DECENTRALISED DISTRICT HEATING IN THE EU: EVALUATING THE PARADOX AND PROPOSING A FRAMEWORK FOR ENERGY COMMUNITY EXPANSION

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Overview

To meet its obligations under the Paris Agreement (2015) the European Union developed the Green Deal in 2019, followed by Fit-for-55 which envisages reducing GHG emissions in the EU by 2030. The phase out of natural gas is one key policy priority for the EU – including decarbonising the Heating and Cooling (H&C) sectors, currently relying on fossil fuels and accounting for a staggering 62% of EU energy consumption. District Heating (DH) has been described as a "Swiss army knife for decarbonisation" due to its potential for combining the use of local renewable electricity and the use of excess heat from industrial and urban sources. On the other hand, to meet the new Commission's policy mandate for a consumer-centric energy transition that leaves no one behind, EU Directives have aimed to enable active energy citizenship through collective and individual means – including mainstreaming energy communities (ECs) in heating and cooling solutions. The decarbonisation of the H&C sectors by DHC cannot be treated in isolation from the justice-centric approach underlying EU energy policy and law. To this end, the decentralisation of DH through the expansion of ECs in the EU is a key opportunity for the decarbonisation of the H&C sectors while empowering active energy citizens in the EU. This paper conducts a Rapid Evidence Assessment to study the state of EC-owned and fuelled DH, providing an overview of the current state of ECs in the EU, and assessing their limitations. This presents a case-study analysis of the Danish heating transition to distil lessons learnt for the EU. The study highlights the need for a robust, interdisciplinary enabling Framework for ECs in the EU and concludes by proposing policy suggestions for the expansion of community district heating.

Methods

This article aims to answer the following research question: to further the EU Climate Law what role can regulated Energy Communities play in expanding decentralised and decarbonised District Heating in the EU? To analyse the role that ECs play in expanding decentralised and decarbonised DH in the EU Climate Law context, this article offers a structured search and assessment of the evidence related to the state of EC-owned and powered DH using the Rapid Evidence Assessment (REA) methodology. This is a type of structured and transparent search, collection, and assessment of evidence to inform law and enhance accountability within evidence gathering pertaining to regulatory and other analyses (Stone, 2013). The research also uses a case-study investigation of the Danish heating transition – specifically investigating the role of energy decentralization in district heating systems. Evaluating the heating transition in Denmark and the impact of decentralization through energy community development and the non-profit principle enables this research to understand the sphere of energy law and its application in a different context and to draw lessons from that (Yin, 2014). Denmark was chosen as the case study for several reasons. Firstly, Denmark has been successful in **decarbonising heat** due to path dependencies (Gross & Hanna, 2019). The comprehensive infrastructure planning in Denmark has resulted in cost-effective District Heat Networks (DHN) (Eikeland & Inderberg, 2016). Secondly, Denmark ranked first in the **Energy Trilemma Index (2023)**, indicating a balanced and robust energy system. Given the potential for delivering decarbonised heat using DHN (Stabler & Foulds, 2020) in the EU, and the successful implementation of DHN in Denmark presents an appropriate country case study for potential policy and implementation lessons. In 2023, DH supplied heat (space and hot water) to two-thirds of the heat demand for Danish households (Johannsen et al., 2023; State of Green, 2023). Cooperative culture and bottom-up innovation have played a key role in the socio-technical deployment of RES deployment (Johansen, 2022). Further, DHN play a crucial role in achieving Danish net-zero goals (Lund et al., 2017, 2018; Ma et al., 2020; Sorknæs et al., 2020; Johannsen et al., 2023). Data was collected from a variety of sources to ensure a comprehensive understanding of the heating transition in Denmark. These sources include government reports, energy policy documents academic literature, grey literature. By using Denmark as a case study, this research hopes to contribute to the broader understanding of how energy decentralization can play a role in achieving a sustainable and consumer-centric natural gas phase-out and heating transition.

Results

The evidence review reveals a gap in the literature and practice as to the implementation of EC-powered DHNs in the EU. While the Danish case study shows the benefits of localised DH ownership and decentralised fuels, this is not applied in the EU. Further, there is no enabling mechanism for the realisation of ECs' broad benefits, let alone their application in the H&C sector. Energy communities face some key challenges that can be categorised under:

infrastructural, financial, capacity-building and governance barriers in EU Member States. Some good practices are identified across the Bloc, but these are limited to 'professionalised' contexts, where ECs have been historically operational. The Danish case study further reveals good practices – that may be transferrable in the European context. DH is technologically complex, which further amplifies the abovementioned challenges faced by ECs. DHNs are characterised as natural monopolies, leading to issues in relation to price regulation and ownership structures. The inclusion of ECs in heating, and the extent to which these can be vessels for community engagement in the heating transition, is limited by the need for local stakeholder collaboration – particularly the engagement of municipalities. The following 'lessons learnt' can be distilled: a) the reimagining of ownership models for heating – particularly in relation to municipal and cooperative ownership; b) the implementation of the no-profit principle to enable affordable heating prices – particularly for vulnerable households – and the reinvestment of revenues in community initiatives; and c) strengthening municipal capacity to participate in DHNs. This informs policy proposals that account for some conceptual and practical stumbling blocks. First, the need for a balance between prescription and flexibility to allow ECs to engage in social innovation. Second, the need for a balance between a top-down approach enabling a bottomup governance vs the creation of a bottom-up decentralisation and decarbonisation.

Conclusions

In summary, this paper uses a REA and case-study to assess the role ECs can play in the decarbonisation of heating in the EU using DHN. This concludes by proposing policies for expanding the role of ECs in establishing decentralized and decarbonized DH to meet the European policy objectives for energy. Enabling EC involvement in DH, whether through community ownership or the distribution of renewable energy by ECs for DH systems, can yield significant socio-technical and political benefits, as demonstrated by the case study of Denmark.

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