Submission to the Consultation on the Draft Policy Statement on Geothermal Energy for a Circular Economy and associated SEA Environmental Report and AA Natura Impact Statement

Prepared by Codema - Dublin's Energy Agency

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Background

Codema is Dublin's Energy Agency is a not-for-profit company limited by guarantee and was founded in 1997. We are the energy agency to the four Local Authorities in Dublin, and our mission is to accelerate Dublin's low-carbon transition through innovative, local-level energy and climate change research, planning, engagement and project delivery, in order to mitigate the effects of climate change and improve the lives of citizens. We are the Dublin Local Authority's (DLA's) one-stop-shop for developing pathways and projects to achieve their carbon reduction and climate targets. Examples of Codema's work include energy master-planning, district heating system analysis, energy performance contracting, management of European projects, energy saving behavioural campaigns and detailed energy reviews. Codema is well networked in Europe and has been very successful in bringing European projects to Dublin with a local implementation for the Local Authorities.

Context

Codema welcomes the opportunity to make a submission to this consultation process. Codema's interest in the Draft Policy Statement on Geothermal Energy for a Circular Economy stems from our ongoing analysis of energy use and emissions from heating systems, and the development of cost-optimal heating technology pathways for the Dublin region. Our research and practical experience of developing projects allows us to advise on local level low-carbon policies which aim to reduce energy, fossil fuel use and associated costs & emissions. We have more than 20 years' experience in the climate change and energy sector, specifically in how EU and national legislation will affect the DLAs activities and the Dublin region as a whole.

Codema's Experience Developing Heating Technology Pathways for Dublin

Codema are Ireland's leading experts in the area of spatial Energy master-planning. As part of our work on the Dublin Region Energy Masterplan we have assessed the **cost-optimal, technically feasible decarbonisation pathway for the heat sector in Dublin to 2030 and 2050**. This pathway considers multiple factors to assess the suitability of heating technologies including spatial constraints, infrastructural costs, building fabric suitability, supply temperature requirements, fugitive emissions etc. One of the key findings from the masterplan is the importance of district heating networks which utilise both waste heat and renewable heat in decarbonising Dublin where **approximately 87% of heat demand in the capital is suitable for district heating by 2050**. Additionally, the estimated deep

geothermal potential within county Dublin is 543.5MW or 4347.8GWh (enough to heat 290,000 homes with an indigenous low-carbon heat source).

Codema's Experience in District Heating

Codema is Ireland's leading expert in District Heating research and project implementation. We have built the evidence-base to support the roll-out of DH in Dublin, developing the first heat demand and heat source maps in Ireland, based on European best practice methodologies. We have identified potential projects across Dublin and, working with Local Authority project champions, have **brought projects from idea to reality; from pre-feasibility, techno-economic analysis, business case through to securing funding, procurement, contracting and delivery**. We are the Dublin Local Authority's one-stop-shop for the roll-out of DH projects, and have supported South Dublin County Council in the development of the Tallaght District Heating, and Dublin City Council in the planning for the Dublin District Heating Scheme, centred in Poolbeg.

Response to Consultation

Summary of Key Points

- There is significant potential for geothermal energy to contribute to the decarbonisation of heat energy in Ireland, and urgent research is required to better quantify the technical potential of both shallow and deep geothermal energy in Ireland to allow assessment of how it can contribute to Ireland's ambitious heat decarbonisation targets.
- District heat has been identified a key system for cost effectively decarbonising heat energy in Ireland, with potential to serve up to 50% of building heat demand in Ireland[1], and up to 87% of heat in Dublin[2], with a significant focus on district heat development in Ireland's Climate Action Plan 2021.
- Geothermal energy to power district heat needs urgent research drilling & data collection, to ascertain the technically viable heat resource, and associated techno-economic and business model analysis to evaluate it in the context of other heat sources for district heat.
- Deep geothermal may not be viable at a smaller scale. In order to realise deep geothermal potential a greater roll-out of district heat networks are required. District heat networks can be planned and built with alternative renewable energy sources, and can connect to geothermal

[1] SEAI National Heat Study, SEAI 2022; Irish Heat Atlas, 2019; and Heat Roadmap Europe, 2018.
[2] Dublin Regional Energy Masterplan, Codema (to be published Q2 2022).

resources when they become available, in line with natural technology replacement timelines or network expansion plans.

- Codema proposes that a pilot and demonstration project for geothermal-district heat is urgently funded and developed to allow feasibility assessment of this potentially important pathway. Codema additionally propose business model research for geothermal energy, and research into the inclusion of geothermal potential in local area spatial energy planning to facilitate awareness and planning capacity for delivery of future projects.
- As district heat is proposed as a key use case for geothermal, a geothermal advisory group could benefit from DH expertise.
- Geothermal energy use-cases beyond district heating should be explored, to maximise the potential of its utilisation.
- Codema support the following as outlined in this policy statement:
    - Public availability of geothermal data.
    - Introduction of a regulatory framework to reduce project risks.
    - Different regulatory paths for small and large projects
- Codema supports the inclusion of environmental protections in the policy statement and regulatory process as identified in the Environmental Impact Assessment and the Appropriate Assessment.

The District Heating Opportunity

This submission focuses primarily on one of the cornerstones of a smart energy system, district heating and cooling (DHC) networks. Heating is a hugely important sector in Ireland when it comes to decarbonisation as it represents approximately **40% of energy demand (twice the demand of electricity)** and is the worst performing sector in terms of renewable proportion (currently at 6.3% of total heat production) behind both electricity and transport. **District heating is new technology in Ireland, currently representing less than 1% of the heat market but with potential for this to be between 50% and 60% of building heat demand based on a 2019 study performed by the Heat Roadmap Europe researchers and results from SEAI's National Heat Study**.

Several pilot schemes for large-scale district heating are in the process of demonstrating how this potential can be delivered[3]. The primary energy sources for heat supply to district heat networks are:

[3] Tallaght District Heating Scheme, Dublin District Heating Scheme

- Waste heat from industry and power generation and transformers
- Heat pumps (water source, air source and ground source)
- Bioenergy
- Deep Geothermal
- Curtailed Renewable Electricity (via electric boilers or heat pumps)
- Waste heat from wastewater treatment and sewage pipes
- Landfill waste heat and landfill biogas

Deep geothermal may not be viable at a smaller scale. In order to realise deep geothermal potential a greater roll-out of district heat networks are required. District heat networks can be planned and built with alternative renewable energy sources, and can connect to geothermal resources when they become available, in line with natural technology replacement timelines or network expansion plans.

District heating networks potential to enable greater uptake of renewable and waste heat sources is shown in the figure below where there is a strong correlation between DH and renewable heat proportions.

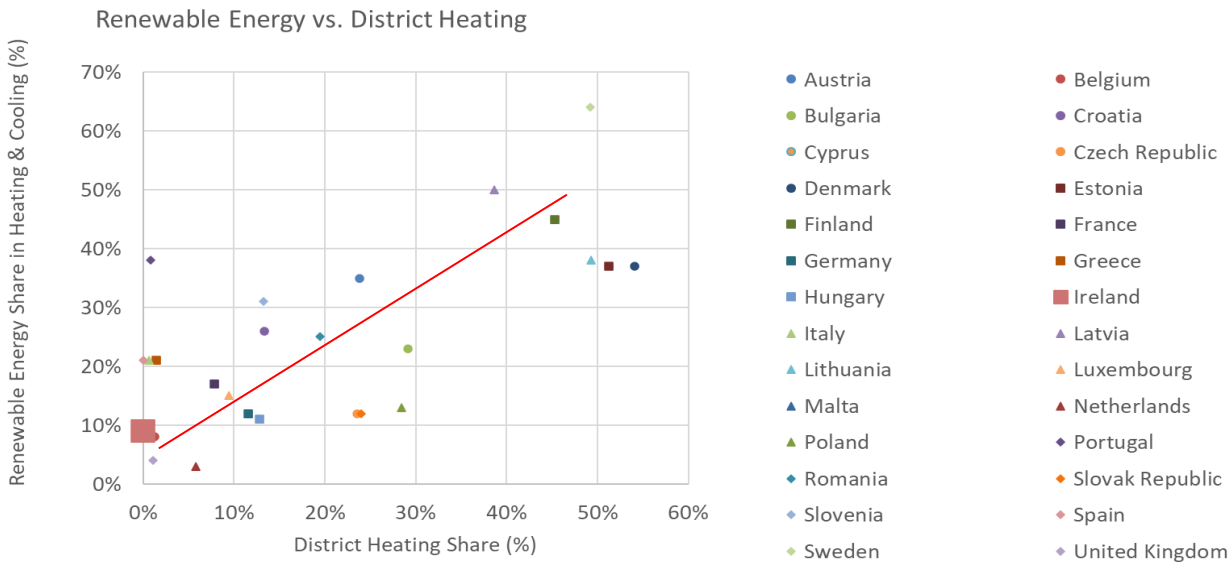

Figure 1: Correlation Between Renewable Heat Share and District Heating Share in Europe (Source: Heat Roadmap Europe)

Apart from being a method for increasing the proportion of low-carbon and renewable heating, DHC provides many additional benefits to an overall integrated energy system, such as:

- **Easier integration of renewable and low-carbon heat sources** without disruption to customers/homeowners as access to each individual dwelling is not required
- **Lower local air pollution** as buildings fossil fuel boilers would no longer be required
- Facilitates **utilisation of indigenous low-carbon resources which would not make sense at a smaller (individual building) scale such as deep geothermal and industrial waste heat resources** – leading to more efficient operation of both industrial plants and heat production and supporting a more circular economy
- **Provides storage and demand side response for the electricity grid** at a fraction of the cost of battery storage when supplied by large-scale heat pumps, electric boilers etc. This also **facilitates greater production of renewable electricity** (e.g., curtailment of wind turbines can be reduced) due to the flexibility provided by this thermal storage capacity.
- **Potential for reduced demands on the electricity system,** in comparison to a counterfactual of having heat pumps in each building. Buildings served by district heating use centralised heat pumps which can achieve higher efficiencies but also can utilise heat sources such as waste heat, geothermal and bioenergy. In the case where centralised heat pumps are being used the cost of grid upgrades required is reduced when compared with the counterfactual due to these higher efficiencies and the ability to by-pass the lower voltage grid infrastructure in terms of grid reinforcement.
- **Increased customer safety** as there is no risk of gas leaks or carbon monoxide due to on-site combustion of fuels
- **Benefits local economy** by providing low-cost heating to customers (reduced overheads) and residents (**reduced fuel poverty**), potential revenue from waste heat for local industries and providing **new local employment** in the construction, operation and maintenance of the network
- **Providing a just transition for those with complimentary skills** which currently work in the fossil fuel industry (welders, engineers, civils contractors, geotechnical experts, etc.)
- Efficient operation of heat production plants is ensured by **constant monitoring, operation and maintenance being carried out by trained professionals** – this is not possible with solutions located in individual homes where equipment is often not maintained to regularly achieve **high operating efficiencies**

Research and Demonstration Opportunity

District heat has significant, cost-competitive potential. Geothermal energy to power district heat needs urgent research to ascertain the technically viable heat resource, and if it can economically compete with other heat sources for district heat networks.

There is significant potential for geothermal energy to contribute to the decarbonisation of heat energy in Ireland, and urgent research is required to better quantify the technical potential of both shallow and deep geothermal energy in Ireland to allow assessment of how it can contribute to Ireland's ambitious heat decarbonisation targets. Current estimates from the Dublin Regional Energy Masterplan show that deep geothermal potential within county Dublin could be 543.5MW or 4347.8GWh (enough to heat 290,000 homes with an indigenous low-carbon heat source).

District heat has been identified a key system for cost effectively decarbonising heat energy in Ireland, with research[4] highlighting the potential of district heat to serve up to 50% of building heat demand in Ireland, and up to 87% of heat in Dublin, with a significant focus on district heat development in Ireland's Climate Action Plan 2021.

Research and demonstration in district heating has been followed by the prominent inclusion of district heat in the Climate Action Plan 2021, with the following targets and actions:

- Target of 2.7 TWh by 2030, to be revised upwards based on final National Heat Study results
- DH utility set up
- DH ownership model, DH investment model
- DH assessment to be included as part of County Development Plans
- New DH schemes to be assessed by the Land Development Agency

This highlights district heat may be at the beginning of a strong growth path in Ireland. However, the potential supporting role of geothermal energy in district heating is uncertain, until further research is carried out.

Geothermal energy was limited in its inclusion in IrDEA and Heat Roadmap Europe analysis, and in the recent SEAI National Heat Study as the realisable technical potential and related economic

[4] Dublin Regional Energy Masterplan, Codema (to be published Q2 2022); SEAI National Heat Study, SEAI 2022; Irish Heat Atlas, 2019; and Heat Roadmap Europe, 2018

potential of geothermal have not yet been fully assessed, due to the data gaps discussed in this draft policy statement. Further research is urgently required to address this gap in knowledge.

The draft policy statement identifies the following research areas:

- Data acquisition:
    - Estimation of amount of heat in the subsurface.
    - Estimation of what proportion of that heat is recoverable.
    - Deep drilling and deep geophysics.

- Economics of geothermal energy
    - Cost of geothermal energy.
    - How to compare costs across all renewable energy sources.
    - How to set an efficient price for geothermal heat in the Irish context.
    - Research on the role financial supports could play.

- Environmental risks:
    - Identification of mitigation strategies and actions for environmental risks associated with geothermal exploration and exploitation.

Codema supports the research priorities above that are discussed in the draft policy statement, as essential to understanding the overall viability of geothermal energy in Ireland, and to what degree it can contribute to decarbonisation of our energy system.

Codema proposes that a pilot and demonstration project for geothermal-district heat is urgently funded and developed to allow feasibility assessment of this potentially important pathway.

Codema additionally proposes research into:

- Business models in terms of both exploration and asset ownership and operation5.
- The inclusion of geothermal potential in local area spatial energy planning to facilitate awareness and planning capacity for delivery of future projects

[5] For example, in the Netherlands, the government de-risks geothermal exploration by covering the costs of up to 85% of exploration. If the exploration is successful, they receive their costs back. Energy support measures and their impact on innovation in the renewable energy sector in Europe, Annex - Case Study - The Netherlands, European Environment Agency, 2014

Geothermal energy use-cases beyond district heating should be explored

Codema support geothermal research for a range of use cases. While district heat is potentially a significant use case for geothermal energy, the many other use cases identified in the draft policy statement need further research to ensure optimum use is made of this resource.

As highlighted in the consultation there are a range of industrial and food applications that could represent an important opportunity for research and exploration.

Codema support public availability of geothermal data as outlined in this policy statement

This policy statement outlines plans for a National Geothermal Database, which will be a centralised location for key geothermal data. This may be updated using data received from geothermal exploration and exploitation projects. Codema supports open access data in this manner to enable maximisation of renewable and low-carbon energy sources.

Regulatory framework:

Codema support the introduction of a regulatory framework as outlined in this policy statement

District heat networks currently do not have a standardised financial and investment support framework. To build a geothermal district heat network where the availability and cost of the heat source is unknown at project initiation is not feasible.

Codema supports a regulatory framework that will improve knowledge and certainty of heat availability and heat cost from geothermal projects, as this will improve the ability of district heat developments to base projects on geothermal energy.

Codema note that timelines for geothermal regulatory framework development and legislation, plus time for geothermal research and exploratory drilling mean that geothermal energy is unlikely to scale significantly before 2030. This suggests that district heat networks completed before 2030 are likely to use alternative heat sources and technologies such as waste heat and heat pumps.

Additionally, as district heat is proposed as a key use case for geothermal, a geothermal advisory group could benefit from DH expertise.

Codema support different regulatory paths for small and large projects

Codema support this pathway that allows smaller scale ground source heat pumps to be excluded from the expanded regulatory oversight required for larger projects where these smaller systems are not located within/do not adversely impact environmentally sensitive areas (SPAs, SACs, etc.).
An alternative option to a 70kW threshold for an exploration licence could be an abstraction rate or depth threshold. For example, systems which extract groundwater could be linked to existing requirements in terms of registration with the EPA, where abstracting >25m3/day and require licencing from the EPA if abstracting >250m3/day. It should be noted that in the case of deep geothermal, the abstraction and reinjection of groundwater happens far below the surface (multiple kilometres below the surface) and may have a lower impact on the near-surface environment as a result.

Codema suggest inclusion of additional descriptive data in the proposed geothermal archetypes

The archetypes could benefit from following useful descriptive criteria:

- Listing the depth range of archetype – shallow, deep, or a specific range.
- Listing the supporting technology required to harness the energy (e.g., heat pumps, turbines, organic Rankine cycle, other).
- Listing any environmental considerations specific to different archetypes.

Codema supports the inclusion of environmental protections in the policy statement and regulatory process as identified in the Environmental Impact Assessment and the Appropriate Assessment.

For further enquiries regarding this submission, please contact:

Ciarán Murphy, Research, Development & Innovation Lead ciaran.murphy@codema.ie
John O' Shea, Energy Systems Analyst/Heat & Electricity Lead john.oshea@codema.ie
Donna Gartland, Chief Executive Officer donna.gartland@codema.ie