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Energy system transformation and long-term interest constellations in Denmark: can agency beat structure?

Per Ove Eikeland, Tor Håkon J. Inderberg*

Fridtjof Nansen Institute, P.O.Box 326, 1326 Lysaker, Norway

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ABSTRACT

Since the oil crises in the 1970s, Denmark's energy system has evolved from import- and fossil fuel-dependency to self-sufficiency with a high share of renewable energy. This transformation has been supported by co-evolving energy policies. A policy shift in 2001 brought a temporary halt to the transformation, which resumed after a return in policy in 2008. Applying public choice- and path-dependency perspectives, this article analyses the development of the Danish energy system and co-evolving policies. Initial structural characteristics have strong explanatory power for the long-term policy trend: de-central ownership, and entrepreneurship have given local-level actors leverage as a political constituency. Over time de-central small-scale solutions (like windpower and district heating) secured generous state aid. Local-level actors provided technology solutions offering broad opportunities. One consequence was strong support for de-central technology solutions. The first policy shift is explained by a new government that advocated dismantling state regulation, subsidies and taxes, supported by a new political majority. The second policy shift is explained by mobilization of interests that had grown to include actors that generally supported de-regulation but saw their commercial interests threatened. The Danish model has inspired similar transformations elsewhere and offers lessons on how to overcome resistance to change.

1. Introduction

The challenges posed by climate change necessitate a global transition away from carbon-dependent energy systems. Denmark stands out as a robust transition case, with its energy system shifting from nearly full fossil-fuel dependency some forty years ago to a renewable energy share of around 25% in 2014, mainly bioenergy and windpower [1,2]. The transformation of the electricity and heat supply system has been comprehensive. The share of renewables in Danish electricity consumption reached 60% by 2014, with windpower alone responsible for about 40% [3]. Denmark qualifies as a puzzling study object also because of the undoubted trend anomaly in the years 2002–2007, when investments in renewables (including windpower capacity) saw a dramatic fall. This followed a policy shift executed by the liberal-conservative coalition government in power from 2001, headed by Prime Minister Fogh Rasmussen. Then, after re-election in 2005, his second government undertook a political turnabout that brought the low-carbon energy transition back on track and paved the way for the broad 2012 Parliament agreement on making Denmark's energy system 100% renewable by 2050 [4].

This study analyses the Danish energy system transition case, focusing on *public policy* as a factor co-evolving with other system factors. What explains the two energy policy shifts observed in the early 2000s—the first one derailing the Danish energy system transition and the second one bringing it back on track? We apply two explanatory approaches, inspired by the public choice- and the path-dependency-literatures. The former pays attention to specific mechanisms applying in public policy decisions: interaction between societal constituencies and policy-makers, and institutional conditions providing leverage for specific constituencies in policy decisions. Policy shifts will follow from shifts in policy preferences, interactions and institutional conditions. The path-dependency perspective is useful for uncovering mechanisms that may reinforce the leverage of specific constituencies over time to explain policy trends. Within this perspective, policy shifts are explained by critical junctures with externally generated pressure for change.

The Danish policy shifts indicate the existence of forces that could restrict reform-eager politicians' room for manoeuvre—a challenge facing many jurisdictions around the world. This article

* Corresponding author.
E-mail address: thin@fni.no (T.H.J. Inderberg).

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concludes a discussion the potential for learning from the case of Denmark.

The Danish energy transition has been analyzed by different scholars applying different approaches. Several historic analyses explain the establishment of and path dependency of the Danish, or other structural explanations of the Danish energy system outcome e.g., [5,6–8]. Other analysts have looked at policy influence, through a technology lens or for example through rational choice perspectives [9,10]. These analyses have usually been done as explicit or implicit diachronic or cross-case comparisons, and mainly focusing on windpower (e.g., [8,9–11]), albeit there are examples of wider analyses from a more constructivist perspective [12]. While building on these studies, this article expands in several regards. It accounts for the historical development in the entire non-transport energy system (the evolution of district heating and electric power sub-systems). Further, it expands in time, by adding more recent developments to the Danish tale. Additionally, the article analyses the establishment of the Danish energy sector's structure by use of complementary perspectives, from a structural and agency basis. This requires a long term account that maps the sociotechnical system paired with the political developments and by adding new understanding about the room for agency and change in an institutionalised energy governance system, responding to calls for further analysis [13: 20f]. Such complementary analysis fills a gap in the literature by highlighting the interaction between structural factors and individual choice.

2. Analytical framework, methods and data

Public choice theory focuses on decision-makers and policy managers, the choices they make, and the factors that influence those choices [14]. Actors—typically politicians and government officials—are viewed as rational, self-interested utility-maximizing agents who normally seek office or maximize budgets [15], and this perspective examines how such individual motivations affect the outcomes of their collective decision-making [16]. These individuals and groups decide the course of action on the basis of consequential logic, in the sense that action depends on anticipations regarding the future effects of actions [17]. As actors can only anticipate such futures, not predict them perfectly, they may be characterized as only boundedly rational [18]. They will maximize utility (seek to remain in office) by consciously providing advantages to interests they believe will help them in their cause [14]. Electoral systems and polity, including supportive and opposing interest-group constellations and alliances, thus shape preferences and the course of action, based on the 'rules of the game' [19].

We expect from this perspective that *Danish energy policies are adapted to the incumbent government's support base (their constituency) and that the first policy shift observed in the early 2000s reflected that the new parliament majority and government catered to a different constituency than the previous government. The second policy shift may thus within this perspective represent an underestimation of the political reactions from important constituencies to the first policy shift (bounded rationality).*

By contrast, the *path-dependency perspective* takes a long-term approach in explaining stability and incremental change [20–22], and focuses on how positive feedback may prevent radical changes in policy [23]. Initial political decisions will institutionalize commitments [24] to specific sets of actors (interest groups) that advocate particular technical solutions, augmenting the political leverage of these actors if the solutions diffuse, at the expense of actors that promote alternative solutions. The majority of actors in this way tend to have interests in keeping the established energy system, as this generates benefits, in sum leading to such a loop of positive feedback. Specific actors and solutions at an early stage (previous decisions) thus constitute a core mechanism that affects subsequent policy decisions [22,23,25,26], gradually creating a path that limits divergent political choices when solutions diffuse and are adapted to by an increasing number of agents in the system. [7,27]. Political processes over time are seen as self-reinforcing sequences of positive feedback that 'lock in' institutional settings by increasing the likelihood of certain policy choices while reducing the likelihood of others [27,28].

Deep policy change or a path break, like the first Danish policy shift in the early 2000s, will be an anomaly within this perspective. *We expect this shift to be explained by the concept of 'critical juncture'* [20,21,29], *where exogenous or endogenous factors challenge the dominant technical solution and thus the institutionalized power of agents committed to this solution* [26,30]. Firm institutionalization of commitments to the solution that was challenged will result in heavy resistance to change, and explain why policy was changed again a few years later by a government led by the same prime minister. Thus, our main expectation from this perspective is that *policy changes will be incremental and adapted to the technical solutions that had diffused in the energy system.*

The study employs case-study methodology, with long-term Danish energy policy as the main case and policy shifts in the early 2000s as embedded subcases. Selected theory has assisted the development of research questions and expectations, thus defining the relevant data to be collected for analysis.

The two perspectives invite different but partly overlapping kinds of data for explaining the policy change and rebound in 2002 and 2007. Employing the public choice perspective, necessitates mapping key actors in Danish energy policy around the time of the policy shifts, their core policy preferences, and how various interest groups constitute constituencies for the political parties. The 2001 Fogh Rasmussen I government differed from previous incumbents also in the constellation of party parliamentary support. We investigate differences in energy-policy preferences among the parties and their core constituencies.

The path dependency perspective on the other hand, invites investigation of long-term energy-system processes in Denmark, paired with political developments. It requires data about long-term structural development of the Danish energy sector—general changes and group interests, the share of types of energy carriers, the larger political decisions, and parliamentary structure. We trace initial and consecutive policy processes, asking whether and how initial commitments favoured specific actors and technology solutions that later resisted policy changes, even at critical points of major external and internal pressure for change.

Data sources include research articles, historical energy industry case records, government policy documents, minutes from deliberations in the Parliament, newspaper and newsletter articles, and expert interviews. Semi-structured interviews with representatives from Energistyrelsen, Roskilde University, EA Energy Analyses, and one independent analyst have been used mainly to cross-check other data sources, and are thus to a lesser degree referred to directly.

3. Evolution of the Danish energy system

3.1. Early industry structure and energy sources

The early modern Danish energy-system emerged with a structure of combined heat and power plants (CHP) supplying major urban areas. Smaller decentralized electric power, district heating, and CHP plants supplied smaller rural towns. Municipalities and private local co-operatives were the principal owners. The latter had deep historical roots in rural farming communities and diffused as a more general model for energy supply when indus-