an auction system (tendering) for new installations.

Under the auction system, Geothermal power installations (included in the second basket) are eligible for Contracts for Difference auctions for large-scale generation (installed capacity of 500 kW or more). Winners of an auction are obliged to sell electricity on the power exchange (though secondary trading is allowed upon authorisation from the authority). No geothermal electricity project is however operating in the country (although development are ongoing and should be coming online around 2020, with projects of capacity around 1MWe).

Additional supporting measures include Tax incentives on the sale and consumption of electricity as well as low interest loans and subsidies to support the purchase and installation of RES installations provided by the National Fund for Environmental Protection and Water Management (NFOŚiGW).

Heating and cooling

The National Fund for Environmental Protection and Water Management (NFOŚiGW) includes several measures to support the development of a low-emissions economy, including programmes supporting the development of renewable and efficient energy sources (including district heating) or decreasing the impact of the industrial sector on the environment. In particular, the Fund provides preferential loans and equity for the purchase and installation of geothermal energy sources with a capacity between 5 MWt to 20 MWt (Stork).

In addition, geothermal technologies are eligible for the thermal rehabilitation grant scheme awarded by the state development bank (Bank Gospodarstwa Krajowego), which supports building renovations which increase energy efficiency or the use of renewable energy sources for heating purposes.

The National Fund for Environmental Protection and Water Management is also in charge of the PolSEFF2, a €200 million credit line made available to participating banks by the EBRD to offer loans to SMEs for financing energy efficiency investments.

In 2016 a state programme under the ministry of environment was launched to support the development of geothermal wells and other geothermal heating infrastructure through grants for capital investments (up to 100%). It has resulted in a takeoff of geothermal heating investments with 10 wells in development in 2018.

Innovation

Funding for Geothermal R&D is mainly covered under the Polish Regional Operational Programmes (particularly in the region of northwestern Poland) and the National Operational Programme Infrastructure and Environment under the priority axis I (low carbon emission) and II (environmental protection).

Key public institutions

- The Ministry of Environment – in charge of policy for environment and geothermal resources, including initiative and funding (see NFOŚiGW).
- The Ministry of Energy - is responsible for the development and implementation of the national energy policy, including the development and use of renewable energy sources;
- Polish National Fund for Environmental Protection and Water Management (NFOŚiGW) – is in charge of financing environmental protection, notably by achieving emission reduction, including with geothermal energy;
- The Energy Regulatory Office (URE) - regulates the activities of participants in the natural gas, electricity and heating markets;
- State development bank (Bank Gospodarstwa Krajowego).
- The National Centre for Research and Development – is the agency in charge, among other things, of funding programmes for R&D in the energy and renewable energy sector.
The geothermal resources of Poland are little developed thus far. However, the country’s geothermal potential is well recognised. Some reservoirs are well identified, notably in the Polish Lowland at the center of the country. The South of the country (inner Carpathian area) benefits from good resources, which are already developed or being developed for heating and recreational uses. Other prospective resources are being explored in the Sudetes regions, outer Carpathian and Carpathian for deep geothermal.

Altogether, Poland’s potential in the short to medium term is in priority destined for heating and cooling applications, although resources allow for localised geothermal electricity developments.
PERSPECTIVE TO 2030, AND POTENTIAL DEVELOPMENTS

<table>
<thead>
<tr>
<th>Ongoing projects in 2017, 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>15</td>
<td>215 MWe</td>
</tr>
<tr>
<td>Geothermal for Electricity</td>
<td>1</td>
<td>1-8 MWe</td>
</tr>
</tbody>
</table>

The Polish deep geothermal sector has known a fairly moderate development in the past decade, which should serve as a guide for what is to come. 15 projects are ongoing in Poland for geothermal district heating, and several of them could be commissioned even before 2020. Any planning of the Polish geothermal sector to 2030 should therefore build on the ongoing developments and not on previous trends. With 215 MWeh of ongoing projects, by 2030 the Polish geothermal sector can deliver two to three times more capacity addition, between 400 and 1000 MWth.

In addition, Poland is likely to become a geothermal power producing country in the coming years, although to a moderate extend. Finally, considering current trend, and the emphasis on reducing air emissions from the heating and cooling sector, the deployment of shallow geothermal systems should continue at the current pace or event to accelerate between now and 2030. Poland will however have to set the right regulatory, policy and financial framework to allow for the right pace of deployment. Considering the emerging nature of the sector, many challenges lie ahead and the country should build on current best practices across Europe. It can however build on an experienced energy industry.

<table>
<thead>
<tr>
<th>Capacity addition (2017-2030)</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>Deep Geothermal H&amp;C</td>
<td>+215 MWeh</td>
<td>+220 MWeh</td>
<td>+300 MWeh</td>
<td>+600 MWeh</td>
</tr>
<tr>
<td>Electricity</td>
<td>+5 MWe</td>
<td>-</td>
<td>+20 MWe</td>
<td>+50 MWe</td>
</tr>
<tr>
<td>Shallow geothermal</td>
<td>+39 000 units</td>
<td>+52 000 units</td>
<td>+65 000 units</td>
<td>+910 000 units</td>
</tr>
</tbody>
</table>

KEY RECOMMENDATIONS

- Set ambitious objectives based on ongoing developments 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;
- Pursue an integrated plan on heating and cooling to improve independence by maximizing local resources, and focus on reducing air pollution.
- Continue and set financial support tools to increase geothermal development for heating and cooling and CHP, notably by the establishment of a geothermal risk mitigation scheme.
- Introduce fiscal 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...)

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