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Do stakeholders' perspectives on renewable energy infrastructure pose a risk to energy policy implementation? A case of a hydropower plant in Switzerland

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ABSTRACT

As governments propose policies for increasing use of renewable energy, a key risk to policy implementation concerns potential conflicts amongst stakeholders, and public opposition to such policies. Adequately accounting for stakeholders' values and interests is key to understanding whether stakeholders' perspectives pose a risk to energy policy implementation. We present results from a case study on the implementation of a renewable energy project in Switzerland, where we applied Q methodology. Three perspectives were identified, namely: 1) promotion for local development and production of energy ('Local pro-producers'); 2) promotion for a national level 'greener' environmental agenda ('National greens'); and 3) regional government empowerment for implementing energy policies ('Cantonal leverage'). These three perspectives reflect different sets of values and priorities for local, cantonal and national interests, revealing disagreements with the energy policy at different levels of government. The key basis for disagreement rests on which objectives of the policy to prioritize, *i.e.* energy efficiency, sustainable development, electricity reduction or production. Despite this disagreement, stakeholders largely agree on the importance of an inclusive and democratic decision process. These findings support calls for the explicit and systematic consideration for deep-seated values and perspectives amongst stakeholders on an evidentiary basis.

1. Introduction

Governments in many countries have started to review their energy policies to accommodate a transition to renewable energy sources, as a response to international commitments to reduce greenhouse gas emissions through climate change mitigation, or in response to phasing out of other sources of energy such as nuclear. Some examples of such policies are: the new energy market design in the European Union (Anon, 2015); the last revision of the German Renewable Energy Act (Anon, 2017); or the Swiss energy law (Anon, 2016). One key factor for successfully implementing these policies is the degree of public acceptance of the infrastructure that comes along with renewable energy (Späth and Scolobig, 2017; Spiess et al., 2015; Stirling, 2008; Wolsink, 2012; Wüstenhagen et al., 2007).

Transforming the energy system, and the electric power system in particular, to one that is dominated by renewables instead of fossil fuels, will likely change the relationship of the average citizen to that system. Actors who are now consumers could then be also small producers in a more decentralized system with household photovoltaic installations, and current big producers could increase investment abroad, where resources for renewables are more abundant (Hanger et al., 2016; Lilliestam and Hanger, 2016). Consequently, the electricity will need to be either transmitted from remote areas with high voltage power lines, or to be smartly distributed by the grid (Blarke and Jenkins, 2013).

In the eighties, developers of renewable energy failed to anticipate acceptance issues associated with the implementation of those technologies. According to Pahl-Wostl (2002), engineers have considered the human dimension as an exogenous variable of their planning, and policy-makers have focused generally on the environmental and technological dimensions. Later, some scholars appealed for policies to institutionalize frameworks that promote acceptance within markets and communities (Wüstenhagen et al., 2007). The need for research on a broader range of determinants of public acceptance of energy technologies besides demographic variables was also identified (Visschers and Siegrist, 2014). A considerable number of studies have focussed on public acceptance, public risk perception, and stakeholder involvement. Fig. 1 shows a compendium of the determinants found in

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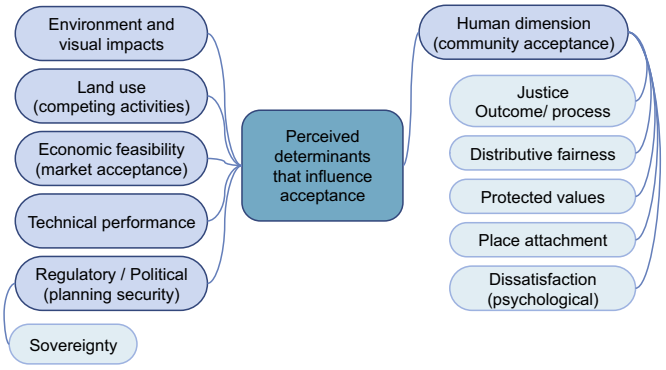

Fig. 1. Determinants of public acceptance during decision processes.

literature that may hinder public acceptance of renewables infrastructure.

The human dimension of public acceptance involves perceptions, namely justice in the outcome and the process of engagement, distributive fairness, protected values and place attachment (Devine-Wright, 2005; Ellis, 2004; Howard et al., 2016; van der Horst, 2007; Walter, 2014). Public acceptance may also be hampered by negative environmental impacts and dissatisfaction with end-of-pipe solutions which tend to prioritize the economic cost-benefit dimension (Geissmann, 2011; Pahl-Wostl, 2002; Zoellner et al., 2008). Spiess et al. (2015) observed that aesthetics, along with techno-economic performance, is a crucial determinant of public acceptance. Furthermore, trust and regulatory context are a relevant determinant of public acceptance (Hanger et al., 2016; Scolobig et al., 2015; Slovic, 1993; Stauffacher et al., 2008; Wolsink, 2007). In many cases, expansion of renewables leads to a conflict of interest or space between stakeholders' activities due to contested land uses (Heller et al., 2010; Neu et al., 2012). All these technical, environmental and socio-economic changes must be taken into consideration for successful implementation of renewable energy projects (Bryson, 2004; Wildavsky, 1979).

Despite the attention and recognition that public acceptance receives in accounting for policy-relevant knowledge, the interconnection of determinants of public acceptance has remained relatively unexplored. In particular, it is important to understand which determinants of public acceptance arise during the transition to renewables, how these interrelate with one another, and whether any negative perceptions pose an actual risk to the implementation of plans to effect a transition to renewable energy. To do so, we use Q methodology to analyse stakeholders' perspectives with respect to a typical renewable energy project in Europe, a proposed small hydropower project being developed in a Swiss community. Our aim is to account for values and perceptions at stake in a renewable energy transition process, thereby enhancing our understanding of potential conflicts and contributing policy-relevant knowledge regarding how key determinants for public acceptance interrelate.

In this paper, we present the results of this study, which we have structured as follows: First, we present a contextual overview of the case study (Section 2), followed by a description and rationale for the methodology employed (Section 3). We then present key results of the analysis (Section 4), followed by a discussion on the significance and relevance of these results – not only for the case study in question, but also for similar cases (Section 5), and conclude with key insights and recommendations (Section 6).

2. Case study: Swiss small hydropower plant

We chose a case study in the country of Switzerland, which like most wealthy countries has a policy target of switching from fossil fuels to renewable sources of energy, and which is having to grapple with acceptance issues (Guggenbühl, 2016). As a consequence of the nuclear accident of Fukushima, the Swiss Federal Council has been working since 2011 to develop a completely new energy strategy for the period 2020–2050 (ES2050). The energy strategy has four main pillars: (i) to reduce energy consumption by 54% based on 2000 consumption; (ii) to increase, 15 fold, the share of new renewable energy production in 2010; (iii) to reduce CO_2 emissions by 40–70% without jeopardizing supply, security, and costs; (iv) to phase out the five existing nuclear power reactors at the end of their safety-related service life and not replace them with new plants (BFE, 2013). The energy strategy is presently the most prominent element of the Swiss energy policy and will have to be voted in several stages by the parliament. Moreover, the public will have to vote on the strategy in the referendum initiated by the Swiss People's Party and a number of associations.

The Federal Office of Energy reported in 2013 economic and procedural determinants leading to public opposition to the energy strategy from specific group of stakeholders (UVEK, 2013). However, in the same document, the Federal Office of Energy declared: "The assessment of the energy strategy as a whole is positive on the part of energy policy, technical, landscape and environmental protection organizations".

Hydropower is the main electricity source in Switzerland, accounting for 59.9% of electricity production in 2015 (BFE, 2015). The energy strategy specifies plans to increase hydropower by 10% with respect to 2010, which is the maximum increase potential for Switzerland (BFE, 2012). Of the total expansion, small hydropower would account for 35%. Currently, the electricity contribution by all small hydropower plants is about 8.6% of total hydropower produced (BFE, 2012). To check how plausible this increase would be, the Federal Office of Energy assessed the hydropower potential in Switzerland among 34 stakeholders. The survey identified a generic list of barriers to expansion of hydropower, including ecological, economic, social and spatial planning factors (BFE, 2012). Some experts expressed "the existing fronts between conservation and use interests have so far prevented an objective discussion. From different sides a transparent, fact-based debate is required instead of lobbying and emotional discussions" (BFE, 2012). As reported in other studies, the location of the small hydropower plants, and the feed-in tariffs raised concerns from environmentalists and other stakeholders (Guggenbühl, 2016; Wehrli and Cadonau, 2014). Although the Swiss Federal Office of Energy attempted to address the hydropower debate in the country, this situation highlights the need for a deep analysis of stakeholder perspectives on the matter.

The complexities involved in the development of small hydropower plants provide a context in which to study and reveal potential conflict areas among stakeholders in the implementation of the Swiss energy strategy. After comparison amongst various options and consultation with the Swiss Federal Office of Energy, we selected the small hydropower plant of Berschnerbach located in the canton of St. Gallen in the east of Switzerland, for this case study (Fig. 2). The planned installed capacity for this hydropower project is 3.1 megawatts (MW), enough electricity for 2500 households or 30% of the consumption of Berschnerbach municipality. According to the energy policy (Anon, 2016), the project was eligible for feed-in tariff for the electricity produced.

The planning of the hydropower project in Berschnerbach was a complex process. It started in 2009 as a proposal from two electricity companies, one operating in that community and one national, along with the municipality of Berschnerbach and one environmental consultancy company. After the water license concession in 2011, the local electricity company organised meetings among the 40 or so participating stakeholders and several compensation measures were added to the plan, according to information obtained through interviews with the stakeholders of this study. The decision-making process lasted until the beginning of 2015, when one NGO submitted several complaints to the cantonal court. In its submissions, the NGO demanded a withdrawal of

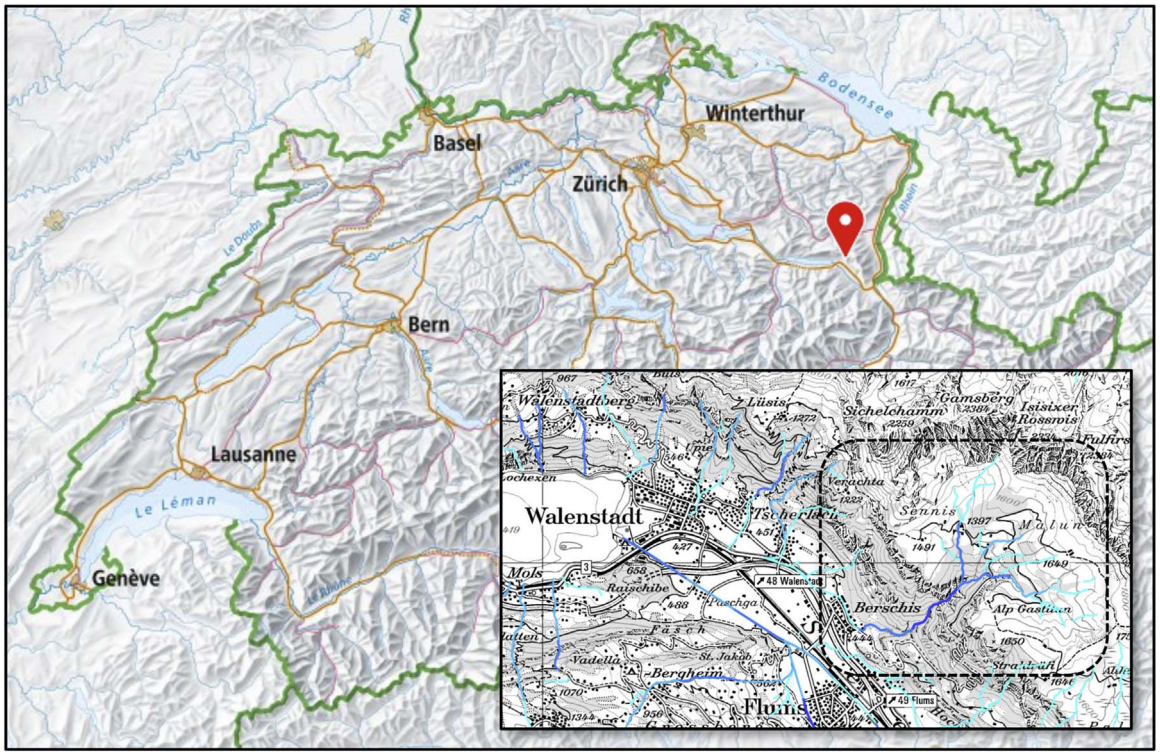

Fig. 2. Location of Berschnerbach river, in Walenstadt, Canton St. Gallen, where the small hydropower will be built.

the water concession provisions granted to the project. Finally, in November 2016, the electricity companies received the construction permits and started the construction of the plant. The plant is expected to be operational by June 2019, 5 years later than initially planned.

3. Methodology

There is increasing recognition for more mixed and participatory approaches for policy design, given the complexity of issues that require a policy response (Arnstein, 1969; Groß and Stauffacher, 2014; Linnerooth-Bayer et al., 2015; Ockwell, 2008; Scolobig et al., 2015; Späth and Scolobig, 2017; Stirling, 2010). Stakeholders' opinions on a given policy have become a central aspect in deliberative processes, because "understanding how a problem gets evaluated and resolved through the decision process [...] serves to identify ways in which decision-making, and thus policy making, can be improved" (McNie, 2007). A mixed method that has arisen to deal with these needs is Q methodology. The core of Q methodology is the development of a set of statements expressing potential stakeholders' attitudes and beliefs about a particular issue, ensuring coverage and balance of the topic (Watts and Stenner, 2012). A sample of participants then ranks the statements, according to whether they agree or disagree with their own perspectives. Using factor analysis, it is possible to identify patterns in the ranking. This requires identifying representative groups of participants likely to rank the various statements differently. In this way, correlations and/or major differences in group beliefs can be identified, enabling one to recognise institutional or demographic attributes of the groups' members.

Q methodology is especially relevant for the study of complex decision processes where accounting for multiple and often competing perspectives on issues is important (Brown, 2006; Cuppen et al., 2010; Ellis et al., 2007; Lynch et al., 2014; Spruijt et al., 2016). In a policy context, the resulting stakeholders' perspectives reveal the salient elements for those that the policy affects, which may also provide insights for policy alternatives that are coherent with the values at stake (Brown, 1980). The value of the approach lies in its ability to move from particular individual narratives within communities to the analysis of a diversity of perspectives that are held by a group of participants (Watts and Stenner, 2012). Accounting for perspectives in a systematic manner allows policy-makers to clarify and give effect to common interests and to reduce uncertainties and potential conflicts.

3.1. Analysis of stakeholders: the P-set

Our study warrants theoretical rather than pragmatic considerations, and participants were selected on the basis of their relevance for the case study (McKeown and Thomas, 2013).

Before settling on a final selection of participants for the Q study (the P-set), we examined the project's context in terms of the decision process that took place to develop the hydropower project, and in so doing identified and analysed key stakeholders (Bryson, 2004; Clark, 2002). We identified nine stakeholder groups that participated in the decision process and analysed their demands, expectations, the context in which the stakeholders interacted, their base values and strategies used to achieve their goals, the values accumulated or lost during the decision process, and the practices that were put in place or maintained. Relying on a snow-balling sampling methodology (Atkinson and Flint, 2001; Sarantakos, 2005), *i.e.* following the recommendations of key informants as provided to us by the Swiss Federal Office of Energy and other stakeholders, we identified 38 people who were directly involved in the decision process of the small hydropower plant at Berschnerbach.

3.2. Concourse, administering the Q, and factor analysis

This section covers the main relevant steps of the statistical analysis conducted, to explain the process of the Q methodology and the relevant decisions taken. More detailed explanations of the methodology and its statistical background can be found in (Brown, 1980; McKeown and Thomas, 2013; Watts and Stenner, 2012).

First, was to explore the discourse or narratives that characterise the opinions expressed on the hydropower project and its policy

Table 1
Final statements classified under the categories of the analytical framework (N=34). The analytical framework is compound of the relevant topics and qualifiers emerged during interviews and literature review. It frames the thoughts of the stakeholders in the small hydropower plant Berschnerbach (Reg. = regulatory, Soc. = social, Econ. = economy, Env. = environment, Tech. = technology).

Topic	Qualifier	ID	Wording
Decision Process	Reg.	**1**	The lack of experience of canton St. Gallen facilitated the decision-making process.
		2	The low agreement was in large part because the initiators underestimated the complexity of the decision process.
	Soc.	**3**	I could not influence the results of the decision process.
		4	All stakeholders should be involved in decision-making.
	Econ.	**5**	The project's result is a "win win" situation for everyone.
		6	In the decision process personal interests are given preference over project interests.
		7	Decisions are logically always taken by those who pay.
	Env.	**8**	In the decision process my main motivation was to produce renewable energy.
	Tech.	**9**	In Switzerland conflicts limit a sustainable energy development.
		10	The decision process brought a huge disadvantage for the project.
Energy Policy	Reg.	**11**	The whole political apparatus could work faster.
		12	In Switzerland, it is easy to hold a roundtable with everyone to make decisions.
		13	The many administration bodies in Switzerland made the decision-making process complex.
	Soc.	**14**	In projects planned at national level, local interests are enough considered.
	Econ.	**15**	Comparing the project's electricity with the market price, the energy policy seems senseless.
		16	We have to produce as much energy as possible to meet our needs.
		17	In Switzerland we should not build any small hydropower plant more.
	Env.	**18**	In Switzerland the environment impacts are not a problem as the economy moves.
		19	The energy strategy should focus on how to protect our nature.
		20	In Switzerland, we have to produce much more renewable energy.
		21	I wonder whether the green lobby has a strong influence on the government.
	Tech.	**22**	We should enhance the energy efficiency (efficient appliances, roof isolation).
		23	In Switzerland, we should improve the efficiency of the large hydropower plants.
		24	The phase out of nuclear in Switzerland is, in my opinion, wrong.
		25	In Switzerland, we should not limit the conventional energy sources (non-renewable).
Project	Reg.	**26**	The hydropower plant Berschnerbach is a decisive project for St. Gallen.
		27	The electricity for the municipality is secured with the hydropower plant Berschnerbach.
	Soc.	**28**	The community has gained much significance with the hydropower Berschnerbach.
		29	Local residents have the best knowledge about community needs.
	Econ.	**30**	In the entire economy of Switzerland, the hydropower plant Berschnerbach is important.
		31	Of course I (or my employer) take profit from the project.
	Env.	**32**	I have the feeling that the ecologic cons and the power production are well balanced.
	Tech.	**33**	Technically wise I am very happy with what the project represents.
		34	If we had invested the money somewhere else, we could produce more energy.

process. In the absence of comprehensive literature to draw upon, we conducted twelve semi-structured interviews with stakeholders of the nine identified groups. The interviews provided insights on the topic, and helped to create a concourse of opinions using the actual terminology and language of the stakeholders, attending to the principle of self-reference and natural digressions (McKeown and Thomas, 2013). Newspapers and multimedia, scientific papers, and legal documents relating to the court submissions were also used to gather statements. The information from direct and secondary sources yielded a rich and substantial generation of 349 initial statements, reaching a saturation point. Based on these statements, we elaborated the analytical framework shown in Table 1.

We defined three main topics and four qualifiers for the specific project under study. We then filtered the initial statements and narrowed them down to a comprehensive and manageable sample of 34 statements (N=34), conforming the affinity of the statements to our framework. The qualifiers of our analytical framework correspond in large terms to the determinants of public acceptance (Fig. 1).

In the next step, the Q sort, the stakeholders cross-compared and distributed the 34 statements according to their personal preference, using a normal fix distribution from 4 to −4, where 4 represented the statements "most like their opinions" and −4 the statements "most unlike their opinion". From the 38 stakeholders identified in the analysis, 26 completed the Q sort, from June to August 2016. Twenty-one of them responded online, using the *Q sortware* tool (Pruneddu, 2013), and five were interviewed face-to-face. Stakeholders also clarified their reasons for placing statements in the middle of the distribution −0 neutral zone- as well as at the extreme ends of the scale, and whether they found some statements non-understandable or missing. Their answers helped to better understand the single perspectives, and facilitate the final interpretation.

Finally, the 26 Q sorts were factor analysed using centroid analysis and varimax rotation in *PQmethod* (Schmolck and Atkinson, 2014). To select the final number of factors, we followed Kaiser-Guttman criterion, as well as Humphrey's rules I and II. Kaiser-Guttman criterion is based on an eigenvalue greater than 1, thus, the factor is represented by at least one participant loading significantly (Kaiser, 1960, 1970). According to Humphrey's rule I, the factor needs two or more significant factor loading after extraction. In our case, a significant factor loading at a single level of $p < 0.01$ was ± 0.442. Humphrey's rule II states that the cross product of the two more significant factor loadings has to exceed twice the Standard Error; in our case ± 0.343. Four factors that captured stakeholders' perspectives in a broad set of interconnected variables were extracted according to this criterion (Table 2).

4. Results

Four factors were extracted from the analysis, each of them representing a specific perspective regarding the small hydropower plant at Berschnerbach. Table 2 shows participants' loadings on each of the factors. A participant with a single factor loading in excess of ± 0.442 loaded significantly, and exemplified the perspective of that particular factor. Three participants had significant factor loadings in more than one factor, hence were considered confounded, and excluded from the analysis (ID: 4, 20, 21).

Table 2
Factor loadings per each participant, Q sort, represented per stakeholder group at a significant level of $p < 0.01$. Participants loading significantly, exceeding ±0.442, are marked in bold.

Participants per stakeholder group	ID	F1	F2	F3	F4
Canton administration	8	**0.49**	0.17	0.09	−0.36
Canton administration	22	**0.45**	0.34	0.26	−0.21
Electricity company - local	16	**0.65**	−0.06	0.42	−0.03
Electricity company - local	24	**0.45**	0.20	0.39	0.08
Electricity company - national	6	**0.53**	−0.15	0.40	0.24
Environmental consultancy	12	**0.70**	0.20	0.07	−0.02
Farmer	19	**0.70**	−0.01	0.40	0.14
Land owner	2	**0.64**	0.01	0.13	0.13
Land owner	14	**0.70**	0.12	−0.03	−0.09
Valley community	9	**0.63**	−0.22	0.23	−0.01
Environmental consultancy	17	0.39	**0.69**	−0.08	−0.04
Environmental NGO	1	−0.05	**0.79**	0.15	−0.17
Environmental NGO	3	0.34	**0.44**	0.38	0.14
Environmental NGO	5	−0.06	**0.66**	−0.09	0.06
Environmental NGO	10	−0.03	**0.79**	0.12	0.03
Environmental NGO	15	0.11	**0.76**	0.01	0.21
Canton administration	7	0.23	−0.47	**0.55**	0.05
Canton administration	11	0.38	0.22	**0.73**	−0.37
Canton administration	18	0.23	0.21	**0.72**	−0.11
Valley community	25	0.01	−0.08	**0.45**	0.05
Electricity company - national	13	0.33	−0.2	0.41	**−0.56**
Electricity company - national	26	0.09	0.00	−0.03	**0.64**
Farmer	23	0.13	0.26	0.42	**0.51**
Canton administration	21	0.33	***0.47***	***0.54***	−0.05
Local administration	20	***0.54***	0.02	***0.51***	−0.08
Valley community	4	***0.55***	0.10	***0.61***	−0.12
Eigenvalue		5	3.9	3.82	1.54
Variance (%)		19.23	15.01	14.69	5.91
Humphrey's (I)		12	7	7	2
Humphrey's (II)		0.49	0.62	0.53	0.32

In the factor interpretation we only address the three most significant factors, because factor 4 represents a complex and bipolar perspective that deserves additional investigation.

4.1. Consensus

Although the three major factors support different priorities regarding the Swiss energy strategy, they agree in some aspects, especially on how to conduct decision processes. Fig. 3 shows the weights each of the statements has per factor, the statements' wording are given in Table 1. As can be noticed in Fig. 3, the consensus statements (ID 3, 4, 7, 11, 13, 18, 24) have similar weight on each of the three factors.

The three perspectives demonstrate a preference for a democratic decision-making process and system. They believe that all stakeholders should be involved in decisions-making processes, although they also thought that the various administrative levels in Switzerland made the decision-making process complex (Statements 3, 4, 11, 13). All stakeholders also agreed that final decisions were not influenced by economic power (7) and that economic development did not prevail over environmental concerns. Finally, the three perspectives all agreed with the nuclear phase out (18, 24).

This understanding across perspectives indicates possible leverage points for negotiations as the policy faces implementation, reminding participants and those designing and implementing the policy where common ground exists.

4.2. Distinguishing statements

4.2.1. Factor 1: Local pro-producers

Factor 1 has an eigenvalue of 5.0 and explains 19.23% of the study variance. The participants associated with this factor were 9 men and 1 woman, of whom 6 were local citizens representing various sectors

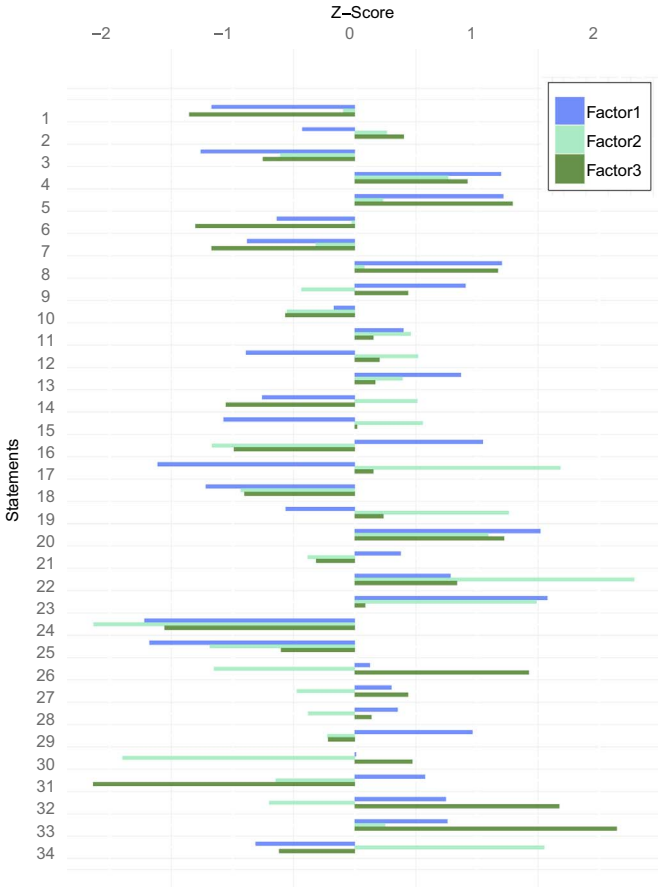

Fig. 3. Z-scores, or weights of the 34 statements, represented by factor. It shows how differently the three perspectives valued every statement (listed in Table 1).

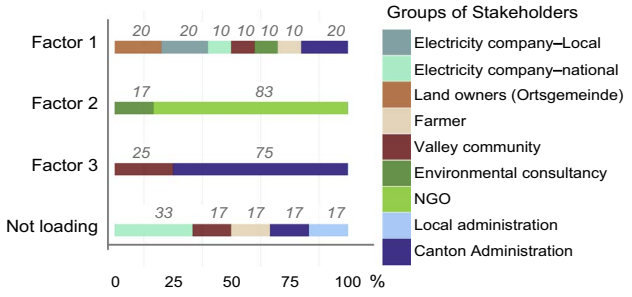

Fig. 4. Stakeholder groups loading significantly on the three principal factors, in percentage.

(Fig. 4). The most important aspect for this group is to address power demands by increasing electricity production, since nuclear must be replaced (Statement 16, Table 1, Fig. 3), and use of fossil fuels must be limited (25). In their opinion, we should foster renewables, build small hydropower plants, and increase the efficiency of the big hydropower plants (17, 20, 23). They placed importance on good management of environmental impacts and economic viability for small hydropower plants to remain operable. In their opinion, the community will gain importance by the project (15, 28, 31, 32, 34). During the decision process, their participation was perceived as active and influential, given that local residents have the best knowledge of the municipality's needs (3, 29). Even though there was no clear agreement amongst the stakeholders, the results led to a "win-win" situation for everyone (5, 8, 9, 12, 21). However, they felt that conflicts, other interests, and the "green lobby" in Switzerland limit the potential for renewables development (9, 21).

4.2.2. Factor 2: National greens

Factor 2 has an eigenvalue of 3.9 and explains 15.01% of the study variance. The participants associated with this factor were 5 men and 1 woman. Five of them are members of environmental NGOs and one is a consultant biologist (Fig. 4). According to this group, the best energy strategy is to cut back on power consumption, thereby placing all efforts on increasing energy efficiency and the preservation of nature. Furthermore, fossil fuels should be limited and, renewables should be promoted only as a last resort (Statements: 19, 20, 22, 23, 25 , Table 1, Fig. 3). This view rejects the construction of small hydropower plants because such projects would not make a significant contribution to the Swiss economy or that of the regions (17, 26, 30, 32, 34). They defended the democratic decision-making process because, in their view, it made it easy to reach solutions with stakeholders (9, 12). They felt that projects planned at national level considered and accounted for local needs but that it would be better if political processes of negotiation were faster (11, 14).

4.2.3. Factor 3: Cantonal leverage

Factor 3 has an eigenvalue of 3.82 and explains 14.69% of the study variance. The participants associated with this factor were 3 men and 1 woman, of whom three have positions in the canton administration (Fig. 4). The most important aspect of this perspective is that the small hydropower plant technology allows for a good balance between electricity production and environmental impacts (Statements: 32, 33, 34, Table 1, Fig. 3). As hydropower production must be encouraged throughout Switzerland, renewable projects such as Berschnerbach are important at all levels, and particularly for the canton (20, 26, 27, 28, 30). Decision processes in Switzerland were considered efficient, leading to good solutions for everyone, but in some occasions projects were perceived to be influenced by personal interest or by the "green lobby" (5, 6, 10, 11, 21). Respondents at the cantonal level thought that local needs were insufficiently attended to at both national and local government levels (14, 29).

5. Discussion

Our results reveal three major stakeholders' perspectives on the energy policy and their manifestation during the implementation of a hydropower project in Switzerland. These perspectives show consensus in that the decision-making process is considered fair, democratic, inclusive and embodying procedural, outcome and distributive justice, all factors perceived by participants to be strengths of current practice. On the other hand, the weakness of policy making is attributed to the complexity of the process arising from the numerous administrative bodies in a federal system *i.e.* dissatisfaction with regulatory determinants.

Our findings also provide evidence of the need for accounting for the relationship between human, the environment and techno-economic determinants in trying to make sense of public acceptance issues. Local pro-producers think that participatory decision-making processes limit development of renewables infrastructure, whereas the canton, also a defender of the hydropower technology, thinks participation adds value to the decision-making processes. The Swiss Federal Office of Energy used techno-economic and environmental determinants to evaluate impacts and public acceptance of the energy strategy, excluding from the analysis the human dimension, such as values and preferred outcomes of locals (BFE, 2013; UVEK, 2013). The results of this study demonstrate that although environmental and techno-economic assessments are key to fostering energy transitions, they are not sufficient in themselves. When it comes to specific developments, personal values and interests of stakeholders must be represented, since they are as relevant as environmental or techno-economic aspects to accept energy transition policies.

This study shows that, in its current state, the Swiss energy policy may not be in agreement with citizens' preferences and values in some regions. The local perspective defends the view that local residents have the best knowledge about community needs. The national perspective prioritizes societal needs as a whole, *e.g.* the wise use of natural resources, and believes that the government adequately addresses local needs. The cantonal perspective on the other hand, formed mostly by representatives of the cantonal administration, may sometimes disagree with this view. The fact that stakeholders at the local level and those at the cantonal and national level differed on who had the best knowledge of local needs highlights the different significance attached to place and protected values. These results also emphasize the need for (i) compromise by the cantonal administration if implementation of the energy strategy is to be successful and (ii) enhanced communication of the objectives of the broader energy policy down to the local context. Further, non-alignment of perspectives could result in the prioritization of substantially different policy targets at different levels of the administration (Juhola and Westerhoff, 2011).

Lasswell (1971) outlines some principles that support the derivation of common interests and resolution of conflicts in such situations. Preference must be given to interests at the national level, when those of the local community may result in value deprivations for other parts of the country. Similarly, preference must be given to the local community when the nation is not negatively affected by the consequences of a given decision. In both cases, agreement on interest and value trade-offs requires engagement with all affected parties and strong policy commitment, especially where substantial differences in policy preferences exist.

Universal consensus was found in only one of the four pillars of the energy strategy, *i.e.* the nuclear phase out. Each perspective supported substantially different priorities with respect to the other main pillars of the strategy: energy consumption, energy production, efficiency and climate protection. The perspectives go beyond the "pro-economy" and "pro-ecology" categories recognized in previous studies (Markard et al., 2016). They show a complex interrelation between human, techno-economic and environmental determinants to support, or not, the energy strategy.

The local and cantonal perspectives prioritize increasing electricity production without any consideration to reductions in consumption. These perspectives contrast with the first pillar of the energy strategy as well as the main priorities of the Federal Act of Energy, which are to reduce power consumption, and to make a more rational use of energy (Anon, 2016). On the other hand, these perspectives support the second pillar: to increase the share of renewables. Regarding energy efficiency, the local perspective supports the enhancement of big hydropower plants. They also hold opinions on the construction of small hydropower plants, even if their energy output is low. The cantonal perspective does not prioritize efficiency, disregarding the principle of most economic and rational use of resources. On the other hand, the national perspective prioritizes reduction of power consumption, enhancement of efficiency, and as a last resort, the development of renewables, a view in agreement with the pillars of the energy strategy. In their view, sustainable development in the context of energy entails a reduction in consumption, achieved by prioritizing efficiency and not production. This is the only perspective that sees nature protection as a priority for the energy strategy, as the Federal Act of Energy does.

In conclusion, our findings show that while all stakeholders agree on the way decision-making should proceed, they prioritize different determinants of public acceptance. Previous studies concluded that agreement on the general frame of reference in a discussion is a prerequisite to reach successful solutions in stakeholder discussions (Kortsch et al., 2015). We advocate this is not enough for the development of specific renewable energy projects. Personal values of stakeholders at local, cantonal and national levels are likely to differ, and their interests must be represented during the decision-making process. Additionally, assessments of policies must include those aspects, because they are as relevant to the acceptance and success of energy transition policies, as environmental or techno-economic de-

terminants. Otherwise, negotiating agreement or support for a particular technology projects could be difficult, more costly and lengthy, or even deadlocked.

Fortunately, consensus statements, which reveal agreement on the way negotiations in decision process can be achieved, can provide leverage points for negotiation on strategies that could work for the policy problem at hand (Michaels, 2009). The agreement on phase-out of nuclear, as well as the way decision processes must be conducted, are a 'common ground' that is sufficiently valid as a basis for negotiation. Our results indicate that decision-making must bring all affected parties together to find a democratic solution during initial phases of the policy process, which include the problem definition and planning.

6. Conclusions and policy implications

While new and controversial policy instruments, such as the Swiss energy strategy, have been enacted to accommodate to international commitment towards climate change mitigation, not enough attention has been given to the study of stakeholders' perspectives and its related implementation processes. Having analysed the energy strategy of the Swiss federal government from the perspective of stakeholders involved in a decision-making process of a small hydropower plant, our results reveal a number of perspectives related to the energy strategy and the decision-making processes. These include the fact that stakeholders largely agree on the means to implement the strategy, the decision process must be inclusive and that common ground can be constructed. However, perspectives differ strongly on what objectives to prioritize, *i.e.* energy efficiency, sustainable development, electricity reduction or production.

In all three perspectives, incongruity was found in the strategy at different levels of the federal government structure. Thus, although the canton plays a relevant role for the energy policy implementation, its perspective did not align with the national interest in terms of CO_2 emissions reductions and energy efficiency. Inclusive and exclusive, national and local interests must be analysed carefully, and prioritized according to each project. Our results also highlight a risk of stakeholders feeling disengaged with the process because they disagree with the overarching framework, *i.e.* pillars of the energy strategy. Such decision-making processes require additional resources, time, money, and knowledge, for deliberation and reaching a compromise.

Overall, the results do not show rejection of the energy strategy. Instead, results indicate that a lack of participation, and responsiveness of the policy to citizens' preferences, in the early stages of policy design, may present a risk to implementation of the policy given the need for re-negotiating the policy objectives at later stages.

Studies, such as the one presented here for the hydropower sector, may help to clarify differences amongst stakeholders supporting similar energy policies, but with differing implementation strategies. Our findings reveal that solutions driven by specific economic powers are likely to be rejected, as well as any personal influence or lobby seen to impose a single perspective. One relevant finding for policy-making is that the stakeholders in this study are willing to invest time to reach long-term solutions. These equitable decision-making processes would ultimately increase the probability of reaching a more nuanced and robust solution that may not necessarily focus on being the most optimal in terms of time, but rather focusing on serving the common interest and therefore with higher likelihood of success.

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