

Can Eastern Europe Use New EU Funding and Legislation to Help Europe Achieve Zero Greenhouse Gas Emissions by 2050?

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ABSTRACT

The European Union (EU) is one of the first major regions to propose binding greenhouse-gas (GHG) emission reduction targets. Specifically, the EU aims to cut GHG by at least 55% by 2030 and become the first climate-neutral continent by 2050. To achieve these targets, the EU has set up a series of public funding instruments to support proposed investments in renewables and energy efficiency projects, including but not limited to geothermal projects. A wide range of projects are envisaged, from innovative to more mature, well-established technologies, and from small-scale RD&I to large-scale plants. This article takes a closer look at a representative sample of the post-communist EU members – Lithuania, Poland, Slovakia, Croatia, Slovenia, Hungary and Bulgaria – to assess how well they are equipped to take advantage of these new geothermal-development opportunities from a legislative, administrative and legal point of view. The analysis necessarily applies to Renewable-energy (RE) law, a particular subset of energy law. RE relates primarily to transactional legal and policy issues involved in the development, implementation, and commercialization of such renewable-energy sources as solar, wind, geothermal and tidal.

1. INTRODUCTION: OVERALL VIEW OF EU RENEWABLES USAGE

In the EU, a group of 27 European countries, the Covid pandemic and the war in Ukraine have led to price volatility and supply disruptions of fossil fuels. This prompted the EU to increase its focus on geothermal and other renewable energy systems. The Renewable Energy Directive, introduced in 2009, is the legal framework for the development of clean energy across all sectors of the EU economy, supporting cooperation between EU countries towards this goal. The highest penetration of renewables in 2022 occurred in the power sector, with renewable energy accounting for 40.7% of all electricity generated in the EU. That was followed by the heating and cooling sector, with a Renewable Energy Source (RES) share of 23.2%. The RES share in transport was 9.6% (data from the European Environment Agency EEA, 2023).

Renewable energy accounted for 24.8% of total energy use for heating and cooling in the EU, up from 11.7% in 2004. Developments in the industrial sector, services and households contributed to this growth. Ambient energy captured by heat pumps used in heating and cooling also played a role.

Geothermal energy accounted for 9.6% of the total renewable energy supplied, and investment in heat pump installations increased by 12% in 2020 (data from the International Energy Agency IEA, 2023).

According to the European Environment Agency (EEA), the share of renewable energy sources in EU energy consumption has increased from 12.5% in 2010 to 22.5% in 2022, and is expected to keep growing. Meeting the EU's new target of 42.5% for 2030, however, will demand a much more profound transformation of the entire European energy network.

2. RENEWABLE ENERGY LEGISLATION IN THE EU

EU decision-makers are entitled to legislate on various issues which affect the geothermal energy sector, regardless of how deep beneath the surface the resource's location, or whether the resource is adapted to heating/cooling, electricity or combined heat and power (CHP). The EU has passed specific legislation which aims to increase renewable energy use by, among other efforts, incentivizing the use of geothermal energy technologies. In the EU as elsewhere, environmental-protection measures may restrict a new geothermal project's placement, affect the procedures required and ultimately increase implementation costs.

EU legislation on energy was long based on various provisions scattered throughout the EC Treaty, relating to the EU's authority over its internal market and environment. With the inclusion of a dedicated chapter in the 2009 Lisbon Treaty, energy officially became a subject of shared competence between the EU institutions and the member states. The Treaty on the Functioning of the European Union (TFEU) included energy policy among the shared competences (see article 4(2) of the TFEU)

The energy market regulation as we know it today was developed step by step in the EU's legislative process over the last few decades. The rules for each energy source vary significantly, and are still evolving in response to technological developments and global challenges. In its 2000 Green Paper, the European Commission stated that growing energy demand meant that new supplies and routes must be found and the use of renewable resources increased.

It was recognized at the time that energy security depended on diversifying Europe's energy sources. To that end, the 2006 Green Paper highlighted three objectives: sustainability, competitiveness, and security of supply. The Commission identified various priority areas to support these three objectives. These included energy efficiency, energy saving, and the development of new renewable energy sources. In 2016, the European Commission presented "Clean Energy for All Europeans", a package of measures to address the EU's energy policy

The package aimed to meet the EU's 2030 climate and energy policy objectives, by emphasizing 3 main objectives: to prioritize energy efficiency, ensure fair treatment of consumers, and become a global leader in renewable energy. Given the specificities of renewable energy production and electricity consumption, i.e., that much renewable energy production is weather-dependent, not consumed when, and difficult or expensive to store, it is understandable that the EU would also try to reward systems that have flexible capacity.

In 2014, the Council decided that the share of renewable energy in terms of gross final consumption within the EU should reach 27%. Member states are encouraged to contribute to the EU-wide binding target. One difference between the 2020 and the 2030 goals is that the 2020 target (based on the 2009 Renewable Energy Directive) was broken down into binding targets for Member States, whereas the 2030 target is not binding, but only posited as a contribution to the EU target.

The optimum uptake of renewable energy requires a high level of electricity transmission, with an extensive distribution grid structure and good interconnectivity between the EU's national and regional grids. As regards this last point, the 2014 Council Decision provides for a legislative package to help achieve the 15% interconnection target. One of the packages's main features is the Governance Regulation for the Energy Union, which seeks to harmonize member states' diverse planning and reporting bodies by consolidating and standardizing both climate and energy policy reporting into 1-year and 2-year reports. Member States are required to submit Integrated Energy and Climate Plans based on the Table of Contents in the Annex to the Regulation.

Renewable energy legislation varies significantly from country to country and even within regions. Current EU laws and regulations are designed to promote the development, integration, and utilization of renewable energy sources. Key components often include targets for renewable energy deployment, financial incentives, grid access, and environmental standards. It's crucial to note that renewable energy legislation is dynamic and subject to change. Governments occasionally update or revise policies based on technological advancements, economic considerations, and environmental goals.

2.1 How Geothermal Fits into Community Energy (CE) Development in Post-Socialist Europe

Although the EU plays a leading role in financing thousands of ongoing projects of small to medium size, those projects are unevenly distributed over the continent. Most such the CE projects are in northwest and central Europe. Projects like those are much more rare in the formerly communist nations of Eastern Europe. This paper gives an overview of the geothermal CE situation in a representative sample of post-socialist countries (PSECs): Bulgaria, Croatia, Hungary, Poland, Slovakia and Slovenia. Of these, Croatia stands out as a positive example. The other countries are farther behind, although Hungary actually has far superior geothermal resources, given its geographic advantage of being mostly located in the Pannonian Basin, which is blessed with abundant low-enthalpy and medium high enthalpy geothermal reservoirs. One generally valid explanation for this lack of development, true especially for Hungary and for other countries to differing degrees, is the widespread distrust of 'community projects' -- of which there have been few positive examples since the communist-system collapse more than 30 years ago. Compared with the rural communities which could most benefit from CE projects, politically well-connected elites in the PSECs generally have more access to investment capital or the expertise needed to prepare an EU-funded CE proposal. Those groups, however, are often less interested in geothermal CE projects, which do not entail any rapid profit for investors. This is a real problem, as a geothermal project's upfront exploration and drilling costs greatly exceed what a typical small village can scrape together.

2.2. Renewable in the Post-Socialist European Countries

Renewable energy usage conditions are critical for the enactment of ambitious local energy transition in the post-socialist renewable energy policy environment that constrains local initiatives. However outliers can also be observed, e.g., the island of Krk in Croatia, a unique case of a shared vision of 100 % renewable energy. Despite political commitments, RES potential, advanced technologies, and decreasing production costs, ongoing energy transition remains a challenge. The following representative survey of PSECs presented in alphabetical order, looks at the general energy situation and the renewable and/or geothermal CE situation.

2.2.1 Bulgaria

The main local energy source in Bulgaria is lignite coal. Another local energy source is nuclear energy, which significantly contributes to energy independence. Bulgaria has a high solar-energy potential, especially in the south. From a total of 100 MW of solar power installed capacity in 2011, Bulgaria has raised that figure to more than 2,400 MW as of 2023, with 600 MW added in 2022 alone. The Energy from Renewable Sources Act regulates the establishment of citizen energy communities. They are becoming market participants, able to sell any surplus electricity they produce and legally entitled to sign bilateral contracts with suppliers.

There are more than 170 geothermal fields in the Republic of Bulgaria, which represent the main sources of geothermal energy in the country. These are spread all over the country. The temperature of the thermal water varies between 25-100 °C, and about 72 % of thermal water sources have low enthalpy, with water temperature below 50 °C. Geothermal water as a source of geothermal energy is used in local heating systems and greenhouses. This usage represents only 1.8 % of the total thermal water use. Regulatory change is one of the planned steps forward, which will result in better utilization and management of the geothermal resources (Deneva et al, 2022).

2.2.2 Croatia

The Republic of Croatia has suitable natural potential for the exploitation of RES, especially in the northern (Pannonian) part. As part of the Euro-integration process, the whole concept of the energy sector reforms through the legal and institutional framework was accepted, and conforms to EU requirements. Such official national documents such as the National Action Plan, together with the 2013/18/EU Directives, stipulate that the 19.6% gross share of RES will be used for direct heating and cooling consumption by year 2020.

The Croatian part of the Pannonian basin area has long been known as a high potential geothermal area. Deep geothermal energy is covered by the Mining Act if it is used for energy purposes, or by the Water Act. Commissioning of the first geothermal power plant, Velika 1, with a capacity of 10 MW, at the Velika Ciglena site in 2018 triggered new developments in the geothermal sector.

Croatian investors with their partners started to develop Croatia's second geothermal power plant in 2022. The exploration work of Bukothermal indicates a geothermal resource of about 142 °C at a depth of 2.4 kilometers. The proposed project site in the northern Varazdin County in Croatia can support a 16-MW geothermal power plant. A new incentive for additional geothermal exploration has also recently come from Croatia's recovery and resilience plan, which funds the Croatian Hydrocarbons Agency with almost €30 million intended for confirmation of geothermal potential. This includes geophysical surveys and the drilling of two exploration wells for geothermal energy to be used in district heating.

Furthermore, Norway Grant's Energy and Climate Change Programme funds four calls for geothermal developments in Croatia that are currently being implemented. (Note: Norway has been a generous contributor of funds in PSECs, but recently suspended all such activities in Hungary after it decided that the grants it made there were not properly used.) All these funding opportunities triggered increased interest in geothermal exploration from private investors and local communities, resulting in more exploration licenses being issued. Consequently, 14 exploration and 7 exploitation licenses for geothermal waters are now active, promising new developments in the following years. Even though private investors are mostly interested in electricity generation projects, local communities and agricultural entrepreneurs have expressed their interest in geothermal heat production to reduce dependency on fossil fuels and to increase the security of supply. There is also a financial component of the heat projects, where users can save up to 30% on energy bills (Zivković et al, 2022).

2.2.3 Hungary

Hungary published its renewed Energy Strategy and National Energy and Climate Plan (NECP) in 2020. These documents highlight the role of geothermal energy especially in the heating/cooling sector, in agriculture and in making district heating more environmentally friendly. Although the foreseen growth of geothermal in the heating-cooling sector is 58% (84.6 ktoe by 2020, 116.6 ktoe by 2030), this would barely increase the overall share of geothermal within the total RES, which will stay around 5%. The Hungarian NECP foresees 59 MWe installed capacity in geothermal power production, but only after 2040.

To foster geothermal project development, the Ministry of Innovation and Technology announced a Call for bids, promising to support geothermal heating by assuming the geological risks for the first wells. This Call supports only projects with reinjection, i.e., drilling doublets, or drilling only reinjection wells to complete already existing systems. The target depth is 1000-2500 m. The total budget is 6 billion Hungarian forints (approx. €16.6 million). The Call was open until December 31, 2023. The reimbursement rate is 30% in case of success, 40% in case of partial success and 60% in case of unsuccessful projects. Due to institutional reorganizations at the end of 2021, the former program operator (Mining and Geological Survey of Hungary) has been replaced by the Western Balkan Green Center, which caused a temporary suspension of the application and evaluation procedures (Nador et al, 2022).

The Hungarian Ministry of Innovation and Technology National Energy Strategy 2030, looking ahead to 2040, has set very ambitious targets for the expansion of domestic renewable, mainly as regards photovoltaic capacity. The strategy thus seeks to contribute to meeting Hungary's EU commitments, promoting sustainable consumption, and providing financial market players with a stable portfolio. Taking into account the renewable energy currently being installed in Hungary and the 2030, 2040- and 2040- targets for the EU, the EU is in a position to provide a more sustainable energy source. Given the ambition of its targets, and the investment costs of the renewable technology, Hungary will find it a challenge to achieve these goals in the current domestic regulatory and financing environment.

2.2.4 Lithuania

Lithuania depends on energy imports, as domestic production in 2022 covered only one-quarter of total energy supply (TES). Two-thirds of TES comes from oil and natural gas and a quarter from renewable such as wind, biomass and hydro. The Law of the Republic of Lithuania on Renewable Energy (the 2021 consolidated version) defines RECs as non-profit-making legal entities who own and develop renewable energy production facilities and have the right to produce, consume, store and/or sell energy in installations.

Lithuania has rich low-enthalpy geothermal resources. The first geothermal investigations were initiated in the periods of 1987-1989. From 1992 to 1994 the government of Denmark financed the Baltic Geothermal Energy Project, covering Lithuania and Latvia. Based on this and other projects, Klaipėda Geothermal Demonstration Plant was engineered (prospective capacity 49 MW, production of heat 598 TJ/year). The plant aimed to meet about 25% of yearly Klaipėda City heat demands. The main legal basis for geothermal energy growth is the new act "National Energy Independence Strategy of the Republic of Lithuania", approved in 2018. The Baltic Geothermal Energy Project begun in 1992 was finally completed in 2000, when the geothermal plant in Klaipėda started producing heat. Various technical problems occurred, but by 2002 KGDP was producing 189000 MWh of heat. The Klaipėda plant has also had to solve problems related to reaching the market and obtaining a profitable fixed minimum heat fee (Zinevicius, 2022).

2.2.5 Poland

Dependence on domestic coal has locked Poland into the carbon trap. Coal constitutes around 80% of the country's energy production and around 50% of the total primary energy supply. This makes Poland the EU-27 country with the highest emission intensity relative to its energy production Capellán-Pérez (2020). This context translates into very challenging conditions for RES deployment in general and for cooperatives and community initiatives in particular. Nevertheless, there are still some fragile projects to be found. The co-operative Spółdzielnia Nasza Energia in the district of Zamość, initiated in 2014 by a local company and several municipalities, has a democratic one-member-one-vote structure and operates a network of biogas stations. According to the Central Statistical Office (data source: GUS, 2021; 2) in 2020 the RES share in total primary energy acquisition was estimated at 16.3 % (499'338 TJ), then given by Eurostat as 16.1 % 3. The contributions of particular RES were as follows: solid biofuels 71.61 %, wind 10.85 %, liquid biofuels 7.79%, biogas 2.58%, heat pumps 2.38%, solar 1.99 %, municipal wastes 1.15 %, geothermal 0.20 % Kepinska and Hajto (2022).

Poland's geothermal roadmap was published in May 2022. This is a comprehensive approach targeting geothermal in key sectors such as residential buildings and across its vast array of fossil-powered district heating systems. Heat reservoirs with temperatures between 30-90°C can be found across 40-55% of Poland's land mass. The roadmap identified 491 localities with heating plants greater than 1 MW and 78 localities with 5 MW situated within the heat reservoir range. Around 114 geothermal plants have been identified by the plan. The next steps are to construct 78 test holes to construct 78 geothermal installations with a combined capacity of 290 MW and 9,949.6 TJ generated by 2040.

2.2.6 Slovenia

Slovenia generated 68.8% of its electricity with zero carbon or carbon neutral sources in 2019, dominated by nuclear power and hydroelectricity. Indigenous energy sources – in the form of domestic coal, nuclear power, hydropower, and renewables – satisfy slightly more than half of Slovenia's energy needs. For 2030 the target is 27 %, to be reached mainly through solar and hydropower, and through the use of wood biomass Tsagarakis et al (2020).

Geothermal energy is considered to be a natural resource, owned by the Republic of Slovenia. Research and exploitation of SGE are regulated by two basic laws: the Mining Act and the Water Act. The Mining Act regulates the research and exploitation of geothermal energy without ground water, whereas the Water Act applies when thermal water extraction occurs. The Water Act regulates the management of surface and groundwater, which are a natural resource owned by the Republic of Slovenia. If there is a water temperature above 20 C (thermal water), a grant must be obtained by the Ministry of Agriculture and Environment. For boreholes deeper than 300 m, a revised mining project needs to be obtained and treated as a system that is not shallow (Tsagarakis et al, 2020). So far only direct use of geothermal energy is effective in the country with emphasis on exploitation of low temperature resources for district and individual space heating, for greenhouses and thermal spas. During the last 20 years direct use showed only slight and changing increase and more recently has remained stagnant. The reasons depend on the locality. Overexploitation of geothermal resources in some localities of the north-eastern part of the country is one of the problems, but there have also been some occasional technical difficulties, and weak incentives for efficient use of the resources. Total installed capacity and annual energy use (both deep and shallow geothermal) in 2021 are 298.45MWth, respectively. Installed capacity and energy use at all 31 users of thermal water from deep sources amounted to 60.70MWth, Rajver et al, (2022).

2.2.7 Slovakia

Slovakia's is still an economy oriented towards fossil fuels, where RES contribute with roughly 29 % on heat production, whilst geothermal energy yields only a 2 % share. In power production, fossil fuels account for a 21 % share, renewables (including small to large hydro) are over 25 %, and nuclear power has the largest share. The Slovak National Energy and Climate Plan was approved by the Slovak Government in 2019. The planned total share of RES for 2030 is 19,2%, which is lower than the EU 2030 goal of 32%. Share of RES in transport is projected to be 14% by 2030.

Geothermal resources contribute exclusively as direct use in Slovakia. A total of 31 geothermal water bodies have been defined to date, responding to The Water Framework Directive No. 2000/60/EC of the EU Parliament and the European Council. Geothermal resources have already been proven with 282 wells, drilled in 30 out of the 31 geothermal water bodies (GWBs), yielding a proven 436 MWth of reserves Fričovský et al, (2022).

3. RENEWABLE ENERGY SHARE IN EU

In 2022, renewable energy represented 23.0 % of energy consumed in the EU, up from 21.9% in 2021. The share of energy from renewable sources used in transport in the EU reached 9.6 % in 2022, up from 9.1% in 2021 (EUROSTAT, 2023).

Figure 1. shows the renewable energy production by percent of gross final energy consumption in 2004 and in 2022. The former socialist countries were close to each other in terms of renewable energy sources at the start. Initially, the use of renewables was not a priority in any of the countries, thanks to cheap Soviet energy sources, and EU quotas were not initially in place with regard to the energy use of the states. But there were clearly differences due to geography. In terms of renewable energy use, the Baltic states of Latvia, Estonia and Lithuania lead the pack. Serbia and Slovenia approached the EU average. The rest -- Bulgaria, Czechia, Slovakia, Poland, and Hungary - fall below the EU average. For the EU as a whole, the share of renewable electricity increased from 38 % to 39 % between 2021 and 2022, whilst fossil fuels still represented 38 % of the EU's electricity production. In 2021, fossils produced 36% of the EU's electricity EGEC, (2023).

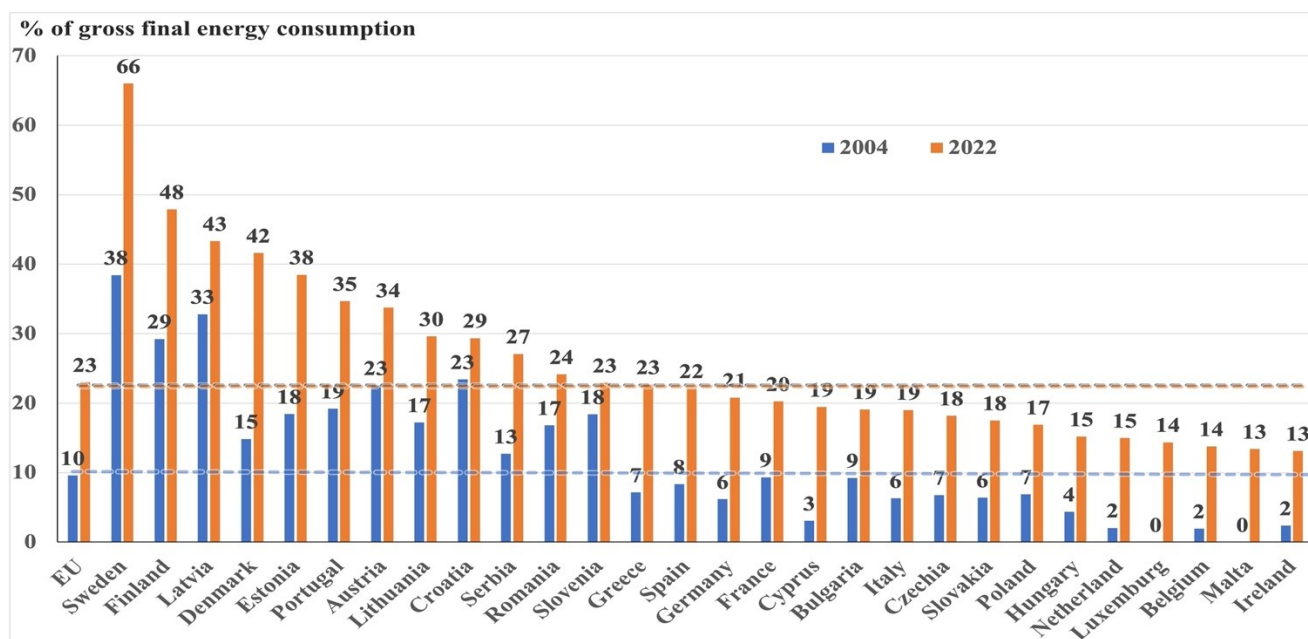


Figure 1: Overall share of energy from renewable sources in the EU (Eurostat, 2022)

3.1. A Brief History of Geothermal in Europe

The geothermal energy situation varies from country to country according to the geological background and the geothermal technology that best suits the available natural resource. Figure 2 shows the geothermal heat-flow in Europe. The spectrum varies, led by power generation derived from high enthalpy resources in Iceland, Italy, Greece and Turkey – and in Italy, where the first geothermal electricity plant started its operation in Larderello, in 1913, and is still operating. It was composed of an alternator Ganz 250 kW, three-phase 50 Hz, and a voltage of 4500 volts coupled with a Tosi Parsons turbine of 350 horsepower.

A handful of geothermal power plants were installed in Europe in the 1970s, in Turkey, Italy, Iceland and French Guadelupe (which is European legally if not geographically). They were all high temperature plants using flash/dry steam turbine technology. The development of new turbine technologies, such as the binary cycle (i.e., Kalina and Organic Rankine Cycle-ORC), was a game changer as it allowed low and medium temperature geothermal power plants to be commissioned. Countries such as Austria, Germany, Portugal, Croatia, and Hungary have installed geothermal power plants over the last 20 years using these technologies. Figure 2 shows the significant difference between the high enthalpy and low enthalpy resources. In 2022, 142 geothermal power plants were in operation with an installed capacity of about 3,5 GWe and generating more than 22 TWh. The average capacity factor last year was 79% Sanner et al, (2022).

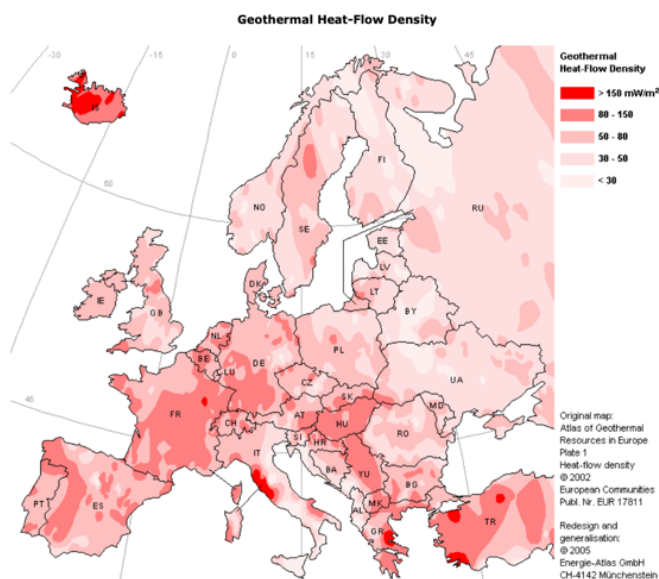


Figure 2: Heat-flow map of Europe

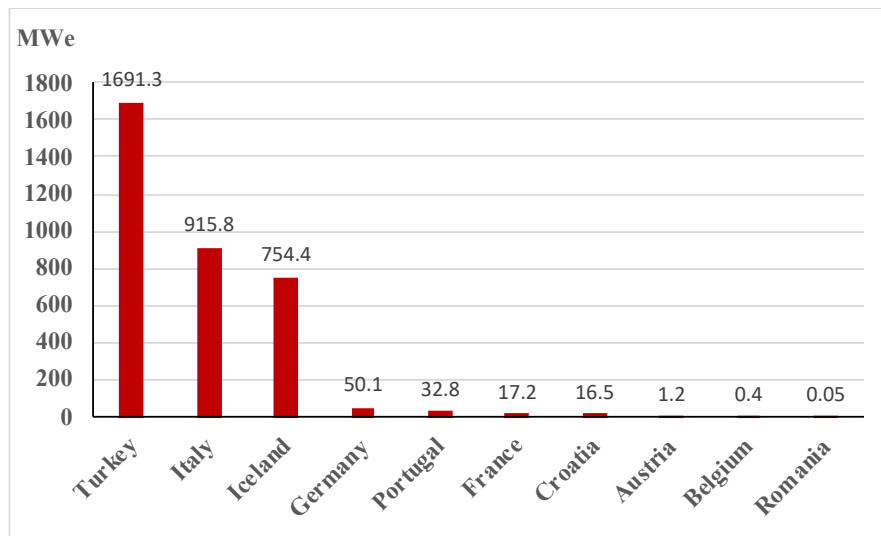


Figure 3: Installed capacity for electricity in 2022 (EGEC, 2023)

For direct use of hydrothermal resources in sedimentary basins such as in France, Germany, Poland, Italy, Hungary, and Romania. Heat supply from geothermal energy in Europe is primarily achieved by using hot water from deep aquifers for district heating. Figure 4. shows geothermal direct uses in the EU countries.

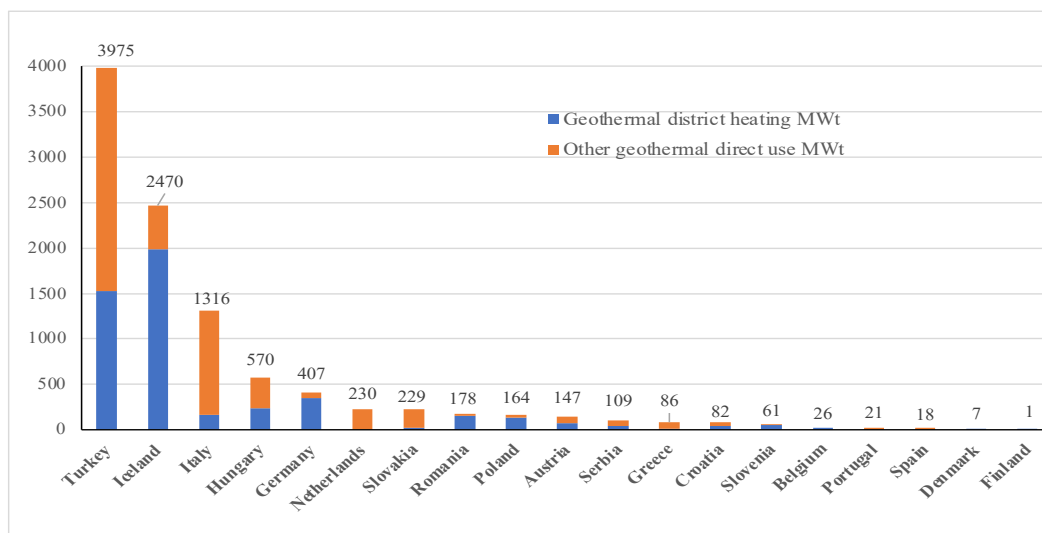


Figure 4: Geothermal direct uses (Sanner et al, 2022)

Geothermal heat pumps represent by far the largest sector of geothermal energy use in Europe in terms of the number of facilities, installed capacity and produced energy. The shallow geothermal share accounts for more than 66% of the installed energy. The total number of geothermal heat pumps installed in Europe is more than 2.1 Mio units. The leader by far is Sweden; Germany, with a population more than eight times larger, comes in second. France is still in the 3rd rank, but due to a relatively low annual number of new installations might lose that rank soon to Finland. Figure 5. shows the numbers of installed heat pumps per country for countries with at least 1000 existing units reported, compared to annual sales. In this regard, the post-socialist European countries lag far behind the European average.

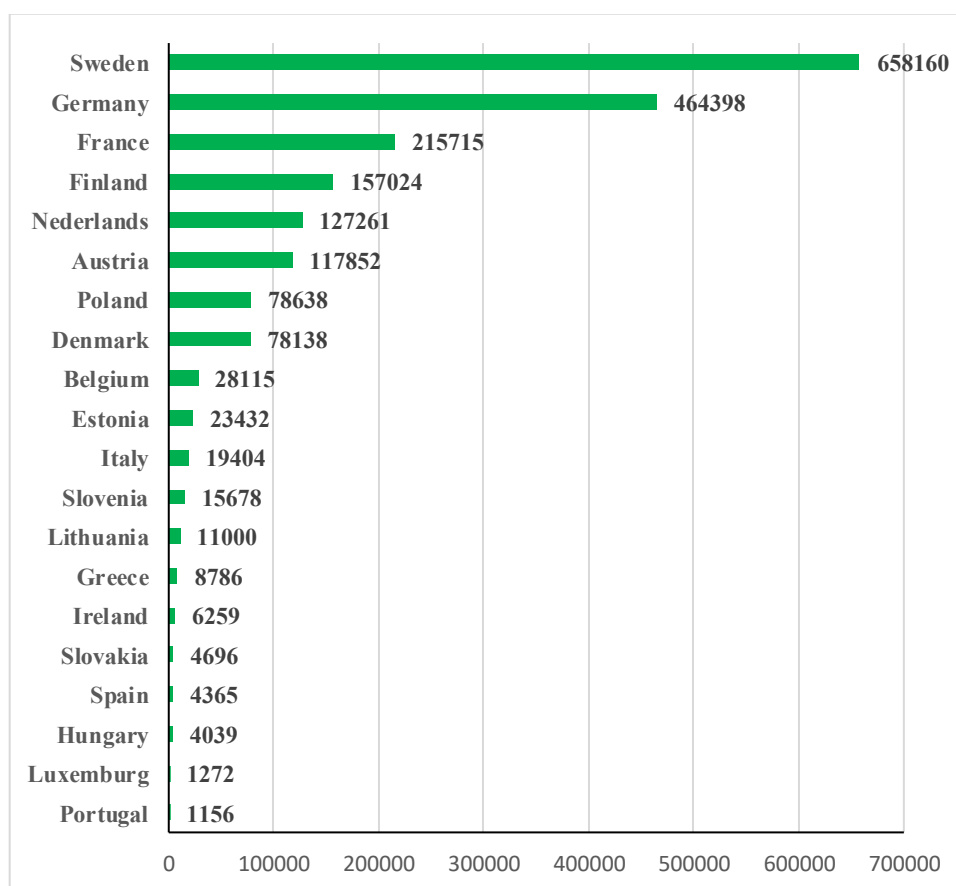


Figure 5: Number of geothermal heat pumps (Sanner et al, 2022 and Zinevicius, 2022)

4. HOW THE EU FUNDS GEOTHERMAL OPPORTUNITIES

The EU supports research and development in geothermal technologies, funding projects for both direct use of heat and the use of extracted heat to generate electricity. EU support also focuses on reducing costs in exploration and drilling, because geothermal installations have high capital costs.

4.1. The European Energy Efficiency Fund (eeef)

In the era of climate change and fossil fuel depletion, renewable energy sources (RES) also offer a key transformative potential from a social point of view due to their modularity and capacity to generate energy at a local level, allowing for the development of local, democratic and participative bottom-up initiatives.

EEEF aims to support the climate goals of the European Union (EU 2030 framework for climate and energy, and the climate-neutral objectives of the European Green Deal) to promote a sustainable energy environment and to foster climate protection by enabling projects in European cities, regions and communities so as to build resilient infrastructure. The final beneficiaries of eeef are municipal, local and regional authorities as well as public and private entities acting on behalf of those authorities such as utilities, public transportation providers, social housing associations, energy service companies etc. Investments can be made in Euros, or local currencies, although the latter is restricted to a certain percentage.

4.2 Horizon

Horizon Europe is the largest transnational program ever, supporting research and innovation, and will be implemented by the EU. The new EU research and innovation program will have a budget of around €95.5 billion for 2021-2027 (current prices). This includes €5.4 billion (current prices) from Next Generation EU to boost Europe's recovery and make the EU more resilient for the future, as well as an additional reinforcement of €4.5 billion (current prices).

As of January 17, 2024, there are 17 ongoing funding and tender opportunities for the Innovative applications/integration of geothermal heating and cooling in industry (HORIZON-CL5-2024-D3-01-06), where the topic is high integration of geothermal heating and/or cooling in different industry sectors, with operation flexibility taking into account start-up time and ramp-up rate, and maximum cascaded use of thermal energy. Activities related to geothermal heat for industry and agriculture, underground thermal energy storage (UTES) including high-temperature storage, innovative and multiple uses for geothermal energy and side-products, balneological systems, and design and operation of geothermal doublets can be considered. Activities are expected to achieve TRL 5 by the end of the project.

4.3 European Climate Infrastructure and Environment Executive Agency (CINEA)

CINEA manages the Horizon Europe work program, which includes Energy Use, Energy Supply, Transport and Mobility and Climate Action areas. In total, it is expected that CINEA just for Horizon Europe will manage a budget of up to €15 billion for Horizon Europe under the 2021-2027 Financial Framework.

4.4 Life

The LIFE program began in 1992 and has co-financed thousands of projects in the field of environmental protection. It is the EU's funding instrument for environment and climate action. The budget of the LIFE Programme increased to €5.4 billion between 2021 and 2027. The LIFE Clean Energy Transition sub-program has a budget of nearly €1 billion over the period of 2021-2027 and aims at facilitating the transition towards an energy-efficient, renewable energy-based, climate-neutral and -resilient economy by funding coordination and support actions (Other Action Grants) across Europe.

4.5 NER 300 program

Renewable energy technologies are the focus of NER 300. It is a funding program pooling together about €2 billion for innovative low-carbon technology, focusing on the demonstration of environmentally safe Carbon Capture and Storage (CCS) and innovative renewable energy technologies on a commercial scale within the EU. The NER 300 program involving all EU Member States, was set up to support the demonstration of a wide range of renewable energy technologies, namely bioenergy, concentrated solar power, photovoltaics, geothermal, wind, ocean, hydropower, and smart grids.

4.6 European structural and investment funds (ESIF)

Over the period 2014-2020 more than half of EU funding was channeled through the 5 European structural and investment funds (ESIF). They were jointly managed by the European Commission and the EU countries. The Cohesion fund (CF) is of particular importance for Eastern European countries, because it funds transport and environment projects in countries where the gross national income (GNI) per inhabitant is less than 90% of the EU average. For the 2021-2027 period, the Cohesion Fund is providing support for 15 Member States: Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia. Over the period of 2021-2027, EU funds allocated to Cohesion Policy will have amounted to €392 billion.

5. CONCLUSION

Clearly, the EU as a whole has the expertise and political will to achieve the ambitious renewable- and geothermal-energy goals it has announced for itself. Even before the war in Ukraine made independence from Russian hydrocarbons an obvious priority, EU leadership had committed itself to a renewable energy as a way to protect against global warming and make each EU member more energy-independent. The problem comes when community-energy projects fail to take root in post-communist countries where the political and administrative disadvantages outweigh the projects' apparent advantages. In these cases, it might be helpful for the EU to 'twin' each project, by making sure there is a more experienced western European manager/advisor to guide the local managers and keep the project on track. Examples of this are the HORIZON-WIDERA 2023 Twinning Green Deal Calls.

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