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Creating an Investment Climate for Clean District Heating

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Scotland's journey to decarbonize heating highlights challenges and solutions for sustainable energy transitions. By integrating large heat pumps, addressing electricity costs, and fostering collaboration, Scotland aims to expand heat networks to 10% by 2035. Key recommendations include confidence in heat sales, commercial viability, and a unified national vision, serving as a roadmap for global net-zero goals.

Introduction

As countries worldwide confront the urgent need to transition away from fossil fuels, Scotland's experience offers valuable lessons for any nation pursuing sustainable energy solutions. With rising fuel poverty and pressing climate legislation, Scotland's journey to decarbonize its heating sector is increasingly urgent. The country aims to significantly expand heat networks; an essential component in reducing carbon emissions and enhancing energy resilience.

Whilst many countries have achieved district heating from combustion sources, Scotland and the UK chose gas. On one hand, a blank canvas. On the other a legacy fuel that continues to offer a cheap counter-factual. Scotland must overcome this and strategise a

way ahead to a district heating landscape not underpinned by combustion but harnessing ambient and waste heat with large heat pumps.

Scotland's reliance on gas heating must diminish rapidly. This transition, signposted by one of the most impressive district heating schemes in the world from a sustainability perspective, has stalled. Figure 1 is of Queens Quay near Glasgow, which is the first and last such facility, which commenced in 2017.

Whilst it is recognised that a "Just Transition" presents an opportunity to foster sustainable and affordable heat networks, generating significant socio-economic benefits and commercial prospects for a Net Zero Scotland, the underlying policy and commercial landscape remains incompatible with subsidy free development. The UK aims to reduce fossil fuel dependence, as the heating sector contributes 37% of annual carbon emissions. Creating the circumstances whereby heat networks are a low-cost, low-carbon solution is critical for urban decarbonization. However, current policies hinder optimal deployment rather than enhance. This article outlines three thematic areas for simple, effective policy shifts to enhance heat network viability. At little or no cost to either the Scottish or UK Government.

A critical aspect of this transition is the recognition that future district heating systems must rely less on traditional heat sources, such as combusting domestic waste, and instead embrace cleaner alternatives. Much of the market activity craves success in this first activity, but it will be short-lived and stunted in capacity. The policy upheaval must be through the lens of total decarbonisation and sustainability. This shift will necessitate the integration of large-scale heat pumps, which utilize renewable electricity to provide low-carbon heating. Consequently, electricity policy becomes a pivotal theme in the successful deployment of heat networks. Effective electricity pricing and infrastructure will be crucial in making low-carbon heat accessible and economically viable for consumers.

Scotland's ambitious targets to increase the proportion of heat supplied by these networks from under 2% to 8% by 2030, and closer to 10% by 2035, demonstrate a commitment to creating a more sustainable and affordable heating landscape. However, the challenges faced in this transition underscore the importance of heat related policy design and regulatory frameworks. This is mirrored by world class deployment of on- and offshore wind, but currently, the linkages are missing, with almost all generated power fed into a grid, which subsequently layers on legacy policy costs, making feed-in rates balloon from approx. €80/MWh to closer to €300/MWh for power purchase even just a few kilometres away.

For countries seeking to implement similar initiatives, Scotland's experience highlights the necessity of fostering collaboration between government bodies, industry stakeholders, and communities. But more importantly, is the close interplay between electricity

generation and heat production. By prioritizing clear communication, economic viability, and integrated planning, nations can cultivate a robust environment for heat network development. As we delve into the proposed policy shifts and strategic recommendations, the lessons being learned in Scotland (there is a long way to go) can serve as a roadmap for other countries aiming to achieve their own net-zero ambitions in a sustainable manner.

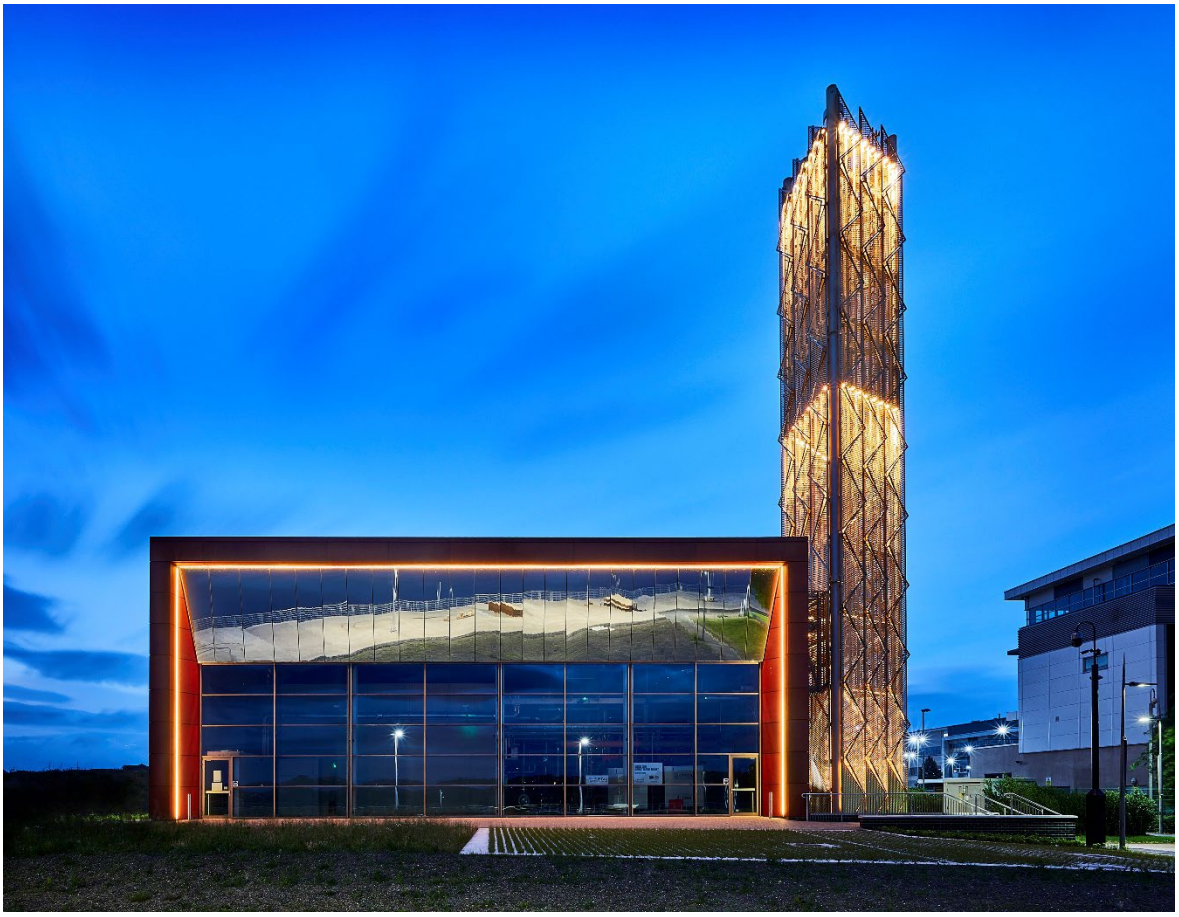

Figure 1: Photo of Queens Quay near Glasgow, which is the first and last such facility - commenced in 2017

Focal points:

To accelerate the deployment of large-scale heat networks in Scotland's urban areas, we identified three critical themes:

1. Confidence around offtaker heat sales
2. Commercial viability when compared to the status quo
3. Communication of a vision for clean district heating based on a national integrated plan

From these discussions, we have compiled a series of pragmatic 'asks' directed toward the Scottish and UK Governments. Recognizing that policy and regulation in this area require a joined-up approach, we emphasize the need for Scotland to adopt a "Whole Systems" Energy Planning framework.

The interdependencies between various energy vectors, such as the increasing pressure on the electricity grid, can be effectively addressed through large-scale district heating schemes. Isolated planning will lead to higher costs for both public and private sector bill payers in Scotland.

We strongly advocate for treating heat networks as a new utility, integral to the national and regional integrated energy design and planning processes led by the new National Energy Systems Operator (NESO) and Regional Energy Strategies (RESPs). This approach would empower heat network developers and operators to adopt existing utility rights, facilitating effective multi-vector energy planning essential for a successful energy transition.

Current state of play

Currently, there are a limited number of operational district heating schemes in Scotland. These have been primarily established by local authorities or Universities and other public sector estates. Subsequent schemes are unable to secure commercial partners for construction with the demise of funding models either associated with gas CHP, subsidised biomass, or subsidised heat pumps. Examples of large-scale, mixed offtaker, low-carbon schemes receiving minimal state incentives are scarce.

While significant progress has been made in early-stage feasibility, regulatory development, and consultation, the transition remains sluggish. Many projects are deemed unattractive, presenting high-risk investment opportunities. Where appealing projects do exist, they are often limited in scale and heavily subsidized to meet necessary financial benchmarks. Overall, progress on project delivery falls short of the required levels, indicating that current Scottish Government policy interventions are not meeting ambitions. The limited market activity in Energy from Waste plants should be set against the reality of both a moratorium on new planning consents for such facilities whilst the

sustainability criteria are reviewed and a limited volume of feedstock versus long-term heat demand.

What needs to change?

In a nutshell, it needs to be commercially viable to make clean heat with big heat pumps.

The barriers to rapid adoption in Scotland primarily reside in policy rather than technology. This article proposes several landscape adjustments to achieve the desired progress.

The Scottish Government is collaborating with the UK Government to address various policy and regulatory challenges across the wider energy sector, however, it should be said though that currently, the collaboration seems to focus more on the deployment of more renewable electricity generation rather than the mutually beneficial harnessing of already existing but curtailed electricity generation by ultra-flexible resources to make clean heat.

1. Confidence of offtaker heat sales

As simple as it may seem, the certainty of sales of clean heat is not yet where our society is at versus a highly regulated and successful gas network. For heat networks to be financially viable, a sufficient number of customers must commit to their adoption, creating a predictable demand stretching forwards several decades. This collective action is vital for reducing commercial risk and attracting private sector investment. However, without clear public policy and regulation identifying heat networks as the preferred solution in specific areas, this collective action is unlikely to occur.

We propose the following key "asks":

- All Governments should clarify the shift away from gas for heating buildings with a backstop date for replacement gas boiler sales.
- Governments must explicitly state that heat networks are the preferred solution for heating in denser urban areas, provided a “credible offer” is available at a “fair price.”
- Public sector buildings should be prioritized for connection to district heating where such offers exist, and any funding allocated to Local Authorities, Higher Education, or Healthcare must support district heating connections when located within heat network zones.
- New properties in or near heat network zones should be mandated to connect to these networks, with planning consents allowing for a transition to heat network consumption within ten years.

Defining a “fair price” within 25% of average retail gas prices would help create confidence in the district heat market, ultimately driving billions in private investment and creating employment while reducing costs and health problems associated with poor air quality.

2. Commercial Viability Compared to Status Quo

Establishing a low-risk, high-certainty capital investment environment is essential, but it must be paired with effective cost management strategies to ensure competitive heat pricing. The likely use of large-scale heat pumps for low-carbon heat means that electricity pricing is the most significant factor affecting market viability.

Recognizing that electricity policy is a reserved matter for the UK Government, a coordinated approach is necessary. Proposed measures include:

Option A: Custom Electricity Tariff for Heat Pump Operators

Implementing a new support scheme to provide operators of commercial scale heat pumps with significantly lower electricity tariffs estimated to be 67% to 75% below current prices, could create a favorable environment for heat networks. This would facilitate competitive pricing without being classified as a subsidy. This is probably the primary message to other European neighbours; ***if you want clean district heating, manage the supply and price of the electricity market to make projects viable.***Option B: Reducing Risk of Private Electricity Transmission

Option A requires a UK Government policy shift. Thinking within the policy boundaries of Scotland; Underwriting the utilization of existing high-voltage transmission infrastructure for clean heat facilities would lower barriers to entry for heat network developers. This could involve mandating side offtake from new transmission hubs in planning consents and fostering collaboration between the electricity sector and heat network developers.

Figure 2 - Whitelees near Glasgow. Largest land-based windfarm in Europe but power costs 4x as much just 200m down the road due to outdated pricing policies. Reducing deployment costs is another essential step for the Scottish Government, which has devolved authority in areas like clean air, planning, and heat. Effective coordination in these domains will yield positive outcomes for district heat network deployment.

A strong message must be to any Government though; “don’t try and fix the cost of all electricity. To make clean heat viable, just correct the cost of electricity for the decarbonisation mission. This will be simpler and quicker and more likely to be achieved.

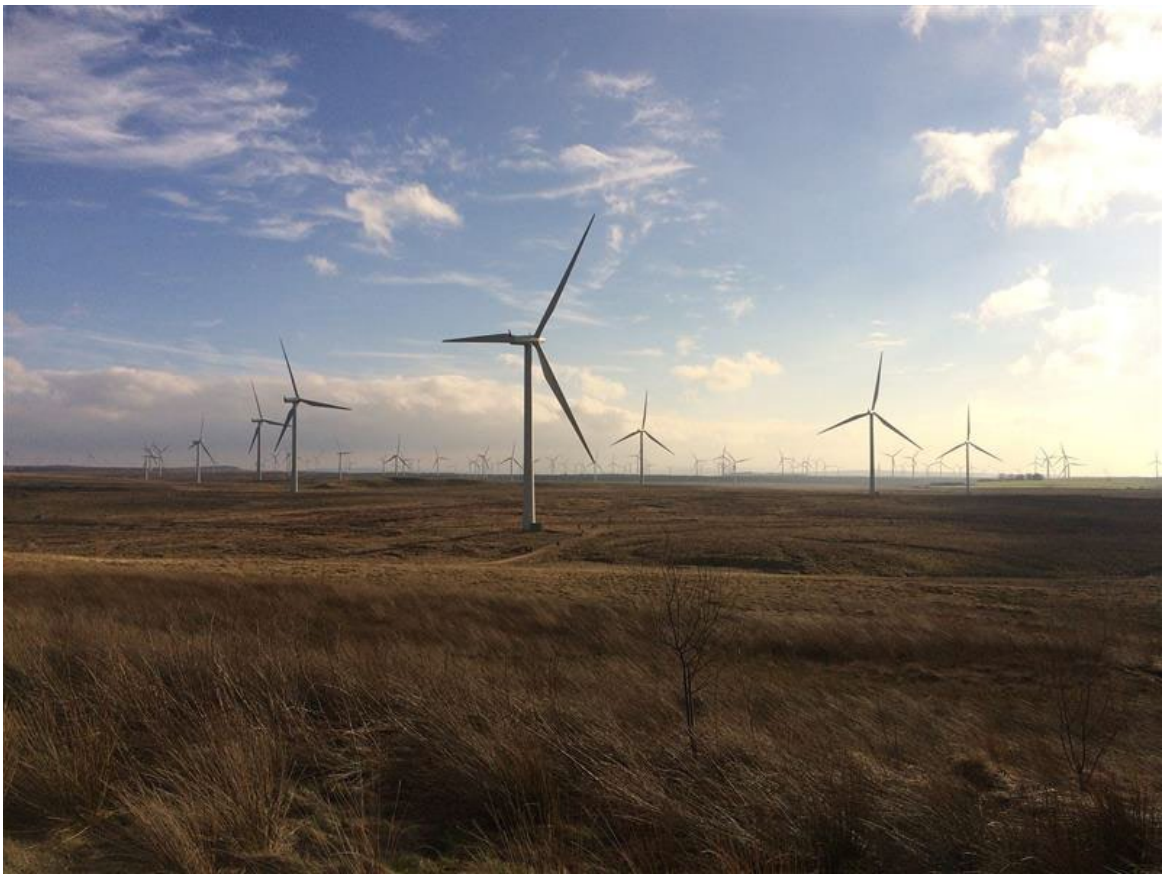

Figure 2: Photo of Whitelees near Glasgow. Largest land-based windfarm in Europe, where power costs are 4x just 200m down the road.

Figure 3: Photo of Ammonia heat pump harvesting heat from the Clyde estuary

3. Communication of a vision and plan for clean district heating

Finally, effective communication is vital for fostering stakeholder engagement and ensuring a cohesive strategy for transitioning to clean heat. The following actions are recommended:

- The UK Government should clearly communicate its intention to phase out natural gas as the primary heating solution for UK buildings over the next two decades. This statement would provide direction for investment in low-carbon heat solutions.
- The Scottish Government should publish a detailed strategy outlining a timeline and plan for achieving heat network uptake objectives by 2035. This includes communication tools and stakeholder engagement to ensure wide understanding and broad support for the transition. Awareness of individual domestic heat pumps is creating a vacuum for those in properties not suited to these, but without clarity that heat networks will be provided. Creating this publicity without the economics being resolved to somewhere close to gas is clearly not a good plan.
- Establishing a formal, representative industry group focused on clean district heating will allow effective engagement in heat network policy, facilitating billions in inward investment for decarbonization efforts. Across Europe, there is no forum

dedicated to clean district heating unencumbered by other industry segments. This creates a lack of a well-tuned sounding board for Governments.
- A pan-cabinet awareness session should be arranged to ensure that all parts of the Scottish Government understand their roles in this transition, creating a unified approach across diverse portfolios.

Clear and strategic messaging will be critical to garnering support for clean heat initiatives, emphasizing the benefits of clean district heating over individual heat pump systems. Figure 3 shows the Queens Quay river source heat pump which has proven the technical case using a natural working fluid, ammonia. The economic case remains to be achieved without subsidies.

Lastly, it is imperative that sustainability is at the heart of a heat pump paradigm. Synthetic working fluids might be technically established, but they are totally unnecessary in this segment and bring a wealth of worrying sustainability weaknesses, whether atmospheric or oceanic. The last thing we want are cleaner homes but dirtier drinking water.

Conclusion

The transition to sustainable heat networks in Scotland and the lessons being learned provides an instructive model for other nations. By implementing simple policy shifts that focus on enhancing confidence, commercial viability, and effective communication, governments can create a robust environment for heat network growth funded privately. This collective effort will not only help achieve ambitious net-zero targets but also drive economic growth and improve public health outcomes. As the world faces mounting environmental challenges, embracing these strategies will be essential for realizing a sustainable energy future.

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