



Energy and environmental attitudes in the green state of Denmark: Implications for energy democracy, low carbon transitions, and energy literacy



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ABSTRACT

This article investigates how a mix of energy-users from Denmark perceives energy and environmental issues such as the affordability of electricity and gasoline, the seriousness of climate change, and preferences for different energy systems. Its primary source of data is a pilot survey and energy literacy test distributed in English and Danish to 328 respondents spread across the country. The survey results are used to test four propositions about energy prices, being “green,” public knowledge and competence about energy issues, and self-sufficiency and sustainable technology. The data supports the propositions that Danes identify with “being green” and prefer national and local policies that endorse sustainable technology and being self-sufficient. However, the data also challenges the propositions that Danes would prioritize low energy prices and affordability as key energy concerns and that they are knowledgeable about energy and environmental issues. In this way, a problematic gap may exist between what many academic articles (and previous surveys) report Danish attitudes to be and what this study suggests they are. Given Denmark’s ambitious low-carbon goals, these findings have clear relevance to other communities and countries seeking to decarbonize their own energy sectors.

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1. Introduction

Denmark has one of the most aggressive energy and climate policies in the world. Since 1976, the Danish energy system has seen a large shift to cogeneration, renewable sources of energy, and energy-efficiency, supported by a political economy of democratic inclusion in decentralized energy planning and a cultural sensitivity to the social and environmental costs of using fossil fuels (Hvelplund, 2014). In 2006 the national government declared a long-term target of “100% independency of fossil fuels and nuclear power,” a goal they have since re-emphasized at international energy forums (Rasmussen, 2011), and in 2011, a new energy strategy was published by the Danish Energy Agency with strong energy policy goals and instruments. If Denmark meets these targets, by 2050 primary energy supply will fall significantly and carbon dioxide emissions will equal zero. Though it may sound

unrealistic, one independent assessment concluded that for Denmark “a 100% renewable energy supply based on domestic resources is physically possible” (Lund and Mathiesen, 2009).

Yet how is this plan perceived by energy users? How do Danish perspectives differ over issues of energy affordability, energy security, climate change, and technological development? This study directly answers these questions by exploring how a pilot sample of energy-users from Denmark reports their attitudes on energy, climate, and environmental issues. Its primary source of data is a survey distributed in Danish and English to 328 respondents throughout the country. The survey results are used to test four propositions rooted in the academic energy, environment, and climate policy literature.

Our study contributes to the environmental policy and energy studies literatures, and advances the state-of-the-art, in four ways. First, and most broadly, by investigating values, it enables us to get “behind” how energy users—and even suppliers—make decisions. As one study notes, it is “underlying values” that “have substantial and important indirect effects” on patterns of energy consumption, national energy policies, and the acceptance or rejection of new energy technologies (Bidwell, 2013). Though assessing individual

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attitudes and values about energy and the environment enables us to better comprehend consumer preferences, it remains an understudied topic in the field of energy studies (D'Agostino et al., 2011; Sovacool et al., 2012; Sovacool, 2014a, b).

Second, in approaching Danish attitudes this way, the article addresses the twin topics of energy transitions (Araujo, 2014; Hirsh et al., 2014) and the social acceptance of low-carbon technologies (Wustenhagen et al., 2007; Sovacool and Ratan, 2012). For instance, it reports what ordinary energy consumers and business leaders think about cutting-edge, state-of-the-art innovative energy systems capable of having a disruptive impact on society (Foxon et al., 2005) such as energy storage and the smart grid, hydrogen fuel cells, electric vehicles, and the residential application and use of small-scale wind turbines or solar panels. Furthermore, our study provides empirical evidence to how the public view and conceive of externalities (Hodbod and Neil Adger, 2014), and how some sources of energy (notably renewable ones) are valued or not valued for their positive externalities such as cleaner air and economic security while others are endorsed (or uncritically accepted) despite their negative externalities such as climate change, community displacement, and construction cost overruns (Sundqvist, 2004).

Third, and more narrowly for European policymakers, by including a diverse group of stakeholders—with surveys directed not only at business leaders but households—our study offers a broad perspective as to how these actors view the effectiveness of Danish energy policy. Previous studies have shown that energy attitudes are neither static nor consistent; they are instead multifaceted, with often contradictory goals and aspirations (Sovacool et al., 2012; Sovacool and Saunders, 2014; Sagoff, 2004; Heberlein, 2012). These competing interests need actively managed in order for countries to make meaningful progress on attaining their energy goals. Our study thus helps identify the scope and severity of these potential tradeoffs.

Fourth, and for those in Denmark, by asking questions about alternative energy and potentially disruptive technologies on the horizon, our study provides insight into what Danish stakeholders frame as the key challenges and opportunities they see impacting them over the next five to ten years. It can help steer Danish analysts and regulators as they attempt to continue their transition to low-carbon fuels. This matter becomes of upmost importance because as other countries begin their own process of decarbonization, they may look to Denmark as a model or template from which to base their policy and regulatory interventions. Denmark—and the attitudes prevalent there—may be a harbinger for things to come in other nations.

2. Research methods

Our primary source of data for this study was two surveys, both distributed in 2014, one sent to household energy users and consumers and one distributed to business or industry leaders. Our structured questionnaire consisted mainly of multiple choice questions (some mutually exclusive, others not) that the authors have used previously in a series of studies researched in 2010 and published over the course of 2011–2013, to assess national energy security issues (Bambawale and Sovacool, 2011a,b,c, 2012; Sovacool, 2011; Sovacool et al., 2012; Sovacool and Vivoda, 2012; Knox-Hayes et al., 2013). We then, uniquely, supplemented our survey with questions about knowledge and competence (known within the field as “energy literacy”) as well as values based on surveys distributed in the United States by the National Environmental Education & Training Foundation (known informally as the “Energy IQ Test” or “National Report Card” on energy literacy) (National Environmental Education & Training Foundation and Roper ASW, 2002; Coyle, 2005). The survey was made

available online to respondents through a survey hosting website, and also distributed physically to improve response rates. Everyone was eligible to participate in the survey as long as they lived (and thus consumed energy) within Denmark. A total of 328 surveys were completed, 224 from households and 104 from business leaders—the authors had hoped for more respondents but believe nonetheless that our results serve as a useful pilot study. Fig. 1 provides an overview of both subsamples, and an English version of the household survey is available in Appendix I, an English version of the industrial survey in Appendix II.

The authors then used the results from our survey to test four propositions about energy and environmental attitudes in Denmark, derived in large part from the academic literature. As Table 1 indicates, one of these propositions centered on prices and affordability; one on green politics and national policy; one on knowledge and literacy; and one on technology and self-sufficiency.

Before the authors proceed to test these propositions, however, it must be noted that Table 1 and Fig. 1 do depict some biases within the sample. Nearly two-thirds of household respondents were postgraduates (higher than the national average), more than four-fifths worked at universities (higher), and more than half the sample was younger than 35 (higher), which is proportionately different than an unbiased sample would represent. Given the location of the authors' university, most respondents were also concentrated geographically in the region of Jutland. The business sample of respondents was non-representative in terms of location (half the respondents from Jutland), size (44% of companies had 10 employees or fewer, lower than the average), type (two-thirds were for-profit institutions, higher than the average), and sector (less than 20% working in the areas of energy and agriculture, lower than the average). Our survey also suffers from self-selection bias: that is, only those that already deem energy and environmental issues to be important (or those unusually interested in energy policy) would likely take the time to complete it.

3. Discussion: testing four propositions

This section of the study first presents each of the four propositions and then “tests” them with the results from the pilot survey. As the section will indicate, survey responses supported propositions two and four (related to being “green” and national policy and to sustainable technology and self-sufficiency) but did not support propositions one and three (related to affordability and energy knowledge and literacy).

3.1. P1: The centrality of affordability

The authors reasoned that affordability would matter for Denmark given that household electricity prices are the highest in the European Union at about 29.8 Eurocents per kWh, and the price of petrol is the fifth most expensive in Europe (coming behind Italy, the Netherlands, Greece, and Spain) (European Commission Eurostat, 2012). The British newspaper *The Telegraph* featured Denmark as one of the world's “most expensive energy locations” (Graham Norwood, *The Telegraph*, 2013) and when adjusted for purchasing power parity the only countries in the world with higher electricity prices are small island developing countries in the Pacific which rely entirely on imported diesel (Lindsay, 2014). The topic of “environmental taxes” or “green taxes” has also become an important political issue in recent months (Jyllands-Posten, 2014a,b), given that “non-recoverable taxes and levies” account for the bulk of electricity tariffs. In 2014, electricity generation costs amounted to only 4.6 Eurocents per kWh and network costs added another 8.5 Eurocents; taxes accounted for

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