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A values-based approach to energy controversies: Value-sensitive design applied to the Groningen gas controversy in the Netherlands

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ABSTRACT

Many energy cases suffer from social opposition. It is increasingly asserted that paying due attention to the moral values involved in controversial energy cases may increase social acceptance. Value-sensitive design (VSD) has been recommended as a promising approach for addressing moral values in controversial energy cases. This paper aims to empirically explore the applicability of VSD in controversial energy cases by investigating the extent to which it is possible to identify the relevant values, norms and design requirements in the Groningen gas controversy (the Netherlands) using values hierarchies. It was found in this case that the relevant values, norms and design requirements could be retrieved, but that two conditions need to be fulfilled to avoid underexposure of relevant values. Firstly, data should be collected using a variety of data sources. Secondly, these sources should be analyzed through both top-down approaches and bottom-up approaches. We find that 'Safety' is a critical value in the Groningen case, while other critical values are related to securing 'Procedural Justice'. Strikingly, the important procedural values 'Trust' and 'Honesty' did not translate into concrete policies. Policy makers can use values hierarchies to address moral values in energy cases and to translate these values into concrete measures.

1. Introduction

Energy cases often suffer from significant social opposition. In the Netherlands, for instance, numerous initiatives of this type have been aborted or significantly delayed due to major social opposition. For instance, underground CO_2 storage near Barendrecht and shale gas production near Boxtel have been aborted because inhabitants were concerned about safety (Cuppen et al., 2016; Feenstra et al., 2010) and the roll-out of smart energy meters was blocked due to citizens' privacy concerns (Cuijpers and Koops, 2013). Other countries have faced similar challenges. The Scottish government declined permission for a wind farm consisting of 181 turbines to be built on the Isle of Lewis following severe resistance from local interests (Jenkins et al., 2016). Similarly, a general lack of social acceptance seems to be a key factor for explaining the lack of developed wind farms in France (Enevoldsen and Sovacool, 2016; Nadaï, 2007). The lack of social acceptance can lead to delays, escalating costs, and failure risk for energy cases (Enevoldsen and Sovacool, 2016).

There is a vast body of literature in the social sciences investigating the conditions under which people are likely to accept or oppose energy cases (e.g. Batel et al., 2013; Huijts et al., 2012). Within this literature, there is increasing attention for the impact of ethical considerations (e.g. Cowell et al., 2011; Gross, 2007; Wüstenhagen et al., 2007). Various scholars argue that low social acceptance for energy cases might result from having neglected relevant ethical issues in the design of these cases (Hannis and Rawles, 2013; Van de Poel, 2016). Hence, it is increasingly argued that moral values should be more carefully integrated throughout the design of energy cases (e.g. Cuijpers and Koops, 2013; Demski et al., 2015; Kostyk and Herkert, 2012; Ligtvoet et al., 2015).

In this literature, energy cases are commonly conceived of as *socio-technical* systems, entities which consist not only of technical infrastructure, but also of people and institutions (e.g. Bauer and Herder, 2009; Berkhout, 2002; Geels, 2004; Molina, 1999; Kern, 2012; Sovacool, 2009; Verbong and Geels, 2010). Socio-technical systems need actors and social/institutional infrastructure (in short: 'institutional arrangements', Williamson, 1998) to be in place in order to perform their functions (Kroes et al., 2006). Indeed, the institutional arrangements in which the technical infrastructure is embedded can facilitate or constrain feasible design alternatives (Wüstenhagen et al.,

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2007). The actors and institutions maintain and/or transform the socio-technical system by a broad range of decisions and procedures: How are the revenues distributed? Who is allowed to make certain decisions? These are value-laden questions and the institutional arrangements thereby reflect certain values. The argument that values should be more carefully integrated throughout the design of energy systems therefore also applies to the institutional arrangements that are part of the system.

A promising approach to addressing values in a structured and comprehensive manner throughout the design process is value-sensitive design (VSD) (Flanagan et al., 2008; Friedman, 2004). VSD was originally developed in the context of information and communication technology (Friedman et al., 2002), for example in the development of an online tool that provides technical functionality while at the same time addressing privacy concerns (Xu et al., 2012), or in the creation of Braille-based applications that provide information about buses and bus stops to the visually impaired, thereby promoting the values of accessibility and inclusiveness (Azenkot et al., 2011).

In principle, VSD could be extended to the context of socio-technical systems and its design (Künneke et al., 2015). Dignum et al. (2016) and Oosterlaken (2015) discuss the possibility of adopting a VSD approach towards socio-technical energy systems. Oosterlaken (2015) provides a theoretical basis for its use in the design of wind turbines and wind parks, but does not apply VSD to a concrete wind energy case nor does she address empirical or practical details related to potential application. Dignum et al. (2016) take a first step in identifying relevant values empirically by analyzing policy documents from NGOs, the National Government and industry groups regarding the exploration and exploitation of shale gas in the Netherlands. From these documents, they first infer arguments/norms which they subsequently reduce to a set of underlying values. Although Dignum et al. (2016) represent an important first step in the empirical investigation of the extent to which VSD can be applied in the context of a socio-technical energy systems, their analysis did not concern an existing socio-technical energy system with concrete users and a concrete technology, but was instead a general exploration of the possibility of shale gas extraction in the Netherlands. As such, while the authors were able to make an inventory of possibly relevant values, they did not consider explicit *design* aspects. The authors were not able to do so because the Dutch government decided to prohibit the exploration and exploitation of shale gas in the Netherlands in response to large-scale societal opposition (Metze, 2014).

To the best of our knowledge, there are no studies which empirically investigate the extent to which VSD can be applied in the context of an existing controversial socio-technical energy system.[1] Hence, the main objective of our study is to explore the applicability of VSD in an existing controversial energy case: the Groningen gas case. A prerequisite for the applicability of VSD is that values, norms and design requirements that are relevant in the project can be identified (e.g. Manders-Huits, 2011; Pesch, 2015). Hence, we primarily investigate the extent to which it is possible to identify the relevant values, norms and design requirements in the Groningen gas case. This is being done by analyzing newspaper articles, political debates and conducting interviews with stakeholders. Since our study also focuses on the identification of norms and concrete design requirements, we contribute to making VSD for socio-technical energy systems more concrete and tangible. Moreover, we provide recommendations for policy makers that aspire to use VSD in the analysis of energy controversies.

[1] An existing socio-technical energy system is controversial when the case is subject of public and political debate and suffers from significant social opposition. For reasons of readability, we will use the label 'controversial energy case' as shorthand to refer to a controversial socio-technical energy system. The term 'energy controversy' is used to refer to the controversy itself pertaining to a specific controversial energy case.

The outline of the paper is as follows. Section 2 discusses the method of value-sensitive design. In Section 3 we present the case study. Section 4 outlines the methodology we used in our study and Section 5 discusses the results. Section 6 provides conclusions and policy recommendations.

2. Value-sensitive design from a top-down and bottom-up perspective

To explicitly design for values, value conflicts, and trade-offs between values, Friedman and colleagues developed VSD in the early 1990s (Friedman et al., 2002). VSD builds on an integrative methodology that combines conceptual, empirical and technical investigations (Friedman et al., 2002). The investigations that require the least context-dependent knowledge are conceptual investigations. Through a philosophically informed analysis, the fundamental issues raised by the project under investigation are clarified and the relevant values identified. Typical questions raised during this phase are: "What are the values at stake?" and, "How should we engage in trade-offs between competing values in the design?" Next, empirical investigations come into play. Often these are needed to evaluate the success of a particular design, addressing questions such as: "How do stakeholders prioritize individual values and usability considerations?" Empirical investigations often require data gathering through observation, interviews, questionnaires and other quantitative and qualitative methods (Friedman et al., 2013). The third type of inquiry is known as a technical investigation, of which, according to Friedman et al. (2002), there are two types. The first focuses on how existing technological properties and underlying mechanisms support or hinder human values, while the second concerns the proactive design of systems to support values identified in the conceptual investigation. Although empirical investigations and technical investigations have a lot in common, there is an important difference in their unit of analysis: the former often focus on individuals or groups that are affected by the technology or the socio-technical system, while the latter focus on the technology itself.

VSD was originally developed in the context of ICT to ensure that a technology's design requirements adequately reflected the values underlying its creation, but several other potential merits for the design process were observed in the literature. Empirical studies on technology-based controversies indicate the need to address values early in the design and implementation of technologies and their governing institutions because underlying ethical issues can exacerbate conflicts and undermine resolution efforts (Glenna, 2010). Furthermore, addressing moral values may secure commitment from relevant stakeholders whose involvement is needed to successfully implement these technologies (Doorn, 2016). VSD could potentially play an important role here. It could be used, for instance, to facilitate structured dialogue in which stakeholders better understand each other's argumentation lines. VSD could be of significant value by clarifying what the debate is about, and what other stakeholders' perceptions actually are. Moreover, by reshaping the discussion in terms of values and norms, VSD could help generate new perspectives, thereby providing a clear point of departure for future debates and increasing the solution space (Oosterlaken, 2015). Finally, the approach could add value to the design process by identifying value conflicts a priori, creating awareness among stakeholders as to the disagreement that may eventually emerge.

While VSD was developed to ensure that design requirements adequately reflect underlying values, it does not provide proper guidelines for the implementation of values within the design process (Harbers and Neerincx, 2014; Van de Poel, 2013). To address this, Van de Poel (2013) introduces the concept of a "values hierarchy". This approach translates values into more tangible design requirements, thereby ensuring that the design sufficiently reflects the moral values at stake. In the present study, we use the concept of values hierarchy to explore