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Geo-Energy Europe: the European strategy to consolidate the internationalisation of the geothermal industry

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ABSTRACT

The European geothermal industry is quite fragmented because of the many national markets with varying priorities, regulatory frameworks and market maturity and geological context for geothermal energy technologies. While the European geothermal energy market is progressing towards a greater degree of internationalisation and competition across national lines, European companies in the geothermal industry, notably small and medium size enterprises, are not able to build on the depth of the European sector to propose their services beyond Europe.

The objective of GEO ENERGY EUROPE (GEE) is to assist European Small and Medium sized enterprises (SMEs) to win work in third country markets. This objective will be accomplished through international business development and capacity building activities tailored to the strengths of the member companies and the markets which they have an ambition to export to. The main target markets of this GEO ENERGY EUROPE meta cluster are Kenya, Chile, Canada and Ethiopia.

Diversifying the markets of European SMEs is key in order to ensure their financial robustness in the event of adverse economic conditions, in addition to supporting the expansion of employment in a niche scientific and engineering related discipline. While exporting geo-energy related expertise is the core business area of the GEO ENERGY EUROPE SMEs, cross sectoral business opportunities exist which further contribute the capacity for European SMEs to diversify their operations. This is of particular importance in instances where the geo-energy companies main business area is in the field of hydrocarbons which are in the process of being phased out of global energy supplies. The creation of new sustainable services for these companies in particular, which draw on the companies knowledge of the subsurface but applies it in sustainable way, such as the harnessing of geothermal energy, afford the chance of supporting jobs that would be in danger of being obsolete if an alternative market were not identified for their use.

This paper will aim at presenting the GEOENERGY EUROPE internationalisation strategy, the structure of the GEE metacluster, and its objectives and mean to reach it. The paper will notably focus on the achievement of the GEO ENERGY EUROPE structure, and draw some key recommendations to facilitate the internationalisation of SMEs in the geothermal energy sector.

1. INTRODUCTION

In the context of climate change and energy transition, the GEO-ENERGY EUROPE metacluster is a voluntary, open alliance of complementary clusters focusing on sustainability and the transition to a decarbonized and sustainable use of geo-energy. The overarching vision for the GEO-ENERGY-EUROPE metacluster is to develop a stronger and more integrated European sustainable geo-energy sector, especially as far as Small & Medium Enterprises (SMEs) are concerned, with an initial focus on geothermal energy deployment and a two-fold strategy, consisting of helping the European geo-energy SMEs increase their business and export the European know-how and experience outside Europe. Another focus is to contribute to the industrial deployment and market uptake of sustainable & decarbonized geo-energy, starting with deep geothermal, in Europe and across the world.

Based on this overarching objective, an internationalisation strategy is developed to layout a pathway to deliver on the outlined vision. This strategy will be the foundation for an internationalisation roadmap, which will lay out the actions to be taken by the metacluster to facilitate the internationalisation of SMEs. The internationalisation strategy builds on the assessments undertaken by the partners of the GEO-ENERGY EUROPE project regarding the identification of key markets of interest for European geo-energy SMEs, and by mapping and analyzing the metacluster structure.

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2. THE GEOENERGY EUROPE METACLUSTER

The GEO-ENERGY EUROPE metacluster is an open and voluntary alliance of complementary innovation cluster organizations or equivalent business network organizations from across Europe, involved in geoscience, geo-energy and/or geothermal energy, which are committed to working together on a common vision, which consists in **developing a stronger and more integrated European sustainable geo-energy sector**, especially as far as Small & Medium Enterprises (SMEs) are concerned, with an initial focus on geothermal energy deployment and a two-fold strategy, consisting in:

- Contributing to the industrial deployment and market uptake of sustainable & decarbonized geo-energy, starting with deep geothermal, in Europe and across the world;
- Helping the European geo-energy SMEs increase their business and export the European know-how and experience outside Europe.

The GEO-ENERGY EUROPE metacluster is supported within the EU COSME Programme (Competitiveness for Small and Medium Enterprises) supported project, under the "Clusters Go International" call for projects.

GEE is structured as a "metacluster", bringing together well established geothermal industry clusters with their respective strength and dynamics, in a format that allows the flexibility required for internationalisation activities – the crisis linked to COVID over the past year has underlined the relevance of flexibility in such context. This approach is also suited to the target objective of GEO-ENERGY EUROPE and fills a gap in the structuring of the European geothermal industry, where there was no dedicated structure to facilitating the internationalisation of companies from all across Europe.

2.1. Structure of the Geo-Energy Europe Metacluster

The GEO-ENERGY EUROPE metacluster aims to widen the potential of individual clusters through international collaboration, which will provide many benefits including improved access to markets, technology and know-how transfer, and diffusion of R&D and innovation results. This increased competitiveness will not only benefit to the clusters and their members, but also foster economic development in the clusters' host areas and countries.

The GEE metacluster is composed of 8 clusters which represent 600+ members, including 300+ SMEs from 23 European countries, and covers the entire geothermal value chain. Some of these clusters represent national geothermal industry companies, while other have a more European membership.

Table 1: Clusters involved in Geo-Energy Europe

Name of the cluster	Number of members	Country/area	Focus
CAPES	29	Hungary	access to RD&I capacity & state-of-the-art expertise in applied geoscience subjects, including hydrocarbon, geothermal and CCS research
COSVIG – DTE^{2}V	185 (including 42 geothermal companies)	Italy	COSVIG is the managing body of the Tuscany Region's Technology Cluster on Energy and Green Economy DTE^{2}V. The Cluster groups stakeholders involved in energy and green economy and it promotes the technology transfer of innovation in these sectors, in Tuscany: the EU27 leading region for geothermal installed capacity and power production. Geothermal is thus one of the main supply chains addressed by the DTE^{2}V, with 42 companies and about 10 amongst research centers, laboratories and university departments operating in this field.
EGEC	120	Europe	voice of geothermal in Europe, working with its members on policy, market intelligence, and communication, providing a link between the industry and European institutions
GEOENERGY CELLE	57	Germany	Promotes technologies, standards and infrastructures for the efficient development of geothermal resources, new drilling technologies in a drilling simulator, training and education of certified drilling and production personnel, as well as the emergence of new applications and markets, especially in the field of geothermal energy sources in Germany.
GEODEEP	20	France	French cluster specialized in geothermal equipment, engineering and financing of geothermal heat and power generation projects, created in 2015 under the umbrella of the French Geothermal Association of Professionals (AFPG).
GEOPLAT	175	Spain	Sectorial & technical coordination group that gathers all relevant stakeholders in geothermal energy sector in Spain, providing them with an industry driven framework to define R&D priorities and action plans aiming at future growth of the Spanish and European geothermal sectors
GEOSCIENCE IRELAND	39	Ireland	Delivering integrated expertise in water, minerals, environmental and infrastructure development to clients in over 50 countries.
JESDER	30	Turkey	Business network organization gathering operating or investing firms in geothermal power generation in Turkey. JESDER has a long history of, and expertise in, geothermal power plant technology to an otherwise subsurface oriented consortium.
POLE AVENIA	170	France	Gathers members from the upstream oil & gas, deep geothermal, geological storage industry, mining & quarrying, hydrogeology and geotechnics. It has developed and implemented a strategy consisting in promoting technology development for subsurface applications through collaborative RD&I work and business, and promoting technology & skill transfers. This led to creating a framework that has

			facilitated dozens of new RD&I or business partnerships and made its industries more integrated, more organized and more visible, nationally first, and internationally thereafter.

The diversity of the clusters involved in Geo-Energy Europe is a strength for the internationalisation of the metacluster, thanks to the different competencies available directly within each cluster's staff (some having a stronger technical focus, some being more business oriented or specialized on policy issues). However, as all GEE partners and their member companies do not necessarily share the same objectives as to the outcomes of the internationalisation of the metacluster, nor do they have the same know-how to promote the metacluster along different priorities, the members of the Metacluster are welcome to act in the form of cooperation structures, where like-minded partner clusters and their member companies of the metacluster can act on the internationalisation strategy without the necessary involvement of the whole metacluster. Such cooperation provides more flexibility to the members of the metacluster while preserving the value of involvement in the Geo-energy metacluster. Actions resulting from such structure by parts of the metacluster should be brought to the knowledge of the other partners of the metacluster, allowing expression of interest.

2.2. Objectives of the internationalisation of Geo-Energy Europe

The overarching objective of the Geo-Energy Europe metacluster is to facilitate the market uptake of geothermal energy globally, and facilitate developments by enabling synergies between the various segments of the European geothermal industry, represented by their respective clusters, and that of the geothermal industry in targets countries. This typically entails:

- Exporting the European technologies and know-how in sustainable geo-energy: the export and diffusion of innovation and best practices is required to develop a stronger and more integrated European sustainable geo-energy sector, especially for Small & Medium Enterprises (SMEs).
- Increasing business opportunities between European companies and companies in target country: through networking, better information and capacity buildings, the internationalisation of the Geo-energy Europe meta-cluster can induce new geothermal projects internationally and within Europe.
- Towards a stronger and more integrated European geo-energy/geothermal sector: the Geo-Energy Europe partnership aims to be a brand that increases the global awareness to the European know-how on geo-energy. Conversely, the increased awareness of the metacluster for European SMEs, through the preliminary results of the internationalisation, is expected to contribute to an increased interest for export opportunities for European geo-energy SMEs.

2.3. Strategy of Geo-Energy Europe

The key priority axis for actions of the GEO-Energy Europe metacluster to successfully contribute to the internationalisation of European SMEs from the Geo-energy industry are:

- Making the metacluster stronger, via the development of strategic partnerships with other clusters and key actors on geothermal energy
- Make the metacluster visible, through website, social networks, and participation to events
- Develop internationalisation services (targeted at metacluster's SME members) such as market intelligence, trade missions, competency & country checks, etc.

To achieve its objective more effectively and establish the basis for the internationalisation of the European geothermal industry, GEE identified key target markets that can be the focus of action, and worked to establish strategic partnerships with key organisations of the target countries. These include Canada, Chile, Kenya. In a second time, other partnerships could be established with the actors in markets such as Ethiopia, Indonesia and Mexico.

To implement this strategy some relevant instruments of internationalisation were identified, including:

- Business to business meetings, Cluster to cluster meetings: B2B meetings have been identified as a valuable resource in their internationalisation process by the SMEs of the GEO-Energy Europe metacluster when responding to a survey undertaken in the framework of the GEE Market Survey, with nearly 75% of respondents highlighting this type of tool as being of interest.

- Communication tools: These include the GEE website, which lake easily accessible the key information to understand the objectives of the metacluster for companies involved and potential partners. Webinars are another key communication tool as they enable reaching a diverse audience – both of SMEs involved in the GEE metacluster which are spread out across Europe – and in target countries.

- Participation to international events: The participation to global trade conferences allow the GEE cluster to gain visibility within the global geothermal industry as an outlet for cooperation with the European geothermal industry as a whole.

- Organisation of international missions: in target markets, the organisation of trade missions have been identified as a crucial opportunity to implement the internationalisation of the GEE metacluster, establishing tight relationships with structuring actors in target countries (for instance national associations), and creating opportunities for projects via B2B exchanges.

3. IMPLEMENTING THE INTERNATIONALISATION OF THE EUROPEAN GEOTHERMAL INDUSTRY

To support the internationalisation of the European geothermal industry, and more specifically of the companies involved within the Geo-Energy Europe structure, several actions were implemented over the 2018-2019 period, during the completion of the first GEO-ENERGY EUROPE project. Building on these achievements and the strategy established previously, the ongoing GEO-ENERGY EUROPE 2 project is looking to implement the internationalisation objectives envisioned at the inception of the metacluster. To

implement this strategy the GEE metacluster will focus on building up international cooperation, capacity building of its membership and dissemination of the achievements of the metacluster for replication of best practices.

3.1. International cooperation building

A first pillar of building up international cooperation within the GEE metacluster, is to ensure that the companies involved can access relevant information on target markets, which can be achieved via market monitoring. One of the channels for identifying the procurement opportunities monitored by the metacluster include International Financial Institutions and multilateral donors agency. Meanwhile, information on tendering from national or regional governments is also relevant, as are investments from energy companies and more generally research funding.

The scope of this market surveillance is to identify cross-sectoral opportunities for member companies to cooperate in projects in target markets. This notably includes the identification of procurement opportunities in geo-energy related operations in markets with emerging geothermal energy potential.

Another important aspect of providing market intelligence to the companies involved in GEE is to identify relevant partners for cooperation, be they clusters in target countries, local authorities exploring the potential for geothermal energy or companies undertaking major developments.

The market intelligence and surveillance activities can serve to identify relevant partners in signing business agreements with GEO ENERGY EUROPE member companies whose skill sets would complement those of the third country companies in the geothermal sector. Based on these agreements, business collaboration is built on trust; and business visits or trade missions are a key measure in developing trust is the presence of companies in a third country market in order to demonstrate commitment to forming long standing business linkages therein. The purpose of these market visits therefore will be to generate the conditions required to facilitate the signature of cooperation and business agreements.

In order to maximise the impact of the actions taken in the framework of international cooperation building of Geo-Energy Europe in target countries, it is crucial to provide training to SMEs, especially those lacking internationalisation capacities. This training will focus on regulation and risk mitigation scheme, market barriers and structure of the competition, key stakeholders, forms of financing.

3.2. Capacity buildings for member companies

Capacity building is the process by which individuals and organizations obtain, improve, and retain the skills, knowledge, tools, equipment, and other resources needed to do their jobs competently. It allows individuals and organizations to perform at a greater capacity (larger scale, larger audience, larger impact, etc.). In the GEO ENERGY EUROPE context, capacity building includes both an internal component, aiming at consolidating the EU geothermal energy sector and an external component, aiming at developing a collaborative offer to provide missing skills, knowledge, tools, equipment, and other resources to its selected target markets. Both internal and external capacity building effort will focus on facilitating collaboration between the meta cluster's SME members.

This capacity building will to a very large extent based on exploring the potential of experience sharing and building on the skills already available to SMEs involved in the GEE metacluster. Another key pillar of the capacity building of the Geo-Energy Europe metacluster and the involved companies is to rely and build on the extensive RD&I in Europe. The dissemination of the findings and knowledge identified by the various European RD&I programmes, such as for instance the Horizon 2020 and its upcoming replacement Horizon Europe, is a crucial element of the competitiveness of European companies when looking to develop projects in new international markets. Finally, the capacity building of the metacluster will also look at identifying strategic partnership with other industries from which synergies may result.

3.3. Dissemination of the findings of the GEE metacluster

Dissemination is a core pillar of the success of the GEO-ENERGY EUROPE metacluster, as it allows a greater awareness for the cluster, as identified by GEE's internationalisation strategy. This dissemination and communication has two faces: first there is outwards communication, increasing the knowledge about GEO-ENERGY EUROPE as a contact point in target countries interested to build partnerships with European SMEs involved in the geothermal industry. Then, there is an internal communication element, where the metacluster must increase awareness for European SMEs in the opportunities for internationalisation of their activities. To achieve these communication priorities, several tools from the GEE Website to the organisation of webinars, or the participation in international events contribute to this communication.

4. KEY RECOMMENDATIONS TO FACILITATE THE INTERNATIONALISATION OF GEOTHERMAL ENERGY COMPANIES

The experience of the GEO-ENERGY EUROPE metacluster provides some perspective that could be generally applicable to facilitate the internationalisation of European companies involved in the geothermal energy sector. Some of the key recommendations resulting from this experience include:

- **Capacity building is crucial to consolidate a "European" geothermal industry:** the experience of the GEE projects, as an international metacluster, composed of several national or international clusters, highlighted that one of the main challenge to the internationalisation of GEE is the fragmented nature of the European geothermal industry. Capacity building, experience sharing, building trust between clusters and their respective members, are crucial to facilitate cooperation and create business opportunities.
- **The need to understand the target markets:** among the main achievements of the GEO-ENERGY EUROPE metacluster is to provide a better understanding of the target markets to member companies, facilitating the conception of their internationalisation approach. Indeed, for most SMEs in the geothermal sector, there are some additional challenges to their internationalisation linked to the heavily regulated nature of the geothermal industry. The lack of capacity of GEE in terms

of international presence however highlights the challenge in understanding the target markets beyond analysing regulatory framework and second-hand knowledge. The organisation of research missions and the establishment of partnerships with structuring organisations in target markets have proven effective in allowing a better understanding of the target markets. The establishment of long-term relationships is essential to facilitate internationalisation, enabling a greater degree of trust.

- **The structuring role of innovation from the European geothermal industry:** the European geothermal industry is a global leader in innovation, especially in some specific segment of the geothermal markets, notably heating and cooling, productive processes and raw material extraction. In all these market segments, there are tremendous opportunities for internationalisation although supply chains and regulatory framework are usually less established that conventional geothermal power production which continues to heavily dominate the market beyond Europe.

The takeaway of the actions undertaken by the GEO-ENERGY EUROPE metacluster, is that there are important opportunities for internalisation of the European geothermal industry, and extensive interest to pursue such opportunities within European geothermal SMEs. However, to facilitate this dynamic, and notably to enable the development of project consortia that tap into the full potential represented by the diversity of the European industry, a public structuring of the internationalisation of the industry appears necessary – notably in light of the weight of global competitors.

The European Union can be a catalyst to enable the internationalisation of geothermal SMEs, and more generally accelerate exports from the European geothermal industry. The GEO-ENERGY EUROPE projects, supported by the COSME programme of the EU, is a very important first step in that direction. The impulsion given by GEE has proven effective in structuring an internationalisation dynamic for geothermal SMEs at the European level. The work of the GEE metacluster during the 2017-2019 period highlighted the many barriers represented by the lack of knowledge of target markets, and the absence of local relays for companies originating from many European countries.

The Clean Energy Industrial Forum (CEIF), established in 2017 as a European Commission initiative to promote the renewable energy industry in Europe, highlighted the need for the EU to contribute to the internationalisation of strategic renewable industries such as geothermal energy. Among the key recommendations of the CEIF relevant to the objectives of the Geo-Energy Europe project are notably proposals to reinforce the protection of intellectual property of the European industry, and highlighting the role of the EU "*to help export such products [renewable technologies] and business models in third country markets, by removing trade barriers and strengthening the cooperation with third countries*." Moreover the role of the EU is also important in structuring global financial flows, and the Sustainable Finance Regulation and the Sustainable Finance Taxonomy it includes are quite important features for allowing the European geothermal industry to secure private financing for international projects.

In the experience of Geo-Energy Europe metacluster, and the internationalisation actions already undertaken – which highlighted the importance of reliable relays in target markets for the success of the internationalisation strategy of a geothermal SME – aligns with the recommendations of the Clean Energy Industrial Forum. National export agencies are a crucial relay for geothermal companies looking to develop projects internationally. There are however major differences in the capacity of the national agencies of the various EU Member States. Meanwhile, the EU's weight as a global economy, its role as a structuring force in supporting innovation in renewable energy technologies – notably geothermal – can make it a relevant actor to supplement national agencies and maximise synergies. The diplomatic service of the EU could be a relevant channel to facilitate the internationalisation of geothermal SMEs, for instance by enable the set up of a European Export Agency. The role of European trade agreements in shaping the global economy should also be noted in that regard, as they could be used as a lever to accelerate the global implementation of the Paris Agreement, and several EU Member States are calling for it. The geothermal industry could stand to benefit from a restructuring of global trade towards the accelerate implementation of the Paris objectives.

6. CONCLUSION

The experience of the GEE metacluster allows to draw several conclusions as to the relevance and limits of the Geo-energy Europe internationalisation strategy. The metacluster structure, loosely bringing together a wide array of companies involved in the geothermal sector presents its share of benefits, allowing for a large pool of skills, know how and technologies to tap from. This structure is a vulnerability at the same time, which requires internal capacity building to create the necessary trust relationship between companies to enable business opportunities between them.

With regards to the internationalisation of SMEs involved, GEO-ENERGY EUROPE remains at an early stage, but many lessons can be taken out from this experience. The metacluster has proven that a proactive stance on facilitating internationalisation for SMEs can yield result. The layout of GEE's internationalisation strategy and roadmap have identified the key relays to facilitate it: the understanding of target markets, the establishment of trust with key actors in these markets, and the role of relays to facilitate internationalisation. While at a modest scale, GEE can provide some of these services for European SMEs, there is a role at the European level for a public framework facilitating the joint internationalisation of European geothermal companies.

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