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The good, the bad, and the ambivalent: A qualitative study of public perceptions towards energy technologies and portfolios in Germany

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ABSTRACT

This paper investigates informed public preferences about electricity technologies and portfolios in Germany, qualitatively analyzing opinions, reasoning patterns and judgments of perceived risks and benefits among lay people. The authors developed and applied a 'mixed-method' focus group approach involving 130 participants in 15 focus groups throughout Germany. This research aimed to specify participants' attitudes and preferences regarding electricity technologies and portfolios (*evaluation categories*); comparatively assess these preferences (*technology/portfolio acceptance profiles*); and identify participants' decision-making strategies and processes (*decision rule typology*). The evaluation basis of people's preferences comprises nine evaluation categories including, among others, trust, national and household economics, and environmental and health impacts. When assessing preferences regarding electricity technologies and portfolios, two overriding results need to be emphasized: first, that selective evaluation patterns produce unique acceptance profiles, and second, that a shift occurs from heterogeneous towards homogeneous evaluation patterns. In relation to decision rules guiding people's preference-making, the research reveals multiple mechanisms are at work when people express preferences about electricity portfolios. Five decision rules were identified regarding how participants dealt with complex portfolio information processing and preference building.

1. Introduction

The transformation of the energy system has become a key political issue in many countries. The main emphasis of responses to climate change challenges is in transitioning the energy system from high to low carbon energy supply and in decoupling energy demand from economic growth. The general principles of energy policy objectives comprise the three paradigms of economic efficiency, security of energy supply and environmental compatibility. These well-established objectives constitute the so-called energy policy triangle in many Western and European countries (Dugstad and Kjell, 2003; Solorio Sandoval and Morata, 2012).

However, some scholars argue there is a need to add a fourth energy policy target – that is, public acceptance of energy system change (Devine-Wright, 2008; Hauff et al., 2011). Irrespective of assigning a policy objective status or not, social acceptance has become a key issue in energy research and policy advice literature. The wider public is deeply involved in energy system change, assuming roles such as consumers, producers, providers of political legitimacy through voting power, and as proponents or opponents of energy technologies and infrastructures (Demski et al., 2015). As such, the energy system has become a key focus of acceptance and acceptability studies worldwide regarding both selected power technologies and – more recently – public values for energy system change from a broader perspective.

However, lacking in the field to date is a comparative analysis of attitudes and preferences with their underlying arguments across the whole range of available electricity options and future portfolios. When using a comparative approach, participants cannot judge energy technologies and portfolios in isolation on a purely abstract level, but are required instead to evaluate them in comparison to existing technology alternatives of equal utility. The comparative approach extends current research by simulating a more real-world preference making and decision making environment.

This article presents empirical results of public attitudes and preferences towards power technologies and power portfolios among the German population from a comparative perspective. By means of qualitative analysis of focus group discussions, the data was synthesised into three main outcomes: a set of preference evaluation categories, a comparative assessment of technology and portfolio acceptance profiles, and a decision rule typology of the preference

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making process itself. This paper supplements the quantitative analysis of informed public preferences already published (Scheer et al., 2013) by investigating qualitatively the opinions, reasoning patterns and judgements on perceived risks and benefits underlying the quantitative ranking decisions. This case study seeks to provide the following insights for international research on energy related public preferences: Methodologically, by innovating a mixed-method design of focus groups to be used in preference studies in the field of energy and beyond; and substantively, by delivering a set of preference evaluation categories, acceptance profiles, and decision rules helpful as a comparative background for case studies in other regions and countries.

We present our research and arguments as follows: We first provide some insights from literature on public acceptance and its application in the field of energy. Section 3 outlines and specifies the methods used. Section 4 provides our main results of eliciting and synthesizing the qualitative data on public preferences. Section 5 discusses the main results while the last Section 6 draws conclusions and outlines policy implications.

2. Background

Literature on public acceptance reflects and analyses people's positive, negative and ambivalent attitudes and actions towards technologies (Fischhoff et al., 1978; Fischhoff, 1995; Sjöberg, 2002). Historically, the public have associated existing and emerging technologies with concerns, protests and controversies. Particularly prominent have been long-standing conflicts in Western countries around nuclear energy, chemical facilities, waste handling and genetic modified organisms (Kitchelt, 1986; Kasperson et al., 1992; Bauer, 2007).

Social science principles state that technologies cannot be seen as isolated from society but must be considered instead as an integral part of the social environment (Pinch and Bijker, 1984; Woolgar, 1991; Klein and Kleinman, 2002; Mordini, 2007; Gupta et al., 2011). Social and behavioural science based research has identified several crucial factors influencing why people endorse or oppose technologies (Covello, 1983; Renn, 2008). On a general level, people evaluate large-scale technologies by balancing their benefits and threats/costs (Starr, 1969; Renn and Zwick, 1997). A positive balance with benefits outweighing the costs results in technology acceptance, while a negative balance with a higher perception of risks and negative outcomes leads to technology rejection. The situation is more complicated however, as people evaluate benefits and threats of a technology from both a personal/peer group and a collective perspective (Scheer et al., 2014). Acceptance relies on the one hand, on the belief that a technology has considerable benefits to one's self or to people close to him/her (individual evaluation); on the other hand, to society as a whole (collective evaluation) (Sjöberg, 2000, 2002). Thus, people accept technologies when they serve the common and individual good. Technology acceptance is given, when both personal/peer group and collective balancing is positive; non-acceptance of a technology is given, when the balancing is negative (Renn, 2008; Scheer et al., 2014). Given the case that personal/peer group and collective balancing evaluation are diametrically opposed (individual benefit vs. collective risk perception and vice versa), the prediction of technology (non-)acceptance becomes more difficult. Evidence exists that people are very willing to do without personal benefits when they are convinced that the technology serves the common good and overall social preferences (Kahneman et al., 1986). Social preferences refer to the fact that people care about certain “social” goals, such as the well-being of other individuals, or a “fair” allocation of risks and benefits among members in society (Li, 2008). Several theories of social preferences have been introduced within recent years in the field of behavioural economics and social psychology including, among others, models of interpersonal altruism, fairness, reciprocity, and inequity aversion (Falk et al., 2008; Falk and Fischbacher, 2006; Fehr and Schmidt, 1999; Fehr, 2009). What can also be observed, however, is that people act selfishly even though they know their behaviour disadvantages society as a whole.

People's attitudes and preferences towards technologies have been studied primarily from a risk perspective, within the so-called psychometric risk perception approach (Slovic et al., 1980; Jungermann and Slovic, 1993; Rohrmann and Renn, 2000; Sjöberg, 2002). This approach quantitatively describes the cognitive and evaluative structure of risks and their determinants, and uses risk as a subjective concept, completely distinct from the idea of risk as an objective entity (Renn, 2008). Field studies in risk perception research reveal a set of both risk-related, and situation-related characteristics. Thus, risk perception among lay people is influenced on the one hand by qualities of the risk source including: dread with regard to possible consequences, familiarity with a risk source, the magnitude of potential damage, the nature of risk, and the reversibility of risk consequences (Fischhoff et al., 1978; Slovic et al., 1985; Slovic, 1992; McDaniels et al., 1997). On the other hand, by situation-related matters such as: characteristics relating to personal control, voluntariness, the equity of risk and benefit distribution, and risk stigmatization (Covello, 1983; Englander et al., 1986; Slovic, 1987; Zepeda et al., 2003). As an additional factor, trust has been identified as important for explaining risk perception patterns (Barber, 1983; Lipset and Schneider, 1983). Since information on most risks in modern society is mediated through risk management institutions, media etc., trust and credibility have become a major factor in risk perception (Löfstedt, 2005; Earle and Cvetkovich, 1994; Siegrist and Cvetkovich, 2000).

Risk perception and technology acceptance research has been widely applied to the field of energy generating technologies (Wüstenhagen et al., 2007; Batel et al., 2013). Surprisingly, the existing empirical literature focusses on just one or, at best, a small selection of existing power technologies (Peterson et al., 2015). To give a brief (and largely incomplete) overview, studies examined the public perception and acceptance of nuclear (Slovic et al., 2000; Sjöberg, 2003; Grove-White et al., 2006; Corner et al., 2011) and carbon capture and storage technologies (van Alphen et al., 2007; Tokushige et al., 2007; Wallquist et al., 2011; Chaudhry et al., 2013). In the field of renewables some studies focus on wind energy (Ellis et al., 2007; Jobert et al., 2007; Kontogianni et al., 2014), photovoltaics (Zhai and Williams, 2012), or a small set of renewable energies (Walker, 1995; Zoellner et al., 2008; Musall and Kuik, 2012; Kaldellis et al., 2013). The above research reveal public favour towards renewable energy technologies such as solar and wind, with biomass viewed more critically. Fossil fuel based low carbon technologies such as natural gas and carbon capture and storage for coal plants, in contrast, was perceived much less preferentially.

The collective vs. personal dimension of technology evaluation has been specified in energy perception research as the NIMBY (not in my backyard) paradigm (Wolsink, 1994, 2000; Devine-Wright, 2005; van der Horst, 2007; Petrova, 2014). Although the NIMBY paradigm is still very popular among policy-makers and stakeholders, social science scholars criticize the concept as oversimplifying people's actual motives. Wolsink (2006) states that since the early 1990s, there has been an increasing trend for studies to require full clarification of the NIMBY concept, to avoid it, or completely discard it as an analytic tool. He argues to abandon the application of the NIMBY argument as a tool for analysis. We therefore refer to local impacts of technologies.

Currently lacking however, is a consideration of the large range of existing power technologies when eliciting public attitudes, in order to simulate a more real-world evaluation and assessment environment. A more recent social science approach considers energy preferences from a broader perspective independent of technology considerations alone (Whitmarsh et al., 2011; Miller et al., 2013; Demski et al., 2015; Lee, 2015). Demski et al. (2015), for instance, discuss public acceptance of sustainable energy transition in terms of values using a ‘whole-system’ lens while Miller et al. (2013) reveal the social dimension of the energy system, applying a socio-technological system perspective.

This intent of this research, is to combine both approaches when