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Challenges for energy data collection and sharing in Denmark

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Fig 1. Future energy systems will rely as much on data as on the pipes. Heat exchanger for district heating in Tingbjerg (Copenhagen), one of the cases in the IDASC project.

INTRODUCTION

It is an indispensable element of a transition towards renewable energy and higher energy efficiency to improve the flexibility of all types of producers, end-users, and on all aggregation levels in the energy sector. In a flexible energy system, electricity and heating systems are interconnected so that the district heating network can act as a storage facility for intermittent renewable energy sources, and the buildings - as heat storage during the peak load period. An increased digitalization and implementation of ICT solutions can help enhance the flexibility, reduce CO₂ emissions and increase energy efficiency and cost-competitiveness.

However, despite the increasing amount of energy-related data from smart meters and sensors in buildings, production plants and the grid, challenges persist for many actors involved in energy data provision, processing and storage. The various data initiatives are uncoordinated, there is uncertainty regarding security and privacy in data sharing, as well as silo thinking due to traditional organization and legislation, which complicate the possibilities for increased digitalization. An improved understanding of user experiences, access to relevant data and sharing possibilities could allow better use of energy data.

This ongoing study collects empirical data using semi-structured expert interviews of different stakeholders in the district heating value chain in Denmark and analyses the interviews using content analysis. The study is part of the project IDASC¹ (Intelligent data use in Smart Cities), which aims to collect and disseminate experiences about opportunities surrounding the self-learning energy systems. The following research question guides the study:

¹ <https://www.gate21.dk/intelligent-data-anvendelse-i-smart-cities-idasc/>

What challenges to data collection, storage and sharing are there, as perceived by actors within the Danish energy sector?

KEY RESULTS

While measurements from smart meters and sensors form very detailed energy datasets, a number of challenges for efficient data access, collection and sharing still exist. These barriers hinder the development of new products, services and business models, where energy data could be applied. As a result, opportunities for increased system flexibility, sector coupling, implementation of renewables and energy saving measures may be missed.

Our findings show that legislative, technical and data access-related barriers occur for most analysed stakeholders. Other frequently mentioned barriers are: organizational, insufficient knowledge, insufficient data security, and communication. In many cases, several intertwined challenges exist, often extrapolated due to insufficient coordination across stakeholders. Table 1 shows an overview of most frequently mentioned barriers.

Table 1. Frequent barriers as perceived by the interviewees (source: own study).

Barrier type	Examples
Legislative	<ul style="list-style-type: none"> - complicated interpretation of legislation for smart meter data ownership, storage, use and sharing - missing legal basis for novel data initiatives - data collection burden due to legal requirements - time-consuming processes around data agreements - overcompliance in order to be "on the safe side"
Technical	<ul style="list-style-type: none"> - insufficient data quality and resolution - concerns around managing large datasets
Data access-related	<ul style="list-style-type: none"> - difficulties in access to heat data - poor data usability
Organizational	<ul style="list-style-type: none"> - "opening up" requires changes internally and externally - private actors less willing to share data
Insufficient knowledge	<ul style="list-style-type: none"> - lack of qualified manpower - lack of customer-focused approach from IT companies
Insufficient data security	<ul style="list-style-type: none"> - risk of cloud providers overtaking ownership of data stored - risk of compromising data confidentiality
Communication	<ul style="list-style-type: none"> - insufficient internal coordination about time and task prioritization and labour division - involving people with different backgrounds in the data projects

CONCLUSIONS

This paper explores the availability of energy-related data and barriers to data collection and sharing, and provides recommendations. Legislative, technical and data access-related barriers are most frequent barriers, followed by organizational, insufficient knowledge, insufficient data security, and communication. In many cases, several intertwined challenges exist. Aspects such as uncertainty about the benefits of the various initiatives, security and privacy in data sharing, silo thinking due to traditional organization and legislation make the possibilities for increased digitalization complicated. These barriers hinder the possibilities for applying data in analyses that could reveal potentials for increased system flexibility, sector coupling, implementation of renewables and energy saving measures.

RECOMMENDATIONS

Table 2 displays recommendations based on the analysis of challenges for energy data collection and sharing in Denmark.

Table 2. Recommendations for improved data access and sharing (source: own study).

Target group	Recommendations
Companies (e.g. district heating companies, IT and electricity sales companies)	<ul style="list-style-type: none">• implementing templates for data agreements and guidelines for legislative processes• experience sharing on data handling
Municipalities	<ul style="list-style-type: none">• collaborating with e.g. research institutions to analyse available data; providing more data• coordinating with property managers to identify open questions; activating key players• coordinated data governance
National bodies	<ul style="list-style-type: none">• common standards for data formats e.g. within the Danish District Heating Association• legislation should dynamically follow the developments in data science• support and develop initiatives for open data and co-creation

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