Policy Position Paper

The effect of Part L Building Regulations on the District Energy sector in Ireland

Irish District Energy Association

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Context

The purpose of this position paper is to address the current policy barriers to successful roll-out of low-carbon district heating schemes in Ireland. District heating has the potential to significantly lower carbon emissions in the Irish energy sector; taking buildings off individual fossil-fuel based systems and connecting them to a centralised source of large-scale low-carbon heat supply, and also enabling the integration of more renewables on the electricity grid through large-scale thermal storage. The new programme for government specifically references DH actions and the National Energy & Climate Plan (NECP) has specific targets for DH implementation by 2030.

There are huge resources of renewable and zero-carbon heat in Ireland, many of which are not accessible through individual heating systems. There are also large quantities of deep geothermal and water source renewable heat that become financially viable when used at scale in DH schemes. Importantly DH systems allow the combined use of all available renewable heat sources, including biogas, biomass, solar thermal, renewable electricity, etc. Preliminary results of the 'Irish Renewable Heat Plan'[1] (Figure 1) show the vast zero-carbon and renewable resources available for heating across Ireland, and a large % of those resources, 132PJ, will not be realised without the use of DH. Connection to district heating has been shown to be the lowest capital cost solution for non-fossil fuel based heating supply for new households to meet the latest building regulations[2], meaning it can also help to reduce the cost of new housing.

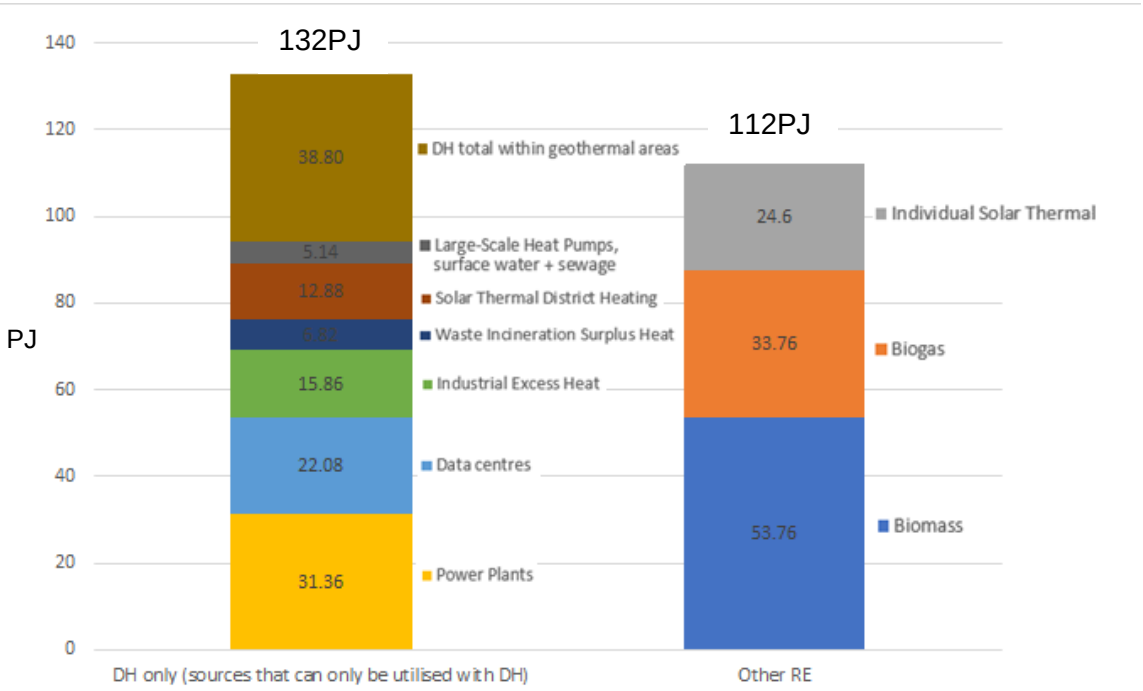

*Figure 1: **2030 Renewable Heat Resource Potential** (Source: Preliminary results of the Renewable Heat Plan Ireland project – XD Consulting on behalf of REI, IrDEA & IrBEA)*

There is also a large portion of Ireland's heat demands that are favourably spatially distributed for

[1] *Currently being developed by XD Consulting on behalf of Renewable Energy Ireland, IrDEA & IrBEA*
[2] *Report on the development of cost optimal calculations and gap analysis for buildings in Ireland under Directive 2010/31/EU on the Energy Performance of Buildings (recast) - AECOM for DHPLG*

DH supply, with more than 35% of Ireland's heat demands in DH feasible zones[3], mostly in urban areas of villages, towns & cities. The figure below, for example, shows the large number of areas of high heat demand density which overlap with locations of large conventional excess heat activities (large industry and power plants). While DH is most feasible in dense urban areas, there are many opportunities for smaller rural schemes, involving local communities and using local resources such as biomass and large solar thermal arrays - this opportunity is highlighted by the many rural Danish DH examples.

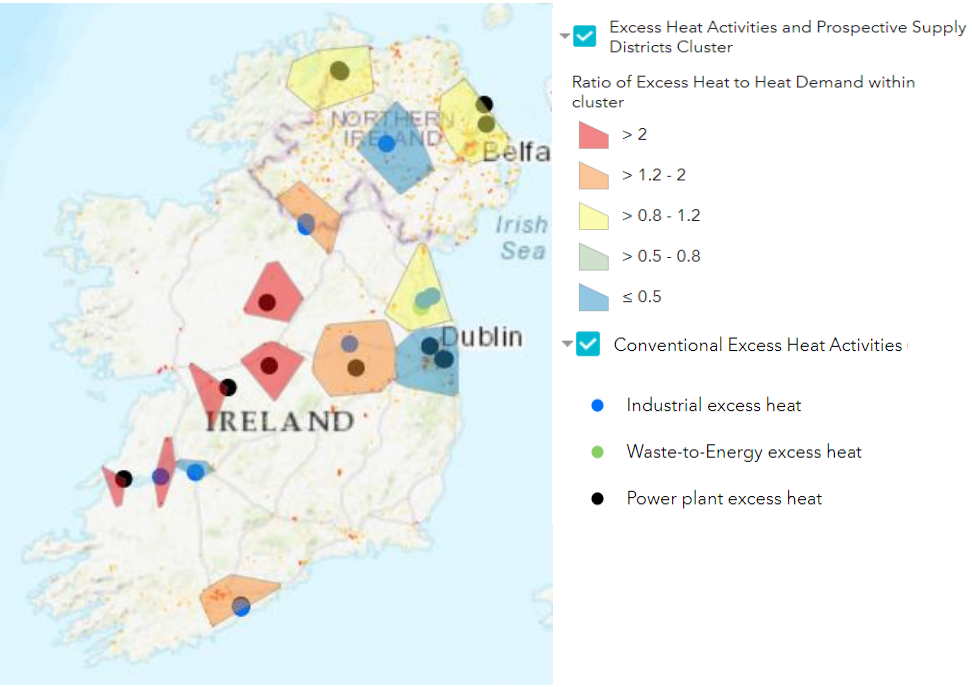

Figure 2: Excess Heat Activities (from large industry on ETS) and Prospective Supply Districts Clusters

It is also important to note that the issues being highlighted in this paper now is due to urgency, and is not to be taken as an exhaustive list of barriers for DH – this paper focuses on the issues regarding the building regulations Part L and the treatment of DH and DH sources within the current assessment tools. If DH is to fulfill its potential in Ireland and play a key role in decarbonising the heating sector, then the barriers discussed in this paper need to be addressed as soon as possible, as they are already having a negative effect on the industry and projects getting off the ground. The pilot DH projects, funded under the Climate Action Fund, and actions referred to in Project Ireland 2040, the Climate Action Plan, and the Programme for Government, are now under threat and the issues here need to be addressed immediately.

Issues

1. **Direct use of Waste Heat does not contribute to 'renewable' energy requirements in the assessment methodologies used for compliance with Part L of the Building Regulations**

[3] Results of the Irish Heat Atlas http://www.districtenergy.ie/heat-atlas

As defined in the recast EU Renewable Energy Directive (RED), 'waste heat and cold' means unavoidable heat or cold generated as a by-product in industrial or power generation installations, or in the tertiary sector, which would be dissipated unused in air or water without access to a district heating or cooling system, where a cogeneration process has been used or will be used or where cogeneration is not feasible. It is also sometimes referred to as 'excess heat' or 'surplus heat'.

Examples of waste heat sources are industries using high temperature thermal processes (i.e. cement production or large bakeries), industries that require large scale cooling (i.e. data centres, large refrigeration warehouses) and thermal generation of electricity. Thermal power stations (e.g. incineration or gas-fired turbines) for example, lose at least half of the primary energy input in the form of heat, vented to air through ventilation stacks or to nearby water bodies. Any carbon emissions emitted in the process of creating this heat is attributable to the primary product - e.g. to the kWh of electricity generated or the bag of cement produced. The waste heat is therefore a carbon-free energy source that is currently disposed of, sometimes at a cost. There are also many other sources of waste heat that are now becoming viable to use for building heating demands, as is highlighted in the EU project ReUseHeat[4], such as underground transport systems and electrical transformer substations.

There are two types of waste heat sources -
high grade waste heat, which are those sources that are at a directly usable temperature (>80℃) for heating older, less efficient buildings during peak winter periods, and come mainly from large industry and power stations,
and *low-grade waste heat*, which are those sources that may be at a directly usable temperature for heating in newer builds (<80℃) but require an uplift through the use of heat pumps to supply to older, less efficient buildings, during peak winter periods and come from sources such as data centres, underground transport systems, etc.

Under the recast RED, it states "*Member States shall **ensure** that their competent authorities at national, regional and local level include provisions for the integration and deployment of renewable energy, including for renewables self-consumption and renewable energy communities, and **the use of unavoidable waste heat and cold** when planning, including early spatial planning, designing, building and renovating urban infrastructure, industrial, commercial or residential areas and energy infrastructure, including electricity, district heating and cooling, natural gas and alternative fuel networks.*"

Waste heat and cold can contribute to Ireland's renewable heating and cooling targets and contribute to the 2030 non-ETS CO2 reduction target. Article 23(1) of the recast RED seeks to promote the use of renewable energy in the heating and cooling sector, whereby each Member State is to attempt to increase the share of renewable energy supplied for heating and cooling by an indicative 1.3% as a yearly average for the periods 2021-2025 and 2026-2030 (Art 23(1)). Waste heat can provide up to 40% towards the yearly target of the 1.3% increase of renewable heating and greatly assist Ireland to meet our targets and move from second-last place in Europe to becoming leaders in renewable heat.

Under the current Part L of the building regulations, both new dwellings and buildings other than dwellings are required to have a portion of their heat and/or electricity demand

[4] https://www.reuseheat.eu/category/waste-heat-recovery/

covered by renewable energy - called the 'Renewable Energy Ratio'. Using the DEAP or NEAP/SBEM assessment systems, building designers and BER assessors can assess whether the building design meets the RER target. The main purpose of the RER, and the purpose of using renewable energy in general, is to reduce CO_2 emissions. Waste heat is a zero-carbon heat resource that can contribute to our renewable heat and CO_2 targets, and therefore should be treated as being as advantageous as using other renewable energy.

There are two other targets (coefficients) that must be met under Part L, and they relate to energy efficiency and CO_2. A Maximum Energy Performance Coefficient (EPC) of 0.3 and a Maximum Carbon Performance Coefficient (CPC) of 0.35 must not be exceeded, as well as a minimum RER of 20%. There is a contradiction when trying to attain the overall aim of reducing a buildings CO_2 emissions and trying to balance the three CPC, RER and EPC criteria; a building can far surpass the CO_2 and efficiency targets when using DH from waste heat, but still will not pass the building regulations as it wont meet the RER without further on-site renewable energy - at an additional cost to the building developer, meaning DH becomes uncompetitive. The outcome is a building with higher CO_2 emissions will be the preferred option as it can meet the RER target.

As it stands, a building heated using direct high-grade zero-carbon waste heat from a DH system will not meet the building regulations, but a building heated by a fossil fuel gas fired CHP supplied heating system will. A building heated using low-grade zero-carbon waste heat in-directly through a large-scale heat pump achieving very high efficiencies (>400%) will also struggle to compete with other higher carbon solutions, as only a fraction of the waste heat (exhaust air) used by the heat pump is allowable as 'renewable'. There is currently at least 87.5 PJ/year (24TWh) of waste heat available in Ireland, which is equal to ~50% of Ireland's total heat requirement (173 PJ/year). To put that in perspective, the GNI target of renewable gas on the network by 2030 is 42 PJ/year. Even if half of the waste heat available was utilised in DH schemes, it would make a significant impact on Ireland's CO_2 emissions from heat, as well as contributing to circular economy goals and increasing security of supply.

Short-term solution:

Allow for waste heat from process and power stations to be a direct input and accounted for as a renewable energy source with a renewable primary energy factor along with an appropriate non-renewable primary energy factor to account for the energy required to deliver this waste heat (i.e. electricity for pumping etc.). This should be provided by a suitably qualified engineer based on data from the District Heating Scheme operator.

Long-term solution: Remove the RER and assess buildings on energy efficiency and CO2 target - CO2 reduction is the main objective and the reason why renewable solutions are used, therefore it should not matter where the energy comes from as long as it reduces carbon and moves towards carbon neutrality.

2. **100% biofuelled (renewable) DH cant compete with individual heat solutions, even though other solutions use energy/fuel that is not 100% renewable.**

Under the current Part L of the building regulations, both new dwellings and buildings other than dwellings are required to satisfy three conditions - a maximum Energy Performance

Coefficient (EPC), a maximum Carbon Performance Coefficient (CPC) and a minimum Renewable Energy Ratio (RER). Using the DEAP or SBEM assessment systems, building designers and BER assessors can assess whether the building design meets these requirements the main purpose of which is to reduce overall energy consumption and CO2 emissions.

A range of DH systems were modelled[5] using both DEAP 4.2.1 and NEAP v5.5 for typical building examples. The DEAP analysis was carried out using a standard apartment with a floor area of 81m2 and designed to NZEB standards. The NEAP analysis was completed using the Example Building model provided by SEAI as part of the software. The analysis showed that a DH system that is operating on 100% biofuel will not comply with current building regulations even though it is almost 3 times lower than the maximum CPC and 4.5 times better than the minimum RER. The system fails to comply with the EPC and can only reach compliance if the primary energy factor of the district heating system is less than 1. This means that only district heating systems usings heat pumps (or systems with a z-factor) will comply with buildings regulations without the need for onsite renewable energy generation. To achieve compliance additional systems generating either renewable heat or electricity will be required for each dwelling. For renewable electricity this will likely mean the addition of solar PV panels (6 to 8 per dwelling) producing approximately 80% more electricity than the consumption estimates by the DEAP calculation. This will likely lead to the production of excess electricity at no benefit to the homeowner.

Biomass DH can play a large part in the decarbonisation of heat in Ireland particularly in many of the larger rural towns such as Tralee. Biomass DH has the distinct advantage over individual biomass systems as it is of sufficient scale for all associated air quality issues to be correctly addressed. This requirement for additional renewable energy systems for each individual building connected to a 100% biomass DH system appears counterintuitive and raises a barrier to connecting new buildings to such a system. In fact the equivalent DH system operating on a gas CHP system achieves better results in terms of EPC compliance while just about achieving the CPC and RER requirements. Hence a gas CHP DH system would require less additional renewable energy so would represent less of a barrier to potential new connections. However this system would release significantly more GHGs over its lifetime than the 100% biomass system and contribute very little to the local economy. Each dwelling connected to this system will emit almost 3 times the CO2 of the fully biomass renewable district heating system.

Short-term solution:
Allow buildings connected to a biomass DH system to use a *Biomass DH Offset value*. This would have the equivalent effect to adding solar PV panels to each building and could be entered into the Renewable and energy saving technologies section of DEAP. For non-domestic applications, an adjustment to the primary energy consumption factor in the District Heating Parameters section in NEAP could be allowed for.

Long-term solution: vary the EPC in relation to the RER. Allow the EPC to decrease by 10% for each corresponding increase in RER up to a maximum EPC limit. This is similar currently used in NEAP calculation to determining the most appropriate RER which is dependent on the EPC. Essentially a building can be supplied with significantly more renewable energy then the minimum required then the energy performance coefficient

[5] *Modelled by Codema - Dublin's Energy Agency on behalf of IrDEA & Dublin City Council*

should be relaxed to compensate. This avoids the addition of further renewable energy technology such as PV and its associated embodied energy and carbon

We would like to engage with the relevant departments and government bodies so we can together find a solution that will overcome the above issues and enable Irish District Energy projects to compete fairly with other low-carbon solutions and contribute positively to reducing carbon emissions from our heating sector.

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