

## Enterprise, Waste & Circular Economy

Q20: What measures can be taken to accelerate the uptake of carbon-neutral low temperature heating in manufacturing?

**Geothermal Association of Ireland:**

Currently, of all the heat produced in Ireland, 33% of it is allocated to industrial heating (SEAI, 2021), with heating and cooling accounting for 50-90% of an individual processing plant's entire energy consumption (GEA, 2021). Reducing this carbon footprint can be accelerated through the introduction of incentives to encourage industrial heat pumps which can use a primary clean source of energy (e.g. geothermal) or capture waste heat from secondary processes such as refrigeration and waste-water disposal. Tax incentive aimed at corporate organisations, such as tax credits or deductions could be given for on-site use of renewable energy or renewable energy systems, particularly focusing on areas where there is a complete removal for the requirement for fossil fuels, for example using waste water or geothermal as the primary energy source for the industrial heat pump.

Q21: What measures can be taken to decarbonise high temperature heating in industry?

**Geothermal Association of Ireland:**

Decarbonising high-temperature heating in industry can be achieved through a pathway of complimentary processes aimed at maintaining current production whilst reducing emissions: 1) switching to zero carbon fuels; 2) utilising zero carbon heat sources where applicable; 3) electrification of heat; and 4) improved heat management. It should be mentioned that financial investment remains the biggest barrier to this pathway and would require invested input from policy makers. Additionally, for high temperature steam requirements, a stepwise process is potentially applicable. Industrial heat pumps are available today with multi-MW capacity and delivering temperatures in excess of 150°C. These can be used for pre-heating from clean sources (e.g. geothermal) so that less fossil fuels are used for the incremental heating.

Switching to zero carbon fuels-In instances where alternative heat sources such as geothermal, solar-thermal or heat pumps are not sufficient to produce the required heat, alternative zero carbon fuels such as hydrogen, ammonia, biofuels and synthetic hydrocarbons (with carbon capture and storage) can be applied. However, regulations would be needed to ensure that no alternative is possible, and that waste heat is being adequately utilised (see heat management). Furthermore, ongoing research and development would be needed to ensure cost competitiveness with traditional fossil fuels.

In instances where carbon is a necessary component in an industrial process, such as steel manufacturing, it is imperative that all CO<sub>2</sub> produced is captured for long-term storage in order to remain carbon neutral.

Zero carbon heat sources-Where applicable, high temperature zero-carbon heat technologies should be considered. These include: solar thermal and geothermal, both of which can and should be coupled to industrial heat pumps.

Electrification of heat-As one of the world's leading producers of wind energy, Ireland has significant potential to supplement zero carbon heating sources. Whilst it is optimal that renewable electricity not be used where a zero carbon heat source is accessible, the availability of electrified heat can fortify heat security. Electrification of heat has the added benefit of being easily adaptable to current infrastructure and can be rapidly applied. Additionally, using surplus electricity when renewable electricity supply outstrips demand to generate heat for thermal storage could benefit the grid and reduce demand at times of lower electricity supply. Geothermal can play a role in hourly, daily and seasonal thermal storage.

Heat management-The application of the above mentioned pathway cannot be efficiently implemented without appropriate heat conservation measures to ensure minimal heat loss. In relation to this, polices are needed to ensure waste heat is captured for further use, either in secondary industrial processes (such as drying, washing, etc.) or is funnelled for external use such as agriculture or in district heating.

As such, there exist opportunities to integrate industrial facilities that would allow for compounded heat input and distribution. Further to this, continued research and development should be applied to model and optimise integrated industrial parks.

Furthermore, heat storage is an essential part of heat management and integral to recapturing waste heat. Excess heat lost to cooling processes such as refrigeration should be stored underground to be use for heating purposes. Similarly, with regards to geothermal electricity generation, excess electricity generated during periods of low consumption, could be converted to heat and stored underground. This heat can later be reconverted back to electricity during periods of high consumption, or use for heating purposes when required.

## Built Environment

Q39: Further to those technologies identified in previous iterations of the Climate Action Plan, what other additional measures could be used to reach our emission reduction target in this sector?

**Geothermal Association of Ireland:**

At present, low temperature heating and cooling is one of the biggest consumers of energy in Ireland. Whilst heat pump technology is acknowledged and being pursued, not enough emphasis is being placed on differentiating between various heat pump technologies. This lack of differentiation is best seen in SEAI purchasing grants, which provide a maximum value, irrespective of the heat pump purchased. Similarly, most building decarbonisation models focus on seasonal heat demand and neglect seasonal efficiency and wear-and-tear on heat pumps.

This is a fundamental flaw in driving heat pump adoption and significantly hampers low temperature heating solutions. Compared to air-source heat pumps, ground source heat pumps have a constant year-round efficiency, a longer life-span and significantly contribute to cooling as well as heating, storing heat in the subsurface during summer months. Geothermal based solutions also pull less from the grid at times of high demand, as opposed to air-sourced. This reduces the grid upgrade requirements significantly. A system wide look at how electrification of low grade heat impacts the overall energy demand, and systems requirements (e.g. grid) is essential for an effective route to electrify heat.

Emphasis should be placed on the benefits of various heat pump technologies and financial incentives should reflect these benefits, providing increased funding and public knowledge for the use of more efficient heat pump technologies. This should focus on a holistic look, rather than just the one-off cost to the consumer. Otherwise we can end up with a grid that is either not able to support the demand or a large country wide expense to upgrade the grid.

Q40: What specific measures would incentivise a greater rate of oil boiler replacement?

**Geothermal Association of Ireland:**

Whilst the initiative to install 600000 heat pumps by 2030 in Ireland, under the 2021 Climate Action Plan, is progressively ambitious, succeeding in this ambition is dependent on customer adoption. The biggest barrier to this adoption is the upfront capital. The deterrent of a €5-15000 cost is not sufficiently balanced by the €4500 grant (for apartments) offered through the SEAI Heat Pump System Grant.

Proposing a 'rent-to-buy' scheme that runs concurrent to the present grants schemes could encourage rapid adoption of low temperature heating. This scheme could allow residents to acquire a heat pump system without the up-front burden of cost, similar to schemes proposed by heat pump installers in Germany.

In addition, under the aforementioned grant scheme, no financial distinction is made between air-source and ground source heat pump systems. Without any distinction, customers will likely opt for cheaper air-source pump systems, despite ground-source systems having a higher year-round energy efficiency and a longer life-span.

Q41: What is the next step for geothermal energy application to the built environment?

 Geothermal Association of Ireland:

Currently there is no legislation governing the licencing, regulation, production/extraction and sale of geothermal energy. Whilst the significant effort being undertaken by DECC to secure Ireland's legislative foothold in the geothermal industry is acknowledged, the present lack of specific policies governing the industry remains the biggest barrier, as such, the 'next step' is to implement user-friendly policies and legislation to allow for rapid investment from interested parties. Ensuring that the new policy and associated regulations make it easy for the individual or community to select ground source heat as a viable and competitive option is essential.

All of these solutions are also lacking a coherent plan for developing the capabilities to deliver (air, ground, heat pumps etc). There is a significant opportunity to create skills, expertise and jobs in renewable heating that currently don't exist.