



Geothermal Consultation,
Geoscience Policy Division,
Department of the Environment, Climate and Communications,
29-31 Adelaide Road,
Dublin D02 X285.

1st March 2022

Re: Notice of publication of the draft Policy Statement on Geothermal Energy for a Circular Economy and associated SEA Environmental Report and Natura Impact Statement

Your Ref: IE000095Lt0014

Our Ref: 21/485 [c.f. 21/384, 21/326]

Dear Sir/Madam,

I write to you regarding the email from RPS Group received on the 04 January 2022, concerning the notice of publication of the Draft Policy Statement on Geothermal Energy for a Circular Economy and associated SEA Environmental Report and Natura Impact Statement.

Geological Survey Ireland is the national Earth science agency and is a division of the Department of the Environment, Climate and Communications. We provide independent geological information and advice and gather data for that purpose. Geological Survey Ireland recognizes the significant potential of Ireland's geothermal resources to decarbonize our heat sector and provide a stable and secure supply of renewable energy for our citizens. Ireland currently uses over 40% of all its energy on heating and cooling ([SEAI, 2020](#)), and has the lowest share of renewable heat (and cooling) in the EU (6.3 % compared to an EU average of 23.1 %). Geothermal energy could provide a significant boost to the national effort to increase the share of renewable heat (and cooling) and meet our 2030 and 2050 climate targets. The current rising costs of fossil fuels, which have been further exacerbated by the geopolitical events of the past week, mean that it is now imperative that we switch to our own secure energy resources.

During research for our report [An Assessment of Geothermal Energy for District Heating in Ireland \(2020\)](#), the lack of a robust legal framework for geothermal resources has been identified as a barrier to the development of an indigenous geothermal industry. Geological Survey Ireland commend our colleagues in the Geoscience and Policy Division (GSPD) of the Department for their role in removing this barrier by developing the first dedicated geothermal policy and legislation for Ireland.

This letter contains our comments on the three consultation documents.

Draft Policy Statement

Having carefully reviewed the Draft Policy Statement, Geological Survey Ireland would like to raise the following points:

- Geological Survey Ireland, as the principal public scientific authority on geothermal resources in Ireland, has provided information to GSPD throughout the process of developing the Draft Policy Statement. Geological Survey Ireland look forward to



continuing to contribute towards the final Policy Statement as a member of the Geothermal Energy Advisory Group referred to in Section 4.1 of the Draft Policy Statement.

- It is critical to unlock Ireland’s geothermal potential within an appropriate timeframe to assist with our 2030 and 2050 climate objectives. Geological Survey Ireland welcome the recognition by the Department in Sections 3 and 7 of the report that research drilling, geophysical data acquisition and development of the National Geothermal Database (hosted and maintained by Geological Survey Ireland) will be necessary to reduce costs and risks to large potential geothermal projects. Section 7 of the report states that “*The Department will prepare a paper on the importance of subsurface data to progressing geothermal development and how this data could be provided*”. We recommend the prompt expansion of a formal geothermal programme, led by experts in Geological Survey Ireland, to achieve these aims. We recommend that this programme should be scoped and funded for a five-year period and include the necessary resources not only to plan and deliver the data-gathering programme but also to create new maps and models from the data and integrate these into the National Geothermal Database (an open-access online resource).
- In countries where geothermal energy uptake is advanced (e.g., Sweden, France, Netherlands), financial support to operators has been made available in the form of, e.g., grants, tariffs, and state-sponsored insurance schemes. We recommend that a study on the economics of geothermal projects at all scales (from GSHPs to deep geothermal installations) in Ireland be undertaken immediately, with input from Geological Survey Ireland as the public authority on Irish geothermal resources, to inform the Government’s position on financial incentives in the final Policy Statement.
- To facilitate the design of the technical programme and the economic research mentioned above we recommend that the creation of a National Geothermal Development Plan be undertaken by the GSPD and Geological Survey Ireland as proposed in the document “PROPOSAL FOR A HARMONIZED EUROPEAN GEOTHERMAL LICENSING GUIDELINES” (Batini et al., 2021; available to download at https://www.geoenvi.eu/wp-content/uploads/2021/06/European-Geothermal-Licensing-guidelines_FINAL-DRAFT_HE31052021.pdf). This should include the formation of an inter-agency task force with the aim of identifying the most promising opportunities to deploy geothermal in industrial/commercial settings and rapidly drive down GHG emissions. Once identified, these locations will be the focal point for data gathering, pilot studies, and provide a basis to define sector-specific incentives.
- As the national Earth science agency, Geological Survey Ireland are best positioned to carry out the “Research & Innovation, Education and Public Outreach” function as outlined by Batini et al. (2021) to assist with raising awareness of the national resource. Geological Survey Ireland have already embarked on undertaking this role from an unbiased scientific perspective and, therefore, should be given formal responsibility, and assigned the necessary resources, to undertake this function more comprehensively.
- Section 6.4 contains the statement “Any [geothermal installation] producing less than 25



kW of energy will not be regulated beyond the current regime for product standards for heat pumps (in effect excluding domestic geothermal heat pumps from the regulatory framework)". While we welcome the intention to remove any perceived barriers to the development of the shallow geothermal industry, we recommend that all geothermal installations should be registered. This will enable accurate analysis of the sector and facilitate planning, monitoring and management for, e.g., sector-specific incentives, subsurface data collection and environmental assessments. The Environmental Protection Agency has already implemented a registration programme for the Water Abstraction Regulations, and they would be a valuable source of information in this regard.

- With reference to Section 6.6.3, as a division of the Department we welcome the statement *"the Department will be entitled at any time to make use of any data received from a geothermal authorisation holder for the purpose of developing geothermal energy in Ireland. This would include the updating of regional geothermal models and publishing national and regional maps."* In the national interest, Geological Survey Ireland as an independent scientific authority should be formally named as a data recipient and as such granted immediate access to any geothermal data received by the Geothermal Regulating Authority, regardless of the proposed period of confidentiality.

SEA Environmental Report

We welcome the recommendation in Section 4.4.3, and later in Section 8 that *"The draft Policy Statement should continue to contribute to the protection of biodiversity and the wider environment by providing policy direction to the geothermal energy sector with a view to developing our renewable and sustainable energy sources, while taking conservation objectives and general environmental considerations into account."* This to us strikes at the heart of the main objectives behind the Draft Policy Statement - to support citizens with secure heat and energy, achieve our wider environmental goals to mitigate the effects of climate change, and to protect and improve where possible our local and national environment. To achieve this balance whilst making the smallest possible negative environmental impact we will need a solid knowledge and understanding of the subsurface conditions and related ecosystems. This can only be achieved through data collection for research and monitoring of geothermal technologies and to quantify their potential impacts.

Having reviewed the report, we would like to highlight the following:

- In Section 3.3.4 Data Gaps / Difficulties Encountered reference to Ocean Thermal Energy Conversion should be removed, this is not geothermal energy and is not referred to in the Draft Policy Statement.
- In section 5.3.3.2. Land under the heading *"Pollution Impact Potential"* the following sweeping statement is made *"The figure shows that areas of high geothermal suitability are not necessarily suitable for the development of a geothermal system due to the high pollutant potential impact"* without justification or explanation. The PIP maps were designed to indicate areas where the land is susceptible to losses of the nutrients phosphorous (P) and nitrate (N), where these losses have the potential to impact surface water receptors by travelling through subsurface and near surface pathways. Geothermal installations will not contribute to either P or N loading, so the PIP maps are not relevant, and this link is without justification.



- In Section 5.3.3.4 Existing Environmental Pressures/ Problems: Land and Soils the following potential impact to land from geothermal energy is presented: “*Potential for unidentified material or mineral assets to be neutralised by geothermal activities e.g. circulation of geothermal fluids may leach potential mineral resources.*” This is not an existing environmental pressure, and even if it was it is extremely unlikely that geothermal production would “neutralise” economic mineral deposits in this way. It also refers to bedrock mineral deposits, i.e., neither land nor soil. We recommend that this statement be removed from this section.
- We welcome the statement in Section 5.3.4.4 “*Any overlap with water abstraction legislation would need to be considered where large scale systems and deep wells have potential impact on water availability, and saline intrusion risk in coastal areas.*” Registration of all geothermal energy systems should be required in the new geothermal regulatory regime so that we have the necessary information to make good decisions for planning and environmental management.
- Section 5.3.6.3 Mineral Potential states that there is potential for geothermal activities to sterilize mineral and/or aggregate potential. This statement is made without any further justification or explanation in the following paragraphs.
- Regarding Section 5.3.6.5 Overview of Geothermal Energy, the number of GSHP installations in Ireland is over 18,000 (the figure of 1,805 is incorrect in our original report from 2020). Please see [Pasquali et al., 2019](#).
- Section 5.3.6.6 Overview of Geothermal Technologies under the heading “Open Loop Archetypes” states that “*Small-scale open loop systems are similar in nature to closed loop systems described above*”. This is not true, open loop systems extract heat from groundwater and usually require separate boreholes for abstraction and reinjection. This needs to be re-stated here.
- In the same section under “*Application: Commercial, industrial heating/cooling*” a list of potential drilling impacts of open loop geothermal systems is provided under the subheadings “*Drilling impacts related to installation of BHEs*” and “*Land subsidence*”. These impacts and the papers cited all refer to BHEs (Borehole Heat Exchangers), which are closed loop geothermal systems. They also reference impacts that are very specific to areas with evaporite geology (salt, or gypsum) where the bedrock is very susceptible to dissolution and swelling. These examples are not appropriate here.
- In the same section under “*Application: District heating/cooling, industrial heating, horticulture*” the term “*hydrothermal eruption*” is used to describe a potential impact of geothermal open loop projects. Having reviewed the citation (Bošnjakovic et al., 2019), it is clear to us that this term refers to a potential complication at high-temperature geothermal power plants only and as such does not relate to the geothermal setting of Ireland. This statement should be removed.
- As a general comment on Table 8-1: Typical Impacts associated with Geothermal Project



Archetypes / Technologies, this should be checked for inconsistencies and confusion around open and closed loop technologies. For example, impacts due to drilling are not included for domestic closed loop GSHP, yet vertical boreholes are a common closed loop GSHP configuration. Again, under Archetype 5 Open Loop Commercial, reference is made to BHEs, which are closed loop technology. Reference to hydrothermal eruptions should be removed from Archetype 6 Open Loop Hydrothermal.

Natura Impact Statement

We have reviewed the Natura Impact Statement and support the overall objectives of the report. In general, if geothermal activities are located properly with due regard for Natura 2000 European sites, and mitigation strategies adopted where necessary (e.g., appropriate design and construction of boreholes), there should not be any Likely Significant Effects (LSEs) to the European sites, or to the wider environment.

We would like to make the following specific comments:

- A careful review of the language of the report should be made. For example, in Section 6.3.3. the following sentence precedes a list of potential impacts of geothermal projects: *“The possible pathways for impact to ecosystems generally relevant to most geothermal project types include:”*. The subsequent list includes issues such as land subsidence, disturbance to habitats from hydraulic fracturing, impacts from surface water discharge, problematic groundwater chemistry, and release of toxic metals and gases to the atmosphere. These issues are not relevant to *“most geothermal project types”* and it is incorrect to suggest otherwise.
- Another example of potentially confusing language can be seen in Section 6.4.1. In Table 6-3, closed loop systems are highlighted for having a *“relatively small land use footprint”*. This statement is not made in Table 6-4 for open loop systems, with the implication that open loop geothermal systems have a larger land use footprint. This is incorrect. Horizontal closed loop geothermal systems can require a large space for trenches to be dug (depending on the size of the installation), whereas geothermal boreholes in general have a small land use footprint.
- Section 4 provides an overview of the receiving environment. Table 4-2: Threat/ Pressure Categories, Notes, and Terrestrial Examples contains several statements linking geothermal energy to an increase in various existing environmental threats and pressures. The evidence basis for some of these statements is unclear, as shown in the following examples:
 - Under Agriculture the Statement asserts *“As geothermal is harnessing sub-surface resources it will not compete directly with agricultural land use pressures however there is potential with regard to drainage and soil condition.....The current scale of geothermal activity is not anticipated to add to the threat/pressure however if it may be significant in future years if developed on a larger scale.”* This statement is made without reference to any specific activities that would impact drainage and soil condition. It is unclear how any potential cumulative impacts from geothermal energy would significantly increase the threat to European sites from agriculture, especially given the low surface footprint of geothermal installations in general, and the current impacts already being felt from agricultural activities with regard to drainage and soil condition. It is also not clear what is meant by *“larger scale”*.



- For the Urbanisation category the following statement is made: *“The draft Policy Statement may result in inclusion of geothermal solutions in residential and commercial/industrial developments or retro-fitting of geothermal solutions to same. Potential to contribute cumulatively to the threat / pressure.”* This statement implies that the geothermal policy statement will somehow increase the threat of urbanisation, residential and commercial development without any analysis or explanation.

We recommend that these statements linking geothermal energy to existing environmental pressures be removed as they are misleading.

- Table 4-2 asserts *“The draft Policy Statement affords potential for greater contribution of geothermal energy in the mix of renewable energy sources to help Ireland transition to a low carbon, climate resilient country, noting however that the sector is not climate neutral.”* It is not clear which sector is not climate neutral. If the intention is to convey that the geothermal sector is not climate neutral, then explanations and references should be provided to back up this statement.
- Regarding Section 6.4.1, the Natura Impact Statement discusses the geothermal project archetypes as laid out in the Draft Policy Statement. These archetypes were carefully selected to classify the different types of geothermal project, which all require different levels of technology, drilling techniques, infrastructure, etc. When discussing potential LSEs, it is too simplistic to reduce these to just two classes: open loop and closed loop systems. For example, a domestic open loop system will have much the same environmental impact as a domestic water well, but deep open loop EGSs will require much more management (e.g., much longer drilling periods, deep brine chemistry, mechanical stimulation of the rock to create permeability, abstraction of high temperature waters). It is not appropriate to suggest, as this statement does, that all open loop systems will have the same potential impacts. Each archetype can involve different pathways and impacts, and they should be discussed separately.
- In Table 6-1: Main Ecological Impacts that could potentially arise from the draft Policy Statement induced seismicity is deemed to have potential impacts related to Habitat degradation; Disturbance to habitats/species; and Species mortality, with an impact prediction of *“Potential direct loss of groundwater biodiversity or indirect impact on GWDE”*. This statement is made without reference to the mechanism for this to occur, or the likelihood or evidence that this occurs in geothermal projects.
- It is noted in the Policy Statement that Ireland is not in geological setting where conventional (high-temperature) geothermal resources are present. It is doubtful therefore that the following will cause LSEs as listed in Table 6-4:
 - *“Air: Discharge of water vapor into air due to mass withdrawal of geothermal liquid leading to changes in micro-climate and potentially contaminates with potential impacts for protected habitats or species;*
 - *Air: Potential for hydrothermal eruptions as a result of surface discharge of stored heat under pressure leading to habitat loss/disturbance.”*

We recommend that these statements be removed unless evidence can be found from jurisdictions with a similar geological/geothermal setting to Ireland.





- In Section 7. Mitigation Measures, we welcome the statement that “*The Policy Statement should commit to further research on the impact pathways for geothermal activities with specific reference to the Natura 2000 network as it occurs in Ireland to improve the evidence base on which to make project level / activity level AA determinations.*” We also suggest that every effort should be made at a policy level to decrease the administrative burden for domestic and small-scale geothermal projects, particularly in rural areas, whilst also ensuring the collection of adequate data and information to support environmental and subsurface management.
- Regarding the geothermal archetypes, in Table 7-2 under “*Whole Policy Statement*” the document states “*It is recommended that a requirement is integrated into the policy framework to undertake a robust constraints analysis prior to identifying a preferred location for any geothermal projects to ensure every opportunity is taken at lease and license stage to avoid possible conflicts with European sites, their Qualifying Interests and Special Conservation Interests.*” Given the different geothermal archetypes a more useful wording in place of “*robust constraints analysis*” would be “*appropriate constraints analysis to the scale of the project and its potential for impact*”. It is imperative that proportionality be applied to geothermal regulations given the diverse array of archetypes.
- In Table 7-2 under the headings “*Geothermal Regulatory Authority*”, “*Geothermal Energy Exploration Licence (GEEL)*”, and “*Geothermal Energy Capture Lease (GECL)*”, reference is made to “*Lessons learned in terms of best practice for the administration of oil and gas licensing*” and “*Lessons learned from the oil/gas and mineral sectors*”. No mention is made as to what these best practise or legacy issues are. It should be noted in the final Natura Impact Statement that the risks pertaining to geothermal are different to the risks pertaining to oil and gas. Given there is no history of onshore oil and gas exploration and development in Ireland it is not self-evident that oil and gas best practises are relevant to geothermal projects. Geothermal development is well established in many European countries so identifying best practises from those jurisdictions will be more beneficial.
- Table 7-1: Mitigation to Address Potential Adverse Effects under Thresholds states “*All installations over 25kW will be registered for information and that appropriate siting guidance is prepared to alert all categories to the pathways for impact and where risks may occur to European site. It should also be explicitly acknowledged that the AA process would apply (screening and if necessary further assessment) of all categories, irrespective of threshold.*” Following this logic, installers of domestic and commercial ground source heat pumps (GSHPs) would have to go through the AA process. It is estimated that there are over 18,000 GSHP installations already in Ireland ([Pasquali et al., 2019](#)) with a combined output of around 200 MW_{th}, however no evidence is presented in the AA Stage 1 screening or this Natura Impact Statement to demonstrate any significant effects on Natura 2000 sites that has occurred as a result. Furthermore, no quantitative risk assessment has been presented to suggest that further installations of GSHPs would have likely significant effects. The administrative burden on operators to apply the AA process “*irrespective of threshold*” would act as a significant deterrent to the uptake of GSHPs in Ireland. Given the important role GSHPs will play in decarbonising heat, and the need for urgent action to meet our climate targets, the environmental consequences arising from applying the AA process indiscriminately would likely be detrimental. Geological Survey Ireland strongly recommends that thresholds with respect to applying the AA process to GSHP installations





are applied in the Final Policy Statement (and ensuing regulation) to ensure the “*legislative overkill*” referred to earlier in the Statement (Section 3.5) does not occur.

I hope that these comments are of assistance, and if we can be of any further help, please do not hesitate to contact us.

Yours sincerely,

[Redacted signature]

[Redacted contact information]