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Original research article

## A two-level analysis of public support: Exploring the role of beliefs in opinions about the Swiss energy strategy

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## ABSTRACT

Energy system transitions in democracies require that national interests and central planning are reconciled with the public's preferences. This pilot study investigates public support for the Swiss national energy strategy and two specific technologies that are part of it: expansion of hydropower and deep geothermal energy. It addresses two research questions. First, how does public support for a national energy transition differ from public support for specific technologies endorsed in an energy transition strategy? Second, are there differences in the factors influencing public support for these technologies? We investigate these questions empirically with a survey (N = 640), focusing on understanding the role lay-people's expectations about the future energy system, political ideology, and future orientation play in generating support for these two levels of public support and for two technologies with different characteristics. We find that while support for an energy transition is well explained by above factors, this is true to a much lesser extent for technology support. One conclusion is that support for an energy transition and for energy technologies is politicized to varying degrees, which is why their acceptability may be less shaped by their objective characteristics, but rather by subjective perceptions and beliefs the public holds towards them.

### 1. Introduction

Many countries are under public pressure to secure their domestic energy supply while simultaneously undertaking large-scale energy system transitions (e.g., [1]). In the past, many of these decisions were made technocratically, even in democracies (e.g., [2]). However, a supportive public has come to weigh more heavily in recent energy system planning and implementation (e.g., [3,4]) — be it for siting nuclear used-fuel repositories (e.g., [5–8]) or for building wind farms [9]. Hence, enabling a complex large-scale energy system transition requires democratic governments to reconcile national interests and central planning with the public's preferences. However, the formation of public support for energy transitions is a complex process shaped by many determinants on different levels [4,10]. For instance, Dermont et al. [11] point out that actors' reactions toward a policy that shapes the overall “acceptance” of the policy differ across stages of policy-making. Moreover, depending on the specific project, technology or policy in question, the same factors may be key determinants of support or not relevant at all (see [12] for a review). This pilot study addresses the role of beliefs and future orientation as important sources of public support, and more specifically, how this role changes depending on the

level of abstraction and the technology in question. Using the case of the Swiss national energy strategy, we analyze general support for an energy transition and support for two renewable energy technologies, namely hydropower (HP) and deep geothermal energy (DGE), whose capacity expansion is currently considered under the national energy strategy. Because these two technologies as well as the two levels at which public support is analyzed differ in a range of aspects, this research setting allows us to comparatively assess the differential relevance of public support determinants.

Studies on public support in the field of energy have provided insights on the categories of socio-political, market, and community acceptance [4]. Despite a high level of support for renewable energy in general (e.g., wind energy), studies highlight that specific technology infrastructures (e.g., wind farms) have attracted significant local resistance [13–16]. A long list of failed energy projects led to significant research efforts at the level of community acceptance. While the notion of Not In My Backyard (NIMBY) emerged as a possible explanation for the gap between support for renewable energy in general and concrete projects in a local context, there are also plenty of criticisms that the NIMBY framework assumes a too “simplistic relationship between proximity and objection” ([17], p. 104). In fact, further research has

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shown that underlying causes of public attitudes and resistance to energy infrastructure are much more nuanced and complex [3,18,19].

Indeed, there are different levels of abstraction at which public support can play a role. In addition to the above-mentioned bottom level of local support for concrete projects, there is the upper level that determines long-term energy goals, and the middle level, at which potential technologies (i.e., the practical steps to implement high-level energy transition goals) are considered. As the example of nuclear energy suggests, a technology's fit with overall national goals (e.g. low-carbon) does not necessarily equal public support [20], pointing to the important difference between public support on the upper and the middle level within the same policy domain. Notwithstanding the literature's awareness of these multiple levels, most public opinion studies have so far focused on one of these levels at a time. In other words, the interlinkages between these levels are not yet well understood. Therefore, the primary empirical goal of this paper is to identify and compare the relevant determinants of public preference between the upper and middle level.

There is also a considerable body of research investigating public preference for technologies in more detail (e.g., [21,22]). This literature concludes even those who are generally supportive of renewable energy do not support it without qualification. Accordingly, people factor in impacts of energy infrastructure developments on landscape, the environment, animals or humans [23]. Some have investigated this issue via choice experiments, measuring the effect of tangible sources of such trade-offs (e.g., costs, effects on employment, and risks) on individuals' willingness to pay [24,25]. However, in reality, public support for energy projects, technologies and policies is shaped by the interplay between social, technical, economic, and political aspects, which cannot be separated and make it a complex field of study [26–28]. In addition, acceptability may be less shaped by objective characteristics of technologies, but rather by the subjective perceptions of these characteristics held by the public (see [12]). These perceptions are shaped by various beliefs, including the intuitive assessment of the technologies themselves or how well the technology is perceived to fit into the current or future energy system. Accordingly, these perceptions are strongly dependent on knowledge, trust in institutions and socio-institutional stakeholders (see also [29], in this special issue), as well as general worldviews and political or societal discourses, which are becoming more populist and nationalistic in many countries (see also [30], also in this special issue). The survey on which our empirical analysis is based makes it possible to account for the intertwined nature of public acceptance by focusing on the role of subjective views on energy technologies.

More specifically, the study at hand seeks to explore how public support for energy technologies depends on different aspects of individuals' broader perception of renewable energy technologies. We aim to better understand how the relevance of these aspects differ with respect to support on different levels: i.e., support for broader energy policy goals vs. for energy technologies. In addition, because perceptions can be substantially different between specific technologies, we also include the analysis of public support within the (middle) level: i.e., between two renewable energy technologies with different characteristics. This is done based on an empirical pilot study in Switzerland, which provides an ideal context to study these questions due to the current energy policy situation and also the long history of direct-democratic participation (see Section 2.2 for details). This research will enhance our understanding of how support for renewables is formed. This is not only relevant for the implementation of specific renewable energy projects, but also for the design and implementation of energy policies seeking to promote large renewable energy projects. After all, public resistance to a project is often only the manifestation of perceptions that form at a more general level due to the decisions made in the development of planning and permission procedures of energy projects [31].

## 2. Background

### 2.1. The role of beliefs in public support for energy issues

There are a number of factors that have shown to influence public acceptance of energy infrastructure and policies. They include trust in experts, operators, or authorities (see e.g., [4,12,32–34]), political ideology, which is often used as a cognitive shortcut in opinion-formation processes of complex and controversial areas [35–37], issue knowledge [38,39] and a wide range of individual psychological factors (see [12] for a review). On top of that, we know from research on mental models [40,41] that individual narratives and sets of beliefs are relevant for opinion formation with respect to complex issues. Beliefs are statements that are presumed to be true by the holder of the belief, regardless of whether they are factually true [42]. Consequently, they are shaped by cultural, social and political dynamics [43]. For example, in this special issue, Batel and Devine-Wright [44] argue that feelings of belonging to different imaginary communities impact people's responses towards energy issues at the local, national and European level, whereas MacArthur and Matthewman [45] explore the role of indigenous ownership of energy infrastructure in New Zealand.

While beliefs are a familiar psychological concept in the energy transition literature [46], expectations, which can be defined as a reflection of beliefs about the future, are an understudied construct in research on public support for energy technologies (with Fergen and Jacquet [47] and Ryghaug and Toftaker [48], being notable exceptions). The following paragraphs describe the beliefs that are analyzed in this study.

*Expectations towards the future energy system:* In the field of energy research, the concept of guiding visions has received a lot of attention as a “central means of mobilizing social actors and the co-ordination of dispersed agency” ([49], p. 449). Both, appeal and technical feasibility, have been identified to be important components of influential visions [50]. Yet, a range of visions can be defined under a single policy goal. Lilliestam and Hanger [51] show that even among expert advocates of 100% renewable electricity systems, there can be irreconcilable differences between the energy futures they have in mind. So far, expectations of lay people have not been given much attention in energy studies. Thus, there is little empirical research on how lay people's expectations about the energy future shape their support for energy policies and technologies. However, the role of expectations and their influence on decision-making is well established in other fields, for example in transition studies (e.g., [52–55]).

*Technology perception:* Energy technologies have a range of specific characteristics. For example, HP dams inevitably entail environmental impacts on aquatic ecosystems or the risk of dam failures. However, research suggests that even identical energy technology characteristics are often perceived differently by people [12]. For example, Slovic et al. [56] use the concept of affect heuristic to explain how the people's risk and benefit judgments are influenced by their feelings towards a technology. Therefore, affection towards a technology leads to higher perceived benefits and lower perceived risks, and vice versa [57]. Accordingly, measuring the broad and subjective technology perceptions is important as they can be partially influenced by cultural, social and political narratives in which alternative energy technologies are embedded in Firestone et al. [58] for example showed that energy technologies can carry a range of symbolic meanings which affect their acceptability.

*Future-orientation:* In addition to beliefs, we also include one psychological factor in the analysis. As most energy policy proposals and energy technology planning horizons are focusing on long-term outcomes, personality traits that describe how individuals conceptualize and deal with distant future outcomes may be important in acceptability evaluations [7]. Research in other fields, such as health-related or pro-environmental behavior, have shown that not only issue-specific expectations play a role for individuals' opinions, but that also their

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