Strategic planning document for policy activities

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ETIP-DG
European Technology & Innovation Platform on **Deep Geothermal**

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Introduction

This Strategic document is intended to provide guidance to the Policy Working Group, by identifying a policy timeline as well as a list of actions to be undertaken.

When regarding the framework conditions for research in geothermal, it appears that they are highly influenced by the energy, climate and research policies. A more supporting framework thus requires influencing these policies by mainly communicating and promoting the messages of the ETIP DG Vision for geothermal, the ongoing Strategic Research and Innovation Agenda and the future Implementation roadmap to the relevant policy makers, at both regional, national and EU level.

In order to reach these objectives, a detailed mapping of relevant policy and regulatory issues has firstly set the context by presenting the policy and regulatory framework impacting geothermal RD&I. It has also highlighted the main issues in order to make sure that the ETIP-DG Vision and research priorities are translated into political priorities and coherent policy messages. The main barriers to deploying deep geothermal and especially RD&I projects will be tackled in this report on Strategic planning document for policy activities.

Article 194 of the Treaty on the Functioning of the European Union (EU) provides that in the context of the establishment and functioning of the internal market and with regard to the need to preserve and restore the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:

- ensure the functioning of the energy market;
- ensure security of energy supply in the Union;
- promote energy efficiency and energy saving and the development of new and renewable forms of energy.

Such provisions entitle the EU to legislate on a number of issues which directly or indirectly affect both the shallow and deep geothermal energy sectors. An outstanding example is no doubt the legislative climate and energy package adopted in 2008 together with the so-called 20-20-20 targets (i.e. at least 20% in greenhouse gas emissions reduction compared to 1990 levels, 20% of the final energy consumption to come from renewable sources; an improvement of energy efficiency by 20% compared to projections).

Alongside EU-wide and national binding targets, a number of accompanying measures have been put in place to deliver the expected results by 2020. In this regard, the Renewable Energy (2009/28/EC) and the Recast Energy Performance of Buildings (2010/31/EU) directives as well as the Energy Efficiency Directive are key pieces of EU legislation for the promotion of geothermal energy in the EU. In fact, these Directives set a stable regulatory

framework with a range of measures designed, inter alia, to overcome non-technical barriers and other market distortions.

Finally, a series of directives aiming to preserve and improve the environment and the way they are implemented at national level may also have a relevant impact on geothermal.

RD&I policy and regulatory framework on deep geothermal

The Mapping of the policy and regulatory issues for deep geothermal RD&I realized in the framework of the deliverable 4.1 of the ETIP DG project provided some crucial results that contribute to structuring the policy activities of the ETIP DG policy working group. The mapping reveals the direct link between policy objectives, regulatory framework and the funding of RD&I projects. This is particularly relevant as the policy activities of the ETIP DG intervene in the late stages of the negotiations on the Clean Energy Package, and on the early stages of the implementation and the translation of the newly established climate and energy regulatory framework. In addition, it highlights key regulatory and policy issues which are among the scope of the policy activities of the ETIP DG working group on policy. These include:

- The *classification and the definition of the resource*: the role of the definition of geothermal energy in the Renewable Energy Directive (2009/28/EC) is highlighted, as it shapes the whole regulatory framework for deep geothermal energy in Europe.
- *Licensing and authorisation*: the implementation of the recast renewable Energy Directive should lead more streamlined authorisation and licensing.
- *Sustainability and the environment*: the ETIP DG policy working group is working towards a more informed debate on the environmental impact of deep geothermal, and on investing in RD&I to further reduce said impact.
- Novel policy tools for *public and other stakeholders' engagement* are advocated by the ETIP DG policy working group, to include new perspectives in the innovation process of geothermal energy technologies, preventing the possible social conflicts around geothermal technology developments
- *Financing*: part of the policy activities of the ETIP DG policy WG includes the assessment of innovative schemes for funding RD&I in deep geothermal.

- *Support schemes*: as a key enabler of new technological deployments, support schemes are within the focus of the ETIP DG policy working group, notably ahead of the revision of the State Aid Guidelines on policy and the environment.

Geothermal energy in the SET Plan

Geothermal energy is rightly recognized as a priority to achieve the EU climate and energy target in the SET plan. The SET Plan acknowledges the large technical potential of geothermal energy, and the underutilization of it. The Plan notes that geothermal energy is "*a reliable, flexible and indigenous energy source with a low levelized cost and high capacity factor. This makes it an attractive option for the EU's energy mix in terms of energy security and better grid management*." It also underlines the new dynamic that is ongoing in the sector, where many new developments are ongoing and research development and innovation is required to unlock the potential of deep geothermal energy. In particular, for electricity generation, the SET Plan targets advocate that 80 GW of EGS capacity should be online by 2050 in Europe. Beyond the generation of electricity, the SET Plan highlights the vastly untapped potential in the heating sector.

Implementation Plan of the SET-Plan Temporary Working Group on Deep geothermal

The Implementation Plan of the SET-Plan temporary Working Group on Deep Geothermal constitutes a basis for the work of the ETIP-DG in establishing its policy priorities for deep geothermal RD&I. The priorities presented in the Implementation Plan are therefore reflected in those put forward in the policy priorities of the Strategic Research and Innovation Agenda of the ETIP DG. In particular, the priorities defined by the non-technical working group of the ETIP Deep Geothermal refer to different areas, such as increasing the "awareness of local communities and involvement of stakeholders in sustainable solutions". This latter topic emerged during a stakeholder workshop organized by the ETIP DG Working Group on Environment, as described in Deliverable 5.4.

As a whole, the policy actions to be undertaken in the framework of the ETIP DG policy working group contribute to the following priorities identified by the SET-Plan temporary working group on deep geothermal:

- *Geothermal heat in urban areas*: the ETIP DG policy actions aim at setting the right policy framework to increase the share of urban heat coming from deep geothermal energy, through the demonstration of innovative technologies and the use of smart thermal grids, as laid out in the ETIP DG vision for deep geothermal;

- *Integration of geothermal heat and power in the energy system and grid flexibility*: The ETIP DG policy working group is directly contributing to this priority through its policy actions, notably with drafting of a position paper on the role of geothermal energy in the decarbonization of the electricity sector as a flexible and dispatchable resource, and the organization of a policy event on this topic.
- *Zero emissions power plants*: this topic was among those considered in the stakeholder workshop of the Environmental Working group in June 2018 as a solution to mitigate the impact of deep geothermal on local communities.
- *Increasing awareness of local communities and involvement of stakeholders in sustainable geothermal solutions*: this was the topic of a stakeholder workshop in June 2018.
- *Risk mitigation*: the policy actions of the ETIP DG policy working group also aim to reduce the issue of the risk of deep geothermal projects. This includes the technology risk embedded in RD&I investments, and the geological risk which increases the cost of developing new geothermal projects. The establishment of a harmonized policy framework across the EU, and of forward-looking objectives for deep geothermal energy is a key measure to provide policy certainty and hence reduce the risk of RD&I (by increasing the projects that a future market exists for the resulting technology innovation). It is among the focus of the ETIP DG policy activities. In addition, the ETIP DG policy working group is specifically working on the financing of innovation to reduce the financial risk associated with it.

Policy timeline

The 2020 Climate and Energy Package has been instrumental in spurring investment in the renewable energy sector across Europe. This policy framework has been built up progressively, over nearly a decade with the successive addition of different legislative pieces, such as for instance the ETS Directive (2003) setting the European carbon trading scheme, later followed by the first Renewable Energy Directive (2009), and then the Energy Efficiency Directive in 2011. To lay out the 2030 climate and energy policies of the European Union, a much shorter timeline has however been selected, putting forward the argument of consistency across legislative texts and compliance with the “better regulation” principle.

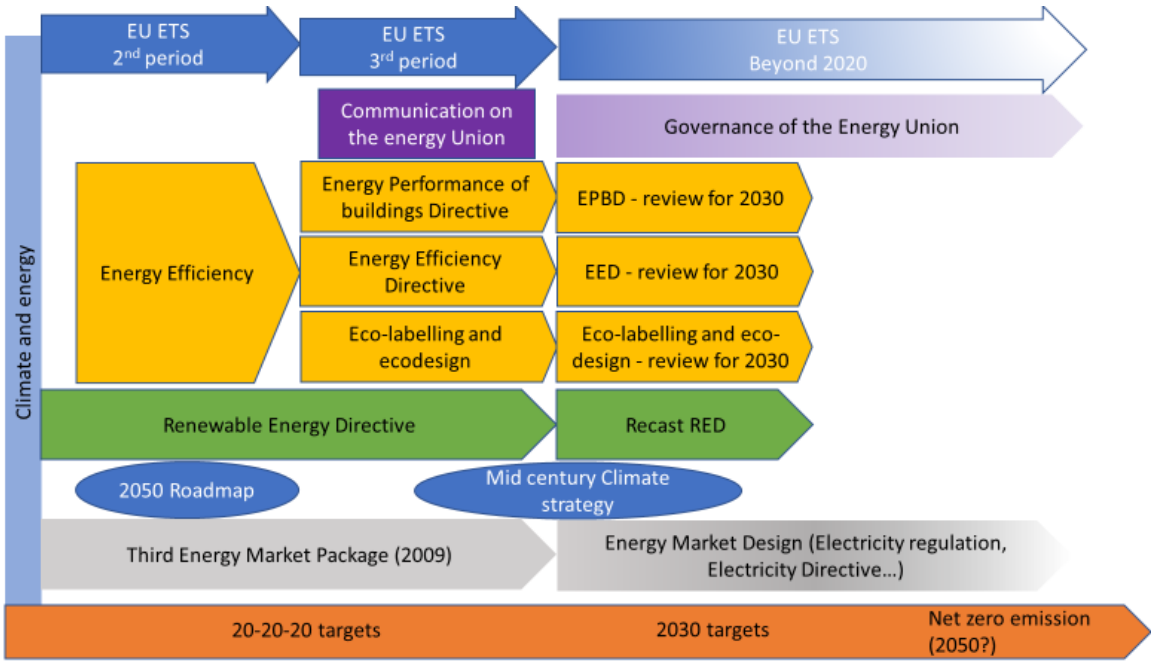

Figure 1: Development of EU climate and energy policies

In 2016, the European Commission published a "Clean Energy for All European Package", which corresponded to a bundle of 8 legislative proposals aiming to propose a consistent climate and energy framework for the EU after 2030.

This Package includes a review of the key legislative proposals that enable the pursuit of the 20-20-20 objectives. It also lays out the objectives for renewable energy deployment, energy efficiency improvements and carbon emissions reduction to 2030. In that regard, the review of the different energy efficiency legislative pieces is rather an update. The Renewable Energy Directive meanwhile is entirely redrafted, to account for the changing realities of the renewable energy sector, and to better acknowledge renewables for heating and cooling. The new text lays out the criteria for awarding support to renewable energy projects. Alongside these proposals, the European Commission proposes to add to the effort to set up the Internal Energy Market, introducing several proposals to define the functioning of the electricity market after 2020. This proposal for instance aims at better integrating higher variable production and allowing the value of flexible electricity production (e.g. geothermal electricity) to be captured. Encompassing all these policies, the Energy Union Governance Framework should come to replace the national binding targets after 2020, setting rules for Member States to set their targets and report on progress, so that the EU level binding objective is met.

These simultaneous proposals, as they define European energy policies after 2020 are a priority strategic area. The final version of the legislations should be adopted at the end of the second trimester of 2018.

List of actions

On 30 November 2016, the European Commission unveiled its proposals for the review of energy sector legislations. Additionally, several other regulations have been revised or are currently under revision (e.g. The EC Energy Statistics Regulation, Water framework directive) and new programmes are in development (e.g. the Innovation Fund, Horizon Europe). In the period 2017-20, the most relevant files on “policy and regulation” for deep geothermal include the following:

Renewable Energy Directive Recast
Review of the Energy Efficiency Directive
Review of the Directive on Energy Performance of Buildings including Smart Finance for Smart Buildings initiative
Electricity Market Design- Directive and Regulation
EU Innovation Fund (replacing the NER300)
Review State Aid Guidelines post-2020
Revision EU ETS Directive
Review Eco-design and Energy Labelling Regulation
New Effort Sharing Decision (including in buildings)
Integrated Energy Union research, innovation and competitiveness strategy / post-2020 framework: Horizon Europe
Horizon 2020 (WP2018-20)
EIB review lending policy for energy projects
Review Water quality legislation
NORM legislation
Reform VAT Directive
Other environmental regulations (F-Gas, Air quality, drilling, etc)
Multi-annual financial framework post-2020
EU Climate Strategy (to 2050)

The political timeline of the Energy Union, the policy to build a European single energy market, which rests on five pillars (security of supply, decarbonization, energy efficiency, internal market and RD&I), is structured around the adoption of the different legislative proposal that make up the Clean Energy Package. Indeed, the political agenda that govern

legislative work is dependent on the result of the European Parliament elections in May 2019, and of the European Commission college to be appointed thereafter. From 2019 onwards, the priorities will be determined by the new European Commission.

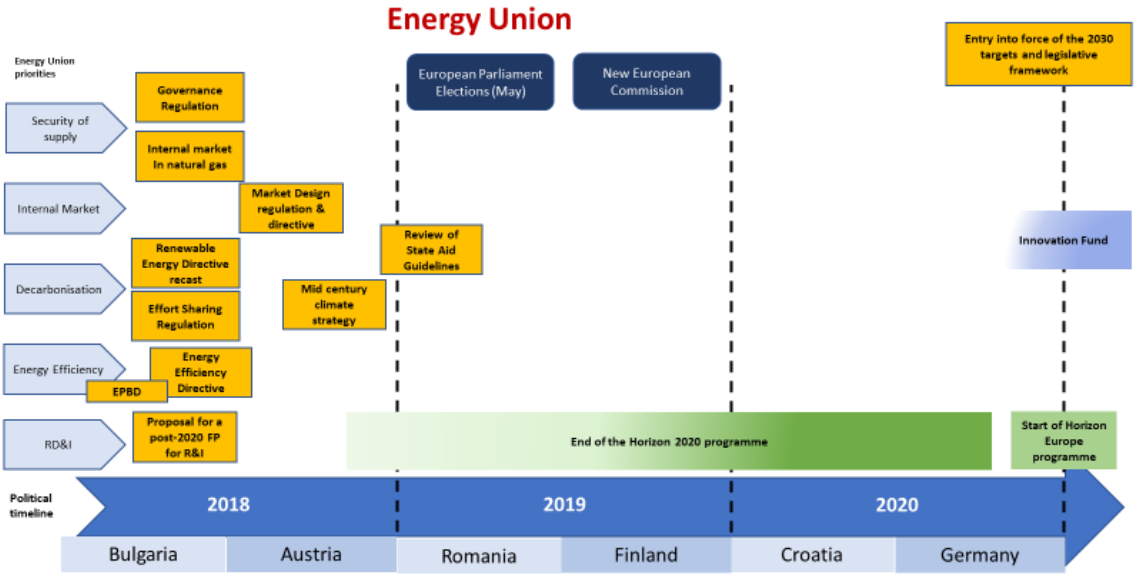

Figure 2: Timeline of the Energy Union 2018-2020

List of actions to be taken by the policy working group

Keeping in mind this policy timeline, the actions to be undertaken by the ETIP-DG policy working group have several objectives, in line with the priorities laid out in the SET plan and the policy priorities defined in the ETIP-DG non-technical working group in March 2018 (see the last chapter of this document). These actions include:

- Regarding the public acceptance of deep geothermal energy: organization of an event on the environmental impacts of deep geothermal energy, to which stakeholders are invited to attend and contribute, notably policymakers and NGOs. (past event)
- Regarding the EU long term strategy on greenhouse gases reduction:
  - ❖ Drafting of a position paper highlighting the role of geothermal energy in a decarbonised European energy system, building on the Vision for Deep Geothermal developed by the ETIP;
  - ❖ Presentation of the ETIP DG Vision to European policy makers involved in the drafting of the EU Long term strategy on greenhouse gases reduction.
- Regarding the future of the European electricity market:

- Drafting of a position paper underlining the contribution of geothermal technologies for providing the flexibility needed by the electricity sector with higher shares of variable renewable capacity, and the prospects of RD&I in further unlocking this potential.
- Organisation of a policy event to create a debate around the consideration of flexible renewable generation such as electricity generated from deep geothermal energy, and to put forward the RD&I needs in this domain for a cost efficient decarbonisation of the EU electricity system.

- Regarding financing, ahead of the revision of the State Aid Guidelines: factsheets on the financing of deep geothermal demonstration projects presenting innovative funding instruments for RD&I in deep geothermal technologies.
- To provide a perspective on the competitiveness of the deep geothermal energy sector in Europe: production of a report on the competitiveness of the deep geothermal energy industry in Europe and its competitiveness on the global market.

Timeline of the policy actions:

- 20/06/2018: WG Environment stakeholder workshop;
- August-November 2018: presentation of the ETIP DG Vision of the future for deep geothermal to EU policy makers, in the context of the EU Long Term emission reduction strategy;
- November 2018: position papers on long term vision for deep geothermal;
- November 2018: position paper on deep geothermal as a flexible electricity generation technology;
- January 2019: Policy event on the role of flexible renewable generation in a decarbonised electricity sector, and RD&I needs;
- April 2019: Factsheet on innovative instruments for financing RD&I in deep geothermal technologies;
- June 2019: Report on the competitiveness of the deep geothermal sector in Europe and the world.

List of policy priorities for the ETIP-DG non-technical WG

The Strategic Research and Innovation Agenda (SRIA) is a key tool for the ETIP DG policy working group, more specifically the section of the SRIA dedicated to “non-technical” priorities. The SRIA was launched by organizing several physical meetings of the ETIP DG’s

different working groups where the research priorities for the deep geothermal sector were laid out and justified. While still at the draft stage, the policy priorities laid out in the SRIA by the ETIP-DG non-technical working group constitute a valuable base on which to set the policy actions of the ETIP DG. It is notably significant as the policy priorities laid out below correspond to the key policy and regulatory issues put forward in the ETIP DG mapping of policy and regulations (deliverable 4.1). While the mapping highlights the role of policy objectives in directing funding to RD&I, the priorities below link the contribution of geothermal RD&I to the achievement of said policy objectives in climate and energy, environment and research, development and innovation. Moreover, the policy priorities listed below are aligned with those identified in the Implementation Plan laid out by the SET-Plan Temporary Working Group on Deep Geothermal.

1. Policies & regulations

Policies and regulations play a tremendous role in driving developments in deep geothermal RD&I by acting as a top down factor, setting targets to reach, rules to follow and providing opportunities for public funding of research and development. Regarding policies and regulations, especially the ones developed at the European level, the following are the main policy priorities of the ETIP-DG non-technical working group:

- Need of a levelled playing field at European level so that subsidies and/or taxation do not befog the overall consistency of the vision for geothermal energy in Europe.
- Need of a clear understanding of the specific agenda of the different countries (depending on their own situation), and the common core.
- Need of a dedicated policy for the desired share of low carbon/carbon free technologies in the mix of energies produced.

Associated research topic:

- P&R 1: Developing a welfare analysis of the increase of deep geothermal energy in the energy mix through a comprehensive assessment of the impact of geothermal energy on economic growth, social welfare, employment, environmental benefits, trade balancing...
- P&R 2: Screening and mapping EU policies and regulation relevant for RD&I in deep geothermal energy.

2. Public acceptance

Among the various public acceptance concerns surrounding the development of geothermal energy projects, a chief one is linked to the environment. The specific aspect of environmental concerns will be explored and addressed by the mean of an Environmental workshop.

The main policy priorities regarding public acceptance include:

- Information gap between geothermal experts and public, and lack of access to knowledge.
- Scarcity of social engagement and inclusive geothermal projects. Need for a true public participation to geothermal planning.
- Although diverse strategies for societal engagement are being implemented worldwide such learnings are not easily accessible for others to profit from them.
- The potential socio-economic and cultural impacts of a distributed power generation and the role of new social actors like the prosumers are still uncertain.

Associated research topic:

- PA1: Sociological analysis of expectations and fears regarding energies, and specifically geothermal energy, in order to identify technological RD&I able to bring effective answers to the concerns and expectations identified (deepening of LCE 21- 2017)
- PA2: Definition of guidelines for systematic information activities.
- PA3: Education and information campaigns about geothermal energy technologies and developments.
- PA4: Definition and test of strategies and practices of public engagement in the geothermal realm
- PA5: Development of a—permanent and constantly updated—trans-European observatory on engagement strategies adopted in the field of renewable energy technology, including geothermal
- PA6: Furthering research and establishing new methodologies to assess the socio-economic and cultural impacts of a distributed power generation identifying the interrelations between these impacts and technology, investments and regulations.

3. Competitiveness

The issue of competitiveness is crucial for the European geothermal sector. It affects its capacity to export beyond the European borders, but the competitiveness against other technologies is also important to attract investments. Below are listed some elements that

can contribute to defining the competitiveness of geothermal energy in the European energy mix:

- Beyond LCOE: cost of intermittency, value of flexibility, full life-cycle costs, life-cycle green-house gas emissions…;
- Use value of geothermal according to different purposes (alternative business models);
- Heat produced to be set equal to electricity, because of higher efficiency in resource use and lack of alternatives for sustainable heat production;
- Heat to be included in calculations of levelized cost (LCOH…);
- Market models.

Associated research topics:

- C 1: Research of alternative criteria to LCOE more representative of the value for the energy consumer, enabling a level playing comparison of renewable energies.
- C 2: Research on the impact of existing sustainable market model designs for renewable energy on geothermal energy (enabling a legitimate return on investments in a context of zero or next to zero marginal costs energy, while ensuring cost efficiency for the consumers)

4. Risk management

The development of geothermal energy in new markets is conditioned to the proper management of the different risk factors that are specific to deep geothermal technologies, chiefly the geological risk.

The solution to this specific risk usually includes some sort of risk mitigation facility, the nature and functioning of which can vary greatly. Priorities in this area, notably for the development of deep geothermal energy project across Europe, include:

- Harmonization of evaluation standards;
- Integration of exploration costs in the business model: portfolio management model versus insurance scheme;
- Addressing the moral hazard issue in an insurance scheme;
- Creation of a risk sharing facility over the borders (Pan-European).

Associated research topics:

- R&M 1: Development of a specific resource assessment standard. Shared resource assessment methodologies exist in oil & gas business. They facilitate the dialogue between companies and financial institutions
- R&M 2: Survey of exploration or pre-cost risk in other industries (e.g. hydrocarbons) and how the increases in cost due to risk are managed and integrated in the overall business model.

Benefits/drawbacks analysis of portfolio vs insurance schemes. Analysis of the specific issue of moral hazard in insurance schemes.

5. Financing

As a capital-intensive technology, the matter of financing is key for the viability of geothermal projects. From research and development stage, to project at scale, the right financing mechanisms are necessary to lower the cost of geothermal energy and improve its competitiveness. The priorities in that regard include:

- Risk threshold for acceptability of funding by banks or private investors.
- Degree of uncertainty/certainty on resource evaluation versus Final Investment Decision (FID).
- Bankability of geothermal projects along the development time.
- How to enable low cost financing for the development?

Associated research topics:

- F: Look-back survey of the post FID development of geothermal projects in order to assess the nature and level of remaining uncertainties that can impact the profitability of investments.

6. Legal and regulatory

In regulatory terms, deep geothermal energy is often as closely associated to 'conventional' mining resources as it is with renewable sources. The regulatory framework defined by such regulations is extremely important in defining deep geothermal energy projects:

- Position of geothermal energy in the different codes (Mining, Environment, Water, …)
- Introduction of a unifying process for geothermal projects (one address for all ministries)
- License granting processes (license rounds, competition window, ...)
- Works authorization processes.

Although this category of issues may have a significant impact on the development of geothermal energy, they do not seem to require or generate needs for RD&I actions.

7. Information

To allow the development of new geothermal energy projects it is paramount to have access to the right information. Among the specific challenges for the geothermal sector, information on the underground is particularly challenging and costly to acquire.

- Availability of geological information. How to enable the exploitation of data created by Oil&Gas exploration and operation?
- Possibility to make unused data publicly available.
- Consistent statistical data.
- European portal for geological and geothermal data?

Although this category of issues may have a significant impact on the development of geothermal energy, they do not seem to require or generate needs for RD&I actions. These issues are addressed through ongoing activities of stakeholders (ex: ERA-NET).

8. Skills, human and material resources

Beyond the regulatory, financial, technical framework, deep geothermal energy projects usually require a high level of specific skills. This makes the development of a skilled workforce an imperative to allow the widespread development of geothermal energy. This rests on the following priorities:

- Science, education, training.
- Industry branch development in a context of decreasing Oil & Gas investments.
- Communication & Dissemination and Public awareness on geothermal energy.

Although this category of issues may have a significant impact on the development of geothermal energy, they do not seem to require or generate needs for RD&I actions. These issues are addressed through ongoing activities of stakeholders (for instance EGEC-GEOLEC).

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