



The (de-)construction of technology legitimacy: Contending storylines surrounding wind energy in Austria and Switzerland

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ABSTRACT

Why do some countries assign a major role to wind energy in decarbonizing their electricity systems, while others are much less committed to this technology? We argue that processes of (de-)legitimation, driven by discourse coalitions who strategically employ certain storylines in public debates, provide part of the answer. To illustrate our approach, we comparatively investigate public discourses surrounding wind energy in Austria and Switzerland, two countries that differ strongly in wind energy deployment. By combining a qualitative content analysis and a discourse network analysis of 808 newspaper articles published 2010–2020, we identify four distinct sets of storylines used to either delegitimize or legitimize the technology. Our study indicates that low deployment rates in Switzerland can be related to the prominence of delegitimizing storylines in the public discourse, which result in a rather low socio-political acceptance of wind energy. In Austria, by contrast, there is more consistent support for wind energy by discourse coalitions using a broad set of legitimizing storylines. By bridging the related but separate literatures of technology legitimacy and social acceptance, our study contributes to a better understanding of socio-political conflict and divergence in low-carbon technological pathways.

1. Introduction

To effectively mitigate climate change and reduce air pollution, it is essential to decarbonize electricity systems (Esteveño, 2020; Intergovernmental Panel on Climate Change (IPCC), 2018; Sindhwani et al., 2022). This requires a replacement of highly centralized electricity systems (built mainly around fossil fuels) with more decentralized low-carbon technologies, such as wind energy and solar photovoltaics. Most renewable energy technologies have become technically and economically viable (Duić, 2015; IRENA, 2020). They nowadays often outperform fossil fuel-based or nuclear alternatives in terms of leveled cost of electricity (International Renewable Energy Agency (IRENA), 2022; Timilsina, 2020), in addition to their advantages with respect to a fairer distribution of various costs and benefits associated with energy systems (Donaghy et al., 2023). Still, their deployment is lagging behind stated objectives in many countries (United Nations Framework Convention on Climate Change (UNFCCC), 2021).

This discrepancy has various, often interrelated causes. Due to the sunk costs of existing systems along with institutional, cultural, and

behavioral path dependencies, electricity supply infrastructures are inherently inert (Geels et al., 2017; Seto et al., 2016; Unruh, 2002; Verbong and Geels, 2007; Wolsink, 2012). Relatedly, socio-technical transitions often face resistance by actors expecting to lose from changes (Geels, 2014; Rinscheid, 2020; Trencher et al., 2019). Moreover, new technologies frequently face local opposition at the project level, which is particularly the case for wind energy (Devine-Wright, 2005; Reusswig et al., 2016; Scherhauser et al., 2017). Nevertheless, various countries have been quite effective in increasing the share of low-carbon technologies for electricity production. Examples include Sweden, Austria, Greece, Chile, and others (Ritchie and Roser, 2021).

This paper is set out to further explore the differences between leaders and laggards in renewable energy adoption. It does so by focusing on the *social acceptance* of wind energy. Researchers have identified social acceptance as a necessary condition for technology deployment (e.g., Batel, 2020; Ellis and Ferraro, 2016; Rand and Hoen, 2017). While social acceptance may refer to a more or less 'active' endorsement, it generally captures the positive reaction of actors (e.g., citizens, stakeholders, and policymakers) towards a technology

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(Dermont et al., 2017). Social acceptance has been established as a multi-dimensional concept (Wüstenhagen et al., 2007). *Socio-political* acceptance is the prerequisite for the adoption of favorable planning rules, reliable financial incentive systems, participation procedures, and other institutional backbones of technology deployment, thereby also influencing *community* and *market* acceptance (Wolsink, 2018). While the social acceptance literature provides a valuable conceptual repertoire to study social conflicts in socio-technical transitions, it often fails to appreciate the *dynamics* of multi-actor processes (Cuppen and Pesch, 2021). Moreover, it has generated little insight into the factors that shape socio-political acceptance in particular. We demonstrate that understanding how socio-political acceptance is shaped over time benefits from studying processes of technology legitimization.

The key role of *technology legitimacy* in the diffusion and decline of technologies is underscored by research on innovation systems and socio-technical transitions (Binz et al., 2016; Geels and Verhees, 2011; Markard et al., 2021). Technology legitimacy refers to the “commonly perceived alignment (or misalignment) of a focal technology with institutional structures in its context” (Markard et al., 2016, p. 333) and is shaped and contested in public discourse. For a niche technology to enter mass markets, it is essential to build up legitimacy across broader constituencies (e.g., consumers and investors) (Smith and Raven, 2012). Technology legitimacy remains essential in later phases of innovation journeys (Geels and Verhees, 2011). Connecting the literatures on technology legitimacy and social acceptance, we argue that gaining legitimacy is necessary for a technology to be accepted by policymakers, investors, and the broader public. By investigating processes of technology legitimization across cases, we ultimately aim to better understand differences in the adoption of sustainable energy technologies.

Empirically, we focus on legitimization processes surrounding wind energy. Globally, wind energy capacity has grown notably in recent years (GWEC, 2023). However, the importance of wind energy varies strongly across countries (WindEurope, 2022). We comparatively study processes of technology (de-)legitimation in two European countries, Austria and Switzerland. While these two cases are similar in many respects (e.g., size, population size, energy transition objectives, strength of green parties, role of participatory processes), they differ strongly regarding the role of wind energy in their electricity systems. Wind energy is an important part of the electricity generation portfolio in Austria, where it accounted for 12 % of electricity demand in 2020 (WindEurope, 2022), but it only covered 0.2 % of electricity demand in Switzerland in the same year (Suisse Eole, n.d.). With the contribution of onshore wind energy being on par with the United Kingdom's, Austria is by far the leader among all landlocked countries in Europe in terms of the share of annual electricity demand covered by wind energy (WindEurope, 2022). Switzerland, on the other hand, is among the least developed wind markets in Europe, with only 41 large wind turbines being installed at the end of 2020 (WindEurope, 2022).

Puzzled by this divergence, our research centers on the question how the construction and deconstruction of technology legitimacy reflects, and influences, the socio-political acceptance of wind energy and the development of deployment trajectories. We examine this question based on the multi-dimensional discursive approach developed by Rosenbloom et al. (2016). Weaving together conceptual lenses from sustainability transitions research and discourse theory, this approach captures how politically relevant actors use so-called storylines in public debates. Complementing this approach, we apply Discourse Network Analysis (DNA) to systematically study discourse coalitions over time, which helps to better understand the role of actors in the (de)construction of technology legitimacy. Going beyond previous research that looks at lock-in and path dependence (Verbong and Geels, 2007; Wolsink, 2012) or local opposition against renewables (Jones and Richard Eiser, 2010; Kontogianni et al., 2014; Reusswig et al., 2016) as primary explanations for low deployment rates of wind energy, we systematically compare discourses surrounding technology legitimacy, thereby unveiling broader societal forces that shape low-carbon pathways over

longer periods of time.

Studying public discourses based on 808 newspaper articles published between 2010 and 2020, we identify four overarching storylines used to (de)legitimize wind energy in both countries. Our analysis shows that storylines that delegitimize wind energy were far more prevalent in Switzerland than in Austria. Specifically, our study documents how concerns about landscape protection and the stability of the electricity system, along with perceived economic risks and questioning the suitability of wind energy, have dominated the public discourse, and contributed to delegitimizing wind energy in Switzerland. We argue that the highly contested legitimacy of wind energy in Switzerland has contributed to shaping a hostile investment environment in which not a single wind turbine was built over several consecutive years in the 2010s. By contrast, while concerns are voiced in Austria too, the legitimacy of wind energy is much less contested. Instead, the public discourse is characterized by efforts to construct legitimacy with broad actor coalitions supporting the fast deployment of wind turbines and seeking to overcome implementation obstacles to make wind energy a central part of a low-carbon energy system.

Based on our analysis, we make three main contributions. First, conceptually, we offer a way to link the related but separate literatures on social acceptance and technology legitimacy. While both concepts are important for the analysis of technology-society interactions and offer complementary insights, they have evolved mostly independently of each other so far. Second, we systematically examine public discourses on wind energy in a comparative setting, thereby identifying key storylines and shifting discourse coalitions over time. This contributes to explaining variation in countries' technology deployment pathways and their embeddedness in broader societal forces over time. Third, by applying the DNA method to studying processes of (de-)legitimation, we advance the methodological repertoire of the analysis of the interactions of technology with socio-political and behavioral aspects.

The remainder of this article is structured as follows: Section 2 discusses the concept of socio-political acceptance, its relation with technology legitimacy, and the role of public discourse and discourse coalitions in shaping technology legitimacy and, in turn, also socio-political acceptance. Section 3 introduces the methods, case selection rationale, dataset, and analysis technique. Section 4 entails the results of our comparative case study. After discussing the results in Section 5, the paper concludes by reviewing the main findings and suggesting implications for future research.

2. Theoretical foundations

2.1. Social acceptance

At least in democratic states, social acceptance is a prerequisite for the large-scale deployment of new technologies. Based on their investigation of renewable energy adaptation in indigenous and vulnerable island communities, Hills et al. (2018), for instance, highlight the importance of the cultural and social dimension for technology adaptation. Over the last 20 years, scholars have produced a rich body of research on the social acceptance of energy technologies (Bell et al., 2005; Blumer et al., 2018; Devine-Wright, 2007; Ellis and Ferraro, 2016; Huijts et al., 2012; Rand and Hoen, 2017; Vuichard et al., 2022; Wolsink, 2007a). We follow Wüstenhagen et al.'s (2007) suggestion to conceptualize social acceptance along the following three interlinked dimensions: socio-political, market, and community acceptance. *Socio-political acceptance* refers to social acceptance at the broadest societal level. This includes the acceptance of technologies and associated institutional frameworks by the broader public as well as acceptance and the deliberation thereof by key stakeholders and policymakers (Wüstenhagen et al., 2007). In terms of institutions, research has examined the role of spatial planning (Toke et al., 2008; Warren et al., 2005), participatory processes (Blumer et al., 2018), and financial procurements systems (Szarka, 2006; Wüstenhagen et al., 2007), among

others. Socio-political acceptance has implications for the *market acceptance* of a technology, which includes acceptance by consumers and investors (Klessmann et al., 2013). Globally seen, market acceptance of wind energy is highly robust nowadays, but still remains contingent on the respective institutional context. In 2021, €41 bn were invested in new wind energy developments in Europe alone (WindEurope, 2022). Globally, onshore wind energy accounts for 769.196 megawatt (MW) installed capacity, which equals 25 % of all renewable sources (IRENA, 2022).

Socio-political acceptance is also strongly interlinked with *community acceptance*, which refers to acceptance of technologies and infrastructures at the local level (Wolsink, 2000; Wüstenhagen et al., 2007). With respect to wind energy projects, local responses have been investigated widely and many factors were identified as influential, including trust in project developers and public administration, distributive justice, and procedural justice (Batel et al., 2015; Bell et al., 2005; Devine-Wright et al., 2017; Ellis et al., 2007; Kontogianni et al., 2014; Rand and Hoen, 2017; Walker et al., 2010; Wolsink, 2007b). Often, opposition by the local population is depicted as a cause for slow wind energy deployment that ‘needs to be overcome’ (e.g., Reusswig et al., 2016). Acknowledging that local responses to wind energy projects cannot be explained by adopting a methodological individualist ontology (Thornton and Knox, 2002; Wolsink, 2000), social acceptance research at the community level moved from the reductionist “NIMBY” concept, which has been extensively criticized for postulating that rational and egoistic individuals engage in opposition against wind projects when their personal well-being is at stake (Devine-Wright, 2009; Wolsink, 2000), to a more nuanced, context-sensitive understanding. The latter attends systematically to local conditions (Walker et al., 2018), institutions (Breukers and Wolsink, 2007; Wolsink, 2000), communication and discourse (Olson-Hazboun et al., 2016; Wolsink, 2007b) in shaping acceptance. Along these lines, Firestone, Bates, and Knapp (2015, p. 248) suggested that positive and negative impressions of wind energy “are more reflective of socially and culturally constructed aspects associated with the wind turbine than physical ones.”

Building on this line of research, we concur with Devine-Wright et al. (2017) who emphasized that, given that perceptions are socially constructed, achieving a comprehensive understanding of local responses to electricity infrastructure deployment requires analyses of the broader economic, socio-political, cultural, and geographical influences by which they are shaped. Relatedly, Blumer et al. (2018) highlighted how the perceptions and beliefs of communities affected by new energy technologies are influenced by public discourses and the cultural and social context in which they are embedded. At the level of individual projects, Huijts et al. (2012) showed that communication has a strong influence on local responses. In sum, all these works point to the malleability of technology acceptance and the crucial role of public discourses in shaping public views on new infrastructure deployment.

2.2. Technology legitimacy

Research on innovation systems and sustainability transitions has underscored the key role of technology legitimacy, which – much like social acceptance – has been described as a prerequisite for the adoption and diffusion of innovations (Bergek et al., 2008; Binz et al., 2016; Bork et al., 2015). Legitimacy can be understood as a shared perception that an object (e.g., a technology) fits into a socially constructed system of institutions, norms, and values (Geels and Verhees, 2011; Markard et al., 2016). In the context of energy technologies, legitimacy thus refers to shared perceptions among a set of actors that a technology is a desirable and appropriate component of broader energy systems. While a technology may be perceived as legitimate among certain actors, such as investors, this does not automatically translate into legitimacy among other constituencies, such as policymakers or consumers. However, if legitimacy is gained among a broad range of actors, this facilitates other processes relevant for the development and diffusion of innovations,

including resource mobilization, market formation, and the configuration of favorable regulatory frameworks (Bergek et al., 2008), all of which may in turn again shape perceptions of legitimacy in a dynamic, co-evolutionary process (Hekkert et al., 2007).

The legitimacy of a technology can rarely be taken for granted, as it is constantly constructed and contested in social processes (Geels and Verhees, 2011; Johnson et al., 2006). This dynamic understanding also implies that legitimacy needs to be maintained to enable continuing public support (Geels and Verhees, 2011; Geels et al., 2017). In assessing the prospects of technology adoption and diffusion, it is important to account for these dynamic processes (Binz et al., 2016; Kishna et al., 2017). Legitimacy-building entails various activities by organizations and individuals seeking to influence others' expectations and beliefs about the role of a new technology in the context of existing systems (Bergek et al., 2008). As Geels and Verhees (2011, p. 913) put it, the study of legitimacy-building “emphasizes that collective sense making takes place on public stages (e.g., public debates, media, newspapers)”, with various actors including industry associations, policymakers, social movements, and others “perform[ing] on these public stages and engag[ing] in discursive struggles that aim to influence collective discourses”. Several studies have since more deeply investigated the construction of technology legitimacy in public arenas (e.g., Dehler-Holland et al., 2022; Markard et al., 2016; Tziva et al., 2020). Importantly, the legitimacy of the status quo; i.e., the widespread acceptance of existing configurations, often works against such legitimacy-building efforts of new technologies (Johnson et al., 2006). Consequently, discursive struggles surrounding new technologies typically also involve active efforts to *erode* legitimacy, such as in the cases of genetically modified food (Jansma et al., 2020) or solar photovoltaics (Rosenbloom et al., 2016).

2.3. Storylines and discourse coalitions

The multi-dimensional discursive approach developed by Rosenbloom et al. (2016) captures how politically relevant actors use *storylines* to strategically frame a technology in a particular way and modulate the menu of options perceived as desirable and feasible. Following Hajer, (2006, p. 69), the multi-dimensional discursive approach defines storylines as “condensed statement[s] summarizing complex narratives” about the alignment of a technology with a given context. Narratives, hence, can be seen as the “key vehicle” by which structures of legitimation are built (Hermwille, 2016, p. 239), and storylines encapsulate a variety of specific narratives that contribute to a common direction of sense-making regarding the object of reference. Obviously, storylines can be employed for the construction of legitimacy, but they can also be used to erode it (Bosman et al., 2014), as in Roberts' (2017) discursive analysis of “negative storylines” surrounding historical American railroads.

Building on the institutional work literature (Fuenfschilling and Truffer, 2016), which highlights the role of actors in shaping beliefs and meanings through discourses, the multi-dimensional approach also emphasizes the importance of actors “who behave in a fashion that advances their perceived interests” (Rosenbloom, 2018, p. 131). Drawing from work on coalition formation in political science (Hall, 2016; Rinscheid et al., 2020), we submit that to better understand the motivations and influence of actors in the (de-)construction of technology legitimacy, and to explicitly account for the *relational* character of these processes, *discourse coalitions* and their interactions provide the most relevant level of analysis. This proposition resonates with Bergek et al. (2008) who assign great importance to actor networks in innovation processes. To examine the construction and diffusion of particular storylines, we hence need to better understand the emergence and reconfiguration of actor networks who nurture these storylines. In conceptualizing discourse coalitions, we follow Hajer's (1995, p. 65) definition. Accordingly, discourse coalitions represent “the ensemble of (1) a set of storylines; (2) the actors who utter these storylines; and (3)

the practises in which this discursive activity is based" (Hajer, 1995, p. 65). In our analysis, we use the case of wind energy deployment in Austria and Switzerland to examine discourse coalitions and their utterance of storylines over time.

Fig. 1 illustrates our conceptual framework. Ultimately, we aim at explaining differences in deployment levels of technologies, which we assume to hinge on the level of social acceptance. We focus specifically on socio-political acceptance – acceptance of policies and technologies by the public, stakeholders, and policymakers – as the most basic dimension of social acceptance (Wolsink, 2018). We conceptualize the legitimacy of a technology as a core aspect affecting the level of socio-political acceptance. Within our framework, processes of technology (de-)legitimation are shaped and reshaped by discourse coalitions. To capture the underlying discursive interactions, we mobilize Hajer's (1995) discourse coalitions approach and the multi-dimensional discursive approach by Rosenbloom et al. (2016). We concede that the constructivist thrust of our argument has certain bounds. For instance, material factors like technology maturity and characteristics of the existing socio-technical systems may have a direct influence on socio-political acceptance as well, apart from their role being discursively constructed (see dashed arrows in Fig. 1). However, the direct influence of such factors can be seen as more or less constant across the two cases under examination (see Section 3).

3. Empirical approach

3.1. Cases

We selected Austria and Switzerland due to our interest in exploring differences in technology adoption across countries and because these countries share several important characteristics. While we deliberately refrain from conducting a causal analysis, which would require a different research design, selecting cases that are similar on several dimensions helps to narrow down the menu of factors that can plausibly be linked to the remarkable divergence in technology adoption.

The ultimate outcome of interest of this study is a country's degree of reliance on wind energy. Austria and Switzerland differ tremendously in this regard (see Fig. 2). In 2020, Austria had 1.307 operational wind turbines, while in Switzerland, only 41 turbines were operational (Suisse Eole, n.d.). In terms of electricity generation capacity, this translates to 3105 MW (covering 12 % of electricity demand) in Austria (WindEurope, 2022) and 86,9 MW in Switzerland (0,2 %) (Suisse Eole, n.d.). Together with Belarus, North Macedonia, Iceland, Slovakia, and Slovenia, Switzerland is among the least developed wind markets in Europe (WindEurope, 2023). What can explain these differences?

Both Austria and Switzerland are relatively small and wealthy countries in the middle of Europe. They are similar with respect to culture, population size, and geographical conditions including wind resources. Notwithstanding some differences in planning procedures, both countries are characterized by comparable institutions for citizen participation in the context of infrastructure deployment, with the local population or the municipality having a direct say in the process and hence a strong influence on project implementations.

In terms of climate and energy policy, both countries aim at becoming climate neutral over the following decades (Austria by 2040; Switzerland by 2050) (Austrian Parliament, 2021; BFE, 2017). In both countries, the green parties are a relevant political factor. Austria's current Head of State (since 2017) is a former federal spokesman for the Austrian Green Party, and the party reached 13,9 % in the last parliamentary election (BMI, 2019). In Switzerland, the Green Party and Green liberal Party, both strong supporters of wind energy deployment, are represented in parliament (Federal Statistical Office (FSO), 2019) ().

As shown in Table 1: Regarding their electricity supply, hydropower plays a particularly important role in both countries (AT: 62 % of electricity generation¹/CH: 58 %² as of 2020). Electricity demand in 2020 was similar in Austria (61,3TWh³) and Switzerland (55,7 TWh⁴), and both countries had an approximately leveled electricity import/export balance in 2020 (AT: 24,52 TWh imports⁵; 22,3 TWh exports⁶ /CH: 32,78 TWh imports⁷; 37,99 TWh exports⁸). Considering the entire energy sector, both countries are highly dependent on energy imports (AT: 58,32 % (Eurostat, 2022) of primary energy supply and CH: 71,95 % (Bundesamt für Statistik (BFS), 2021)).

There are also two relevant differences between the countries. First, while absolute population size is similar (AT: 8.9 million/CH: 8.6 million), Switzerland has a considerably higher population density (210 inhabitants per km²) than Austria (106 inhabitants per km²). Second, Switzerland runs nuclear power plants, while Austria does not. In the Discussion section, we will come back to the question how these factors may influence the discursive legitimation of wind energy. In the following, we provide a brief overview on the development of wind energy and supporting policies in both countries.

3.1.1. Austria

In 1994, the first wind turbines were installed in Austria. A notable increase in capacity occurred between 2001 and 2005, when installed capacity rose from 94 to 817 MW within four years (see Fig. 2) (IG Windkraft, 2022). This growth was mainly due to the *Green Electricity Act* (Ökostromgesetz, ÖSG), which defined feed-in tariffs (FIT) for all renewable electricity generation technologies. Adopted in 2002, this law was the first to regulate the purchase of green electricity on a nationwide (rather than provincial) basis. The next period of dynamic growth started in 2011, after the amendment of the ÖSG. Adopted in 2011, this reform entailed specific expansion targets for renewable energies (ÖSG, 2012). Moreover, the ÖSG stipulates that renewables are subsidized through guaranteed FITs for a period of 13 years. In total, the installed capacity increased from 1.103 MW to 2.425 MW between 2011 and 2015 (IG Windkraft, 2022). However, the ÖSG amendment also included a cap on the total volume of financial support provided via FITs of €11.5 mn for wind energy (ÖSG, 2012). This resulted in a curb of growth in 2015, when the cap was reached, because new projects that had already been permitted but not yet constructed were put on a waiting list. In 2021, parliament adopted the *Renewable Energy Expansion Act* (Erneuerbaren Ausbau-Gesetz, EAG) to resolve this situation. Implemented in 2022, the EAG aims at increasing annual electricity generation from renewable sources by 27 TWh, with a target of 10 TWh for wind energy. Based on this new policy, renewables are supported through market premiums (EAG, 2022).

¹ <https://de.statista.com/statistik/daten/studie/325519/umfrage/stromerzeugung-in-oesterreich-nach-energetraeger/>.

² <https://de.statista.com/statistik/daten/studie/182186/umfrage/struktur-der-bruttostromerzeugung-in-der-schweiz/>.

³ <https://oesterreichsenergie.at/downloads/grafiken/detailseite/stromverbrauch-in-oesterreich-ab-1970>. TWh means terawatt-hours.

⁴ <https://de.statista.com/statistik/daten/studie/291735/umfrage/stromverbrauch-der-schweiz/>.

⁵ <https://de.statista.com/statistik/daten/studie/325080/umfrage/stromimport-oesterreichs/>.

⁶ <https://de.statista.com/statistik/daten/studie/325125/umfrage/stromeexport-oesterreichs/>.

⁷ <https://de.statista.com/statistik/daten/studie/291753/umfrage/stromimport-der-schweiz/>.

⁸ <https://de.statista.com/statistik/daten/studie/291758/umfrage/stromexport-der-schweiz/>.

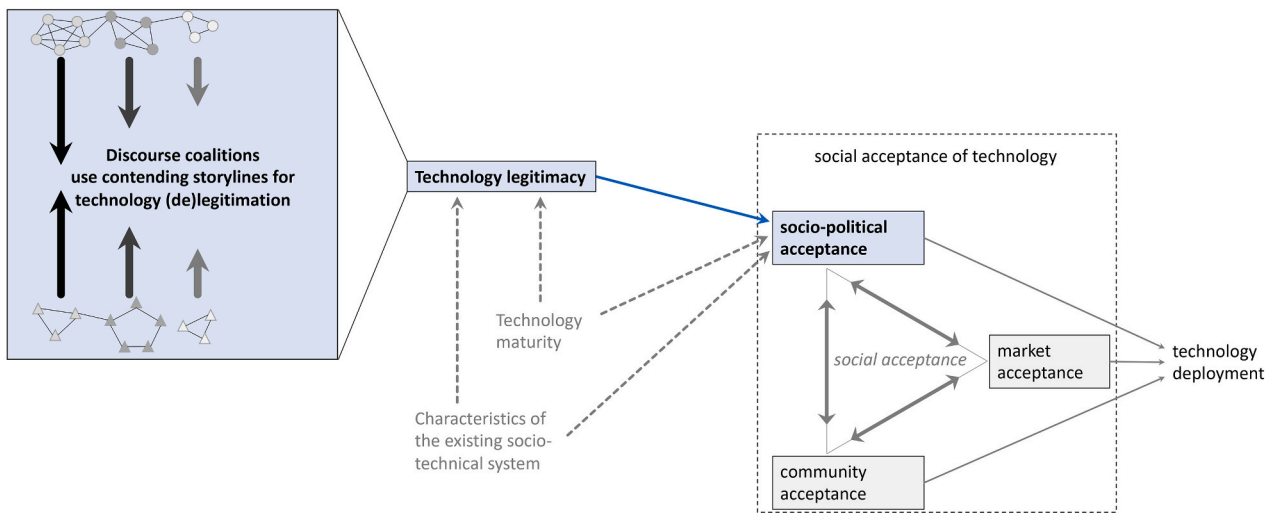


Fig. 1. Conceptual framework. Blue parts highlight the core focus of this study. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

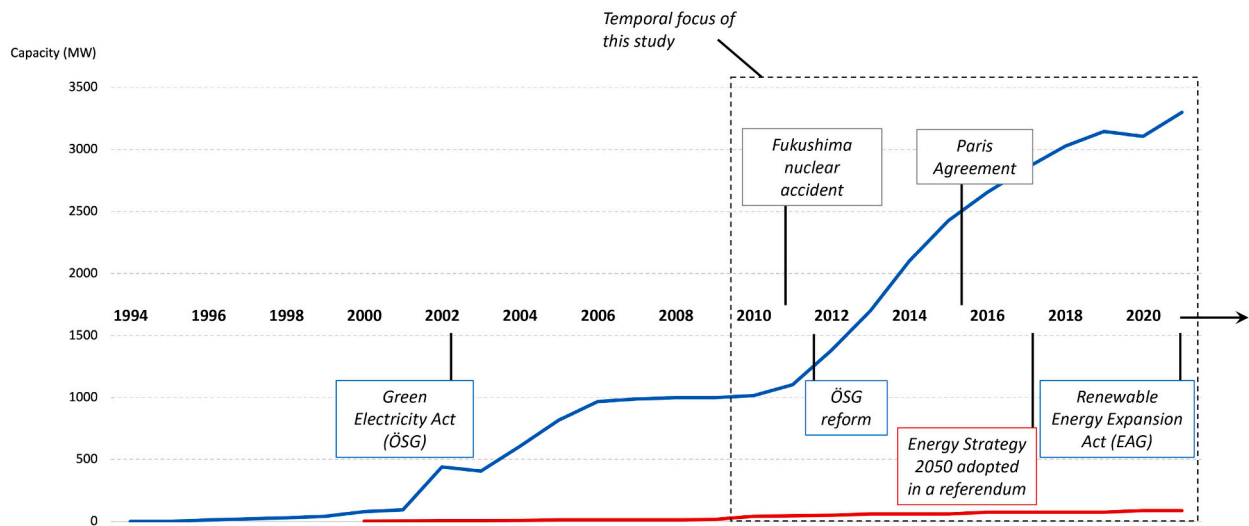


Fig. 2. Development of wind power capacity and relevant policy developments in Austria (blue) and Switzerland (red), 1994 to 2020. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Table 1
Electricity and Energy market structure in Austria (Statista, 2022) and Switzerland (Statista, 2021).

2020	Austria	Switzerland
Electricity Mix	62 % Hydro, 21 % RE, 18 % Thermic	58 % Hydro, 33 % nuclear, 9 % other
Electricity consumption	61,3 TWh	55,7 TWh
Electricity imports	24,52 TWh	32,78 TWh
Electricity exports	22,3 TWh	37,99 TWh
Energy imports	1.362.570 TJ	621.380 TJ
Energy exports	579.961 TJ	136.150 TJ
Energy import dependency	58,32 %	71,95 %

3.1.2. Switzerland

In Switzerland, the first turbine was installed in 1990.⁹ In contrast to Austria, there has been no dynamic growth at any point in time since then (see Fig. 2). Overall, the installed MW capacity in Switzerland in 2020 was still lower than Austria's installed MW capacity 20 years earlier. With respect to the relevant policy framework for renewable energies, the Energy Law (Energiegesetz, EnG), which was introduced in 1998,¹⁰ acknowledged wind energy for the very first time only in its 2008 revision, establishing a purchase and payment obligations of utility companies but no further incentives for wind energy. In 2009, a feed-in-tariff system (KEV) was implemented to promote electricity generation from renewables. Finally, in 2017, after a six-years long process, the Energy Law was completely revised based on the *Energy Strategy 2050* (Energienstrategie 2050), which aims to provide the overarching strategic direction for the development of the Swiss energy

⁹ <https://de.statista.com/statistik/daten/studie/296206/umfrage/windstromerzeugung-in-der-schweiz/>.

¹⁰ <https://www.fedlex.admin.ch/eli/cc/1999/27/de>.

system. As implemented in the revised Energy Law (Energiegesetz, EnG),¹¹ the Energy Strategy 2050 defines for the first time expansion targets for renewables and regulates the renewable energy market. The stated objective is to generate 7 % of electricity generation from wind energy by 2050, which translates to an increase of the number of wind turbines by a factor of 20 (Art. 2 and 3 EnG). Based on the EnG, renewables are supported through feed-in-tariffs. While these were initially granted for 20 years, there is a long waiting list since there are more project applications than available funds (Swiss Federal Office of Energy, 2018). Despite the adoption of the Energy Strategy 2050, wind power development has not seen a more dynamic development recently, which has been ascribed to the fact that the length and complexity of the relevant administrative and planning processes has not yet been fundamentally reformed (Broughel and Wüstenhagen, 2022; Thaler et al., 2019).

3.2. Dataset

Our study builds on newspaper data. Compared to other data sources, newspapers have several advantages. First, they are published regularly and thereby generate a reliable base for systematic empirical analysis over longer periods of time. Second, in contrast to parliamentary protocols or position papers, newspaper data presumably represent a broader variety of actors (Leifeld, 2013). This is also due to the fact that newspapers tend to highlight conflicts to attract attention (Bennett, 2016). Hence, they tend to provide space to a greater diversity of actors and arguments compared to policy documents (Delshad and Raymond, 2013). Third, by carefully selecting various newspapers, it is possible to explicitly consider different types of newspapers (quality press versus tabloid journalism) and ideological leanings. Presumably, this contributes to obtaining a comprehensive account of the socio-political acceptance of wind energy. Fourth, newspapers are relevant in shaping citizens', stakeholders', and policymakers' views (Crow and Lawlor, 2016; Gamson and Modigliani, 1989), specifically also in the context of renewable energy technologies (Batel and Devine-Wright, 2014). In Austria, 58,3 %¹² of the population regularly read newspapers, while this share even reaches more than 90 % in Switzerland (WEMF, 2019).

Our analyses rely on six major newspapers in Austria and Switzerland. For each case, we selected one liberal and one conservative quality newspaper as well as one tabloid newspaper with a broad reach (bpb, n.d.) (see Table 2). For comparability, we only use the German-speaking part of Switzerland, which represents ca. 63 % of the population (BFS, 2017).

We used the Factiva database to systematically retrieve newspaper articles about wind power from the newspaper archives. The time frame

encompasses 11 years from 2010 to 2020. We selected 2010 to start our analysis for two reasons. First, in both countries, deployment of wind energy was at a relatively low level before 2010, with little or no capacity additions in the years leading up to 2010. However, a notable growth set in around 2010/2011 in both countries, albeit at different levels (see Fig. 1). Second, our pre-tests of systematic searches for relevant newspaper articles showed that the salience of wind energy in public discourse was rather low prior to 2010, becoming higher at the turn of the decade. After the 2011 Fukushima nuclear disaster public debates on the energy transition intensified.

The search string used to identify relevant articles included the terms “wind energy” and/or “wind turbine”. This resulted in 460 articles for Austria and 782 articles for Switzerland. After removing false positives and irrelevant articles, our analyses rely on 298 articles for Austria and 510 articles for Switzerland. Supplementary Files A (for Austria) and B (for Switzerland) contain information on these articles.

3.3. Coding and analysis

Inspired by the multi-dimensional discursive approach (Rosenbloom et al., 2016) and following principles of qualitative content analysis (Mayring, 2014), we conducted an in-depth review of the 808 relevant articles. Our first aim was to identify the dominant storyline entailed in each newspaper article. This was an iterative and inductive process. After having read all articles, a first preliminary list of narratives – i.e., more specific arguments about wind energy – put forward in the newspaper articles was drawn up. Based on thematic analysis (Braun and Clarke, 2012), this list was then revised and consolidated by merging similar categories and classifying related narratives into higher-order storylines. After three rounds of consolidating and informed by feedback the authors received at a research workshop, the final dataset entails 45 different narratives for Austria and 68 for Switzerland. For both cases, these were classified into the same four distinct storylines that either encapsulate the legitimization or delegitimization of wind energy. For example, the narratives “Wind energy and PV are complementary” and “Wind power is preferable to nuclear” were classified as conveying the legitimizing storyline “Future-proof electricity system”, as both narratives portray wind energy as an enabler of a ‘future-proof’ electricity system. On the other hand, the narratives “Wind power puts grid stability at risk”, “Nuclear energy is necessary” and “A transition towards renewables is not feasible” seek to delegitimize wind energy with reference to the electricity system; hence they were classified as advancing the same storyline in a delegitimizing way. Finally, each individual newspaper article was re-coded so as to represent one of the four bi-directional storylines. Relevant articles in which no storyline could be identified were categorized as “other” (AT: 47, CH: 96). Articles were excluded if they for instance were merely descriptive. As these are not examined in depth, our contextualized descriptive analyses of storylines in Section 4.1 rely on 251 articles from Austrian newspapers and 414 articles from Swiss newspapers.

Our second aim involved closer attention to actors and emerging discourse coalitions. Based on the category scheme developed in the first step and the same dataset, we coded statements made by actors that conveyed certain narratives with respect to wind energy. As new narratives emerged during this process, the original coding scheme was amended where necessary. Despite this, the subsequent classification led to the same storylines established earlier.

For the analysis, we used Discourse Network Analysis (DNA), a method developed by policy scholars to investigate policy debates in a systematic way (Leifeld and Haunss, 2012). DNA combines qualitative discourse analysis and quantitative actor network analysis, thereby allowing identifying discourse coalitions and reconfigurations of coalitions over time. For our analysis of discourse coalitions in Sections 4.2 and 4.3, we analyze these discourse data at the level of storylines entailed in actors' statements. In particular, we rely on actor congruence networks. In these graphs, a link between two actors is established if

Table 2
Newspapers used for the analysis.

	Austria	Switzerland
Liberal	Der Standard ^a	Tages-Anzeiger ^b
Conservative	die Presse ^c	NZZ ^d
Tabloid	Kronen Zeitung ^e	20 Minuten ^f

^a <https://www.eurotopics.net/de/148488/der-standard>.
^b <https://www.eurotopics.net/de/148807/tages-anzeiger>.
^c <https://www.eurotopics.net/de/148502/die-presse>.
^d <https://www.eurotopics.net/de/148731/neue-zuercher-zeitung>.
^e <https://www.eurotopics.net/de/148614/kronen-zeitung>.
^f <https://www.eurotopics.net/de/148396/20-minuten>.

¹¹ <https://www.fedlex.admin.ch/eli/cc/2017/762/de>.
¹² <https://de.statista.com/statistik/daten/studie/307036/umfrage/nettoreich-weiten-der-tageszeitungen-in-oesterreich-nach-zeitungen/>.

both employ narratives classified under the same storyline. For example, if two actors both portray wind energy as a barrier to a future-proof electricity system, they are linked in the actor network, even if they differ in terms of the specific narrative employed to convey this overarching storyline. We opted for this highly aggregated mode of analysis as it facilitates the comparison between cases and helps to uncover broader trends. We are mindful of the fact that a lot of fine-grained information about specific narrative clusters and argumentative struggles, which are often temporally and spatially bound, remains unattended to. In line with our research objective, these highly aggregated network graphs allow us to visualize and compare the salience of specific storylines over time and help to identify coalitions of actors working towards the legitimization or delegitimation of wind energy.

4. Results

Our analysis proceeds in three steps. First, we introduce the storylines identified in Austrian and Swiss newspapers and compare their relevance (in terms of frequency) both across time and scale. Second, based on DNA, we analyze and compare the evolution of wind energy discourse coalitions. Third, we trace those actors over time that are particularly influential in constructing or eroding the legitimacy of wind energy in both countries.

4.1. Four storylines

4.1.1. Wind energy as part of a future-proof electricity system

The storyline “future-proof electricity system” entails narratives discussing the role of wind energy as part of electricity systems, often referring to the future of electricity supply and discussing other technologies alongside wind. The main thrust of the storyline, if used to legitimize wind energy, is that the technology contributes to the efficient and effective operation of the electricity system. Going one step further, many articles subsumed under this storyline proceed from the standpoint that wind energy is a viable technology and discuss the changes necessary to better integrate wind energy into electricity systems. On the other hand, articles that delegitimize wind energy with reference to electricity systems tend to portray the technology as problematic, e.g. by highlighting grid stability risks or evoking an increased risk of blackouts.

As can be seen in Fig. 3, throughout the entire period of observation, this storyline plays an important role in the legitimization of wind energy in the Austrian discourse. Prominent narratives highlight the need to expand the grid, improve grid integration, and enhance the

infrastructure in order to support large-scale deployment of wind energy. Additionally, to productively address the technology's volatility in electricity generation, the role of wind energy in the future electricity system is portrayed as benefitting from solutions like power-to-gas and power-to-x.

In the Swiss discourse, the storyline is a prominent vehicle to legitimize wind energy especially at the beginning of the decade, but less so later. Interestingly, our data reflect a ‘Fukushima effect’ in the Swiss wind power discourse. Under the impression of the nuclear disaster, many articles in 2011 interrogate the contribution of wind energy. This discourse appears to be polarized, with an almost balanced number of articles delegitimizing or legitimizing wind energy. In terms of technology legitimization, several articles highlight the feasibility of a transition towards higher shares of renewable energies, the role wind energy could play in replacing nuclear power, and the required grid expansion. Regarding the delegitimizing side, concerns about grid stability and potential blackouts, a recurring issue in Swiss energy debates, are evoked as downsides of wind energy, alongside general doubts about the feasibility of transitioning away from nuclear power and towards a higher share of renewable energies. Over time, this nuclear narrative and other narratives that call into question the contribution of wind energy to an efficient electricity system became quieter, only to re-emerge over the years 2019/2020. In Austria, on the other hand, the role of wind energy in electricity systems has rarely been a relevant anchor to delegitimize the technology, even if grid stability and related system challenges are repeatedly evoked in a small number of articles.

4.1.2. Risks and benefits of wind energy

The “Risks and Benefits” storyline summarizes narratives that frame wind energy as a force influencing economic development, innovation, and environmental performance. When used to legitimize wind energy, the storyline highlights opportunities and benefits associated with the deployment of wind turbines. On the other hand, when used to delegitimize wind energy, the technology is portrayed as a threat.

Fig. 4 shows the relevance of the “Risks and Benefits” storyline for both Austria and Switzerland over time. As mentioned, this analysis relies on the coding of the dominant storyline in individual newspaper articles. As can be seen, overall, Swiss newspaper coverage is characterized by a considerably higher number of articles highlighting risks. Important narratives to delegitimize wind energy in Switzerland foreground the impact of wind turbines on landscapes, risks for birds, and associated concerns with regard to social acceptance. Not only is the frequency of articles that convey delegitimizing narratives under the

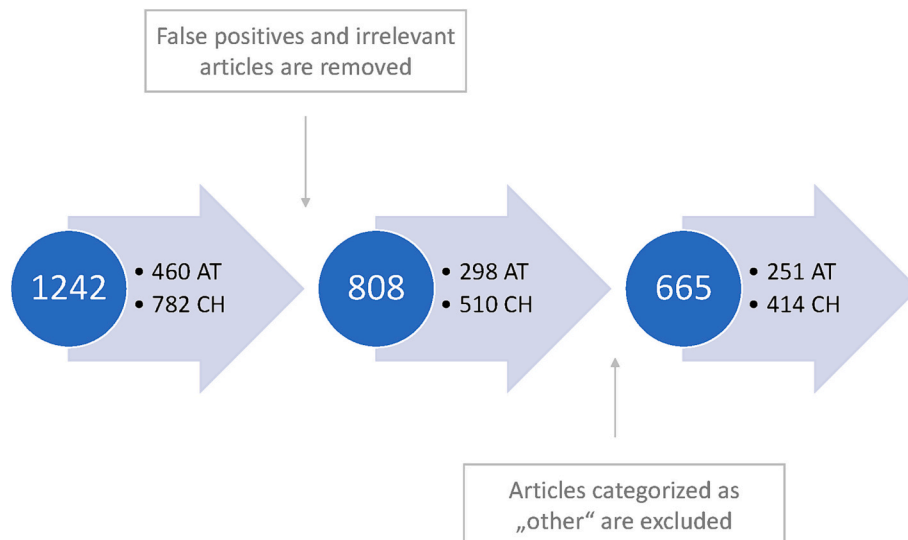


Fig. 3. Data Set generation.



Fig. 4. Number of storylines identified per year in Austria (left column) and Switzerland (right column).

“*Risks and Benefits*” storyline much lower in Austria (21 versus 42 in Switzerland), but the narratives also differ. Concerns about social acceptance are raised in Austria, too, but landscape and bird protection only play a subordinate role in the discourse surrounding wind energy. Instead, pointing to economic risks, concerns about costs of the energy transition are raised more frequently.

When it comes to the construction of legitimacy, the number of articles is about equal and decreases in both countries over time. In Austria, the most prevalent narratives highlight the economic potentials of wind energy, for instance as a job creator and viable business opportunity. Moreover, the potential participation of citizens (e.g., as investors) is seen as an advantage of wind energy vis-à-vis more centralized energy technologies. In addition, arguments about the much lower externalities of wind energy when compared with fossil fuels contribute to the build-up of legitimacy via this storyline. Similarly, in Swiss newspapers, legitimacy is attempted to be built up primarily on the basis of economic considerations. Most importantly, the (future) profitability and technological advances are highlighted to underscore the benefits of wind energy.

4.1.3. Regulatory framework

The “*regulatory framework*” storyline highlights the policy dimension of technology deployment. It foregrounds that policy risks need to be reduced in order to ensure a reliable environment for investors. Almost all instances of this storyline are employed to legitimize wind energy. In Austria, the storyline is prominent in particular between 2012 and 2014 and then again from 2019. This reflects the policy risks associated with the cap on the volume of financial support for wind energy introduced in 2011. From 2012 to 2014, several articles called for a more reliable regulatory framework, but the issue was not resolved in the legislative arena at that time. With an ever growing queue of projects awaiting realization, problem pressure has mounted since 2016, which is reflected in numerous articles calling for changes to the regulatory status quo in order to remove the cap and provide further incentives for wind energy expansion.

Overall, the storyline is equally prominent in Switzerland. Again, a ‘Fukushima effect’ can be seen in Fig. 4, reflecting the calls for a new energy policy framework and suggestions to introduce a stable financial support scheme for wind energy. Another policy risk narrative reflecting a Swiss particularity relates to calls for the European Union and Switzerland to enact a common electricity market. In contrast to Austria, the “*regulatory framework*” storyline was repeatedly used to delegitimize wind energy in Switzerland. Accordingly, some articles argued that regulatory changes or policies to incentivize deployment (such as FITs) would distort market forces, thereby giving wind energy an advantage that it does not deserve. In these articles, the fact that competing technologies such as nuclear power are not viable without various, potentially more massive and less targeted forms of state support tends to be overlooked.

4.1.4. Wind energy in a small country

Finally, the storyline “*small country*” encompasses narratives that link the desirability of wind energy deployment with spatial perceptions and country identity. When used to legitimize wind energy, narratives highlight the need to strengthen energy transition efforts in Austria or Switzerland to catch up with other countries. Frequently, this also involves references to role models; i.e. countries seen as good examples for a successful technology adoption. When the storyline is evoked in a delegitimizing sense, this typically entails references to other countries whose experiences with wind energy are portrayed as problematic. Another frequent narrative implies that wind energy investments should be made abroad and not domestically.

As Fig. 4 shows, the “*small country*” storyline is an especially important part of the Swiss discourse. With 101 articles on the delegitimizing side and 66 on the legitimizing side, it is the most frequently used storyline overall. When used to legitimize wind energy, the most

prevalent narratives in Switzerland center on positive examples of wind energy projects and energy transitions in other countries, often combined with statements that Switzerland currently risks fostering its positions as a laggard. Likewise, in the Austrian discourse, the development of the country’s wind power sector is frequently evaluated against positive examples from other countries, with several articles highlighting achievements within specific federal states, such as Burgenland, and others emphasizing that the energy transition is flourishing in Austria.

When it comes to delegitimizing uses of the “*small country*” storyline, there is a strong contrast between Austria and Switzerland. Swiss articles often refer to country size and geographical conditions as an excuse to assert that wind power has no place in Switzerland. However, this narrative is not invoked in Austria. Interestingly, many Swiss newspaper articles argue that Swiss companies should undertake wind energy investments abroad, due to better regulatory conditions, better and faster project implementation, higher profitability, and better wind conditions. Again, this narrative does not occur in the Austrian discourse, where the small country storyline is occasionally used to delegitimize wind energy based on problematic experiences made in other countries. In sum, while country size, geographical conditions and associated issues of national identity are frequently evoked to delegitimize wind power deployment in Switzerland, the “*small country*” storyline is mostly used to legitimize the technology in Austria.

Overall, our analysis indicates that the discourse in Switzerland is more polarized than in Austria. While delegitimizing storylines are slightly more frequent in Switzerland (52,7 % of the categorized articles) more than two thirds (68,4 %) of the Austrian articles convey storylines that legitimize wind energy. Apart from the frequency of storylines, the relevance of themes differs as well. In Switzerland, the most prevalent narratives center on landscape protection, birds, and the viability of wind energy in a small, alpine country. In contrast, the Austrian discourse evolves more around the necessary steps to better integrate wind energy into the electricity system and policy changes necessary to enable faster wind power deployment. In the next section, we substantiate the relevance of storylines and analyze the role of actors in giving direction to discourses surrounding wind energy.

4.2. Discourse coalitions over time

We assess discourse coalitions based on actors’ statements in the newspaper articles. In order to trace reconfigurations of coalitions over time, we split the period of investigation into four equal segments of 33 months each. The graphs in Fig. 5 entail so-called ‘actor congruence networks’, in which nodes are linked if the actors they represent have uttered statements subsumed under one or more of the same storylines. Hence, for each phase, the graphs illustrate clusters of actors who share the same storylines that legitimize or delegitimize wind energy. Apart from delivering a comparative actor network analysis, the graphs also help to better understand the importance of storylines. While a storyline may be more or less salient at a certain point in time (as assessed with Fig. 4), this does not automatically translate into *discursive resonance*; i. e., the “extent to which a storyline gains traction among policymakers and the public” (Rosenbloom, 2018, p. 131). For instance, a storyline may be transmitted repeatedly by the same newspaper, but unless it is taken up and shared by various actors, it does not generate a lot of discursive resonance and, hence, in our case can be assumed to have no particularly strong influence on the socio-political acceptance of wind energy.

In Austria, legitimizing storylines are dominant from the first through the fourth phase. In the first phase, three discourse coalitions of equal size advancing the legitimizing storylines “*future-proof electricity system*”, “*regulatory framework*” and “*risks and benefits of wind energy*” can be identified. While a number of actors are part of two or even all three of these coalitions, the level of discursive integration overall appears to be moderate. In other words, most actors are more likely to either

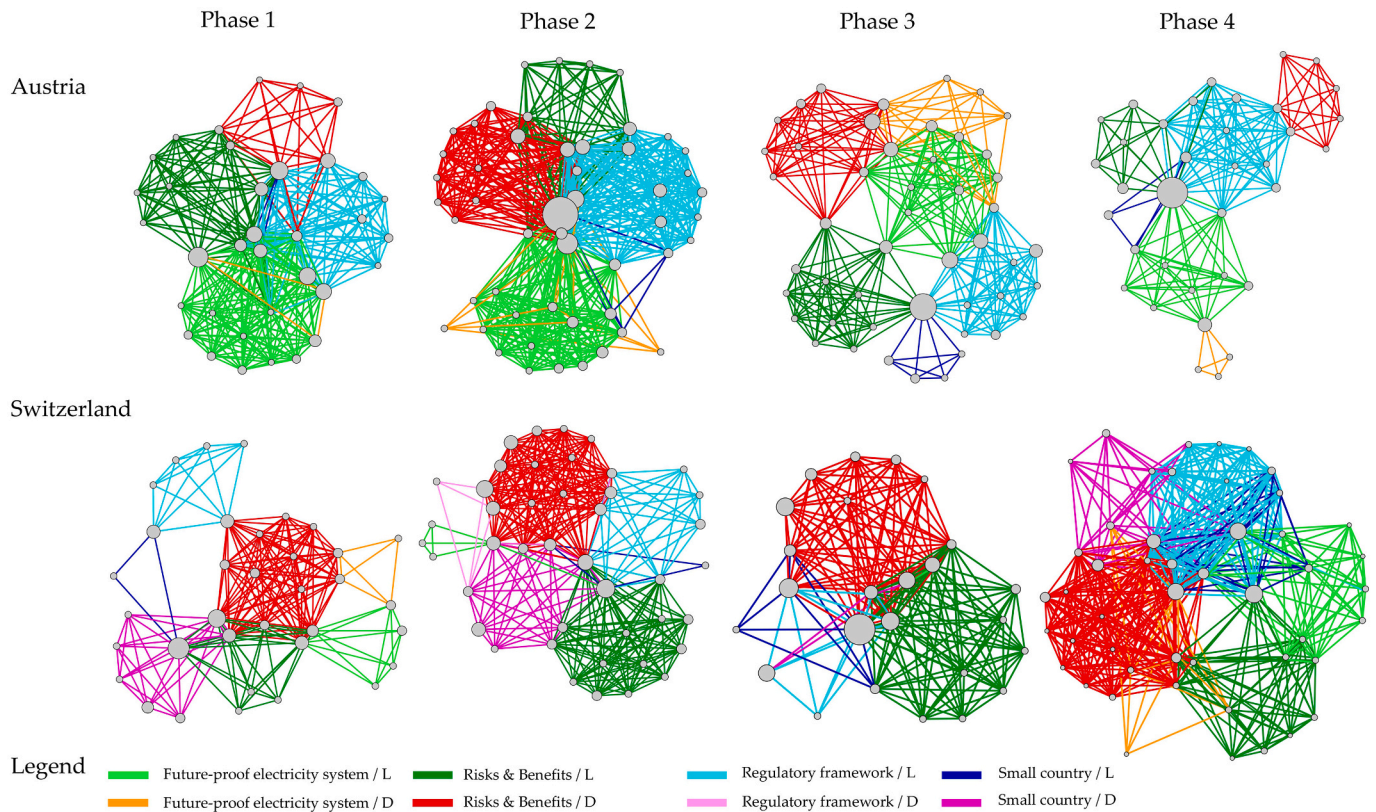


Fig. 5. Actor congruence networks for Austria and Switzerland over 4 periods of time. Nodes (representing actors) are connected (via edges) if they share at least one storyline during the respective phase. Edge color represents the shared use of a storyline by adjacent actors. Actors who share several storylines are linked by the respective number of edges. Node size is proportional to the number of statements made by an actor in the respective phase. Graph layout is based on a stress minimization (MDS) of graph-theoretic distances (Brandes and Pich, 2009). Each period includes 33 months (Phase 1: 1.1.2010–30.9.2012; Phase 2: 1.10.2012–30.6.2015; Phase 3: 1.7.2015–31.3.2018; Phase 4: 1.4.2018–31.12.2020). Graphs were generated with the open-source software visone.

discuss that the regulatory framework needs to be improved, or that wind energy is necessary for a future-proof electricity system, or that the technology has certain other benefits (e.g., environmental), rather than conveying several statements and thereby supporting more than one storyline. On the delegitimizing side, the only relevant storyline during phase 1 is “risks of wind energy”. While the storyline is shared by eight actors, five of them at the same time convey statements that legitimize wind energy. This indicates a relatively low level of discursive polarization, as numerous actors act as bridges between the discourse coalitions working towards legitimizing versus delegitimizing wind energy.

During the second phase (October 2012 to June 2015), the structure of the entire discourse network is similar, but the delegitimizing version of the storyline “risks and benefits” gains importance, as it is shared by a higher number (18) of actors. This reflects that during this period of dynamic growth, a relatively strong discourse coalition voices concerns about social acceptance and the short-term costs of wind turbine deployment. Yet, two coalitions working towards legitimizing wind energy dominate. In light of the imminent cap on financial support for the further expansion of wind energy, one coalition calls for a more stable and long-term oriented regulatory framework. Another coalition re-emphasizes the contribution of wind energy to a “future-proof electricity system”.

Since July 2015, the discourse network becomes more fragmented, as fewer actors are part of more than one discourse coalition. While a second delegitimizing coalition appears as sizable for the first time – the one challenging wind energy in terms of grid stability and its overarching function as part of the electricity system –, the share of actors working towards delegitimation is similar as before. Notably, most intersections during phase 3 concern the coalitions debating the role of the

technology in electricity supply. This indicates that some actors see challenges, but at the same time propose solutions for how these may be overcome. During the final phase, the discourse becomes even more fragmented and less dense. While almost no new wind turbines are built between 2018 and 2020, policy debates center on the design of the Renewable Energy Expansion Act. In the public arena, this is not accompanied by a particularly sizable coalition seeking to delegitimize wind energy. Instead, several smaller, moderately integrated discourse coalitions continue to convey legitimizing storylines.

To summarize, discourse coalitions working towards the legitimization of wind energy dominate throughout the period of investigation. In particular, the coalitions submitting that wind energy supports a future-proof electricity system and that an improved regulatory framework is required for further wind energy deployment in Austria are consistently present in public debates. There is a somewhat higher discursive resonance for delegitimation during the period of strong growth (which approximately equals phase 2 and 3), but this tendency attenuates over time. Finally, an interesting finding concerns the “small country” storyline. While it is regularly evoked in newspapers and was coded as the dominant storyline in many articles (see Fig. 4), it plays a less important role for actors. Except for a small group of actors that legitimizes wind energy based on spatial considerations, the storyline is less relevant for the formation of coalitions.

Compared to Austria, discourse coalitions working towards the delegitimation of wind energy are much more present throughout time in Switzerland. During the first phase, the most prominent discourse coalition working against wind energy forms around the “risks and benefits” storyline. Another sizable coalition is bound together by the ‘small country’ storyline, arguing that wind energy is neither feasible nor desirable in Switzerland. Both coalitions remain vocal over time,

crystallizing much of the opposition against wind energy in the public discourse. By contrast, the third delegitimizing storyline identified as relevant in Fig. 4, which portrays wind energy as a barrier to an efficient electricity system, only generates little discursive resonance in phase 1. What is more, it plays almost no role in subsequent discourse networks.

While the discourse coalitions that form around legitimizing storylines are small and highly fragmented in phase 1, this changes in phase 2, when two sizable clusters of legitimization can be identified. One of these is based on the *'future-proof electricity system'* storyline, which gains some prominence in discussions about the role of wind energy in the context of the process leading to the Energy Strategy 2050. The second centers on broader benefits of wind energy, emphasizing economic opportunities and the prospect of gaining from innovation. Interestingly, several members of both discourse coalitions also voice concerns about the role of wind energy, which indicates that these actors take decisively balanced views – a tendency deeply engrained in the Swiss political culture. This pattern gets reinforced during phase 3, although the discourse network is now strongly dominated by only two coalitions, each of which mobilizes the *"risks and benefits"* storylines in one of their opposing variants. In phase 4, the pattern gets more differentiated again, when discourse coalitions form around several storylines.

In sum, several differences stand out in the comparison of discourse coalitions. In contrast to Austria, where the discourse becomes more fragmented over time, the Swiss discourse is characterized by an increasing number of links between discourse coalitions, frequently connecting coalitions that pursue different objectives with respect to wind energy. Second, while the number of actors participating in the discourse decreases over time in Austria, there is a remarkable increase in Switzerland especially during the last phase, which coincides with the first phase of implementation of the Energy Strategy 2050. Third, while the storyline capturing wind energy's contribution to a future-proof electricity system is used to legitimate the technology since (at least) 2010 in Austria, it generates considerable discursive resonance in Switzerland for the first time since 2018. Finally, the *"small country"* storyline plays no role to erode the legitimacy of wind energy in Austria but is the most prominent storyline in Swiss newspaper articles (see Fig. 4) and generates discursive resonance among actors seeking to

delegitimize wind energy in Switzerland.

4.3. Relevant actors

Based on our DNA coding, Fig. 6 carves out similarities and differences with respect to the presence of different types of actors in the discourses. In both cases, actors representing the energy sector, politics and academia are among the top 5 actor types and, hence, important in shaping the discourses surrounding wind energy. However, for a better understanding of the role of particular actors in the (de-)construction of legitimacy, analyzing differences is more relevant than assessing commonalities. Three differences stand out as particularly striking. First, industry associations, who represent the third most important actor type in Austria, play a very subordinate role in the Swiss discourse. In Austria, the wind lobby group IG Windkraft is the most dominant actor in this category, alongside other associations such as the European Wind Energy Association (Wind Europe) or umbrella organizations for renewables. These actors play a crucial role in the legitimization of wind energy, as they articulate several legitimizing storylines, thereby leveraging their institutional role as a broker between politics, applied science, and the energy sector or the private sector more broadly. In Switzerland, on the other hand, these voices are not playing a key role in the public discourse. Second, non-governmental organizations (NGOs) do not occur frequently in the Austrian discourse but leave their imprint on the Swiss discourse. Importantly, most NGOs that appear frequently in Swiss newspapers can be classified as landscape or bird protection NGOs, which tend to articulate their concerns about effects of wind energy projects on the landscape or on birds. And similarly, third, citizen initiatives against wind projects are much more engaged in the Swiss discourse. These groups typically voice their opinions about specific projects, thereby amplifying local opposition against energy infrastructure deployment. Counterintuitively, this actor type is much less represented in Austrian newspapers despite many more wind projects being active in Austria throughout the period of observation, which could provide many opportunities for local initiatives to express their displeasure.

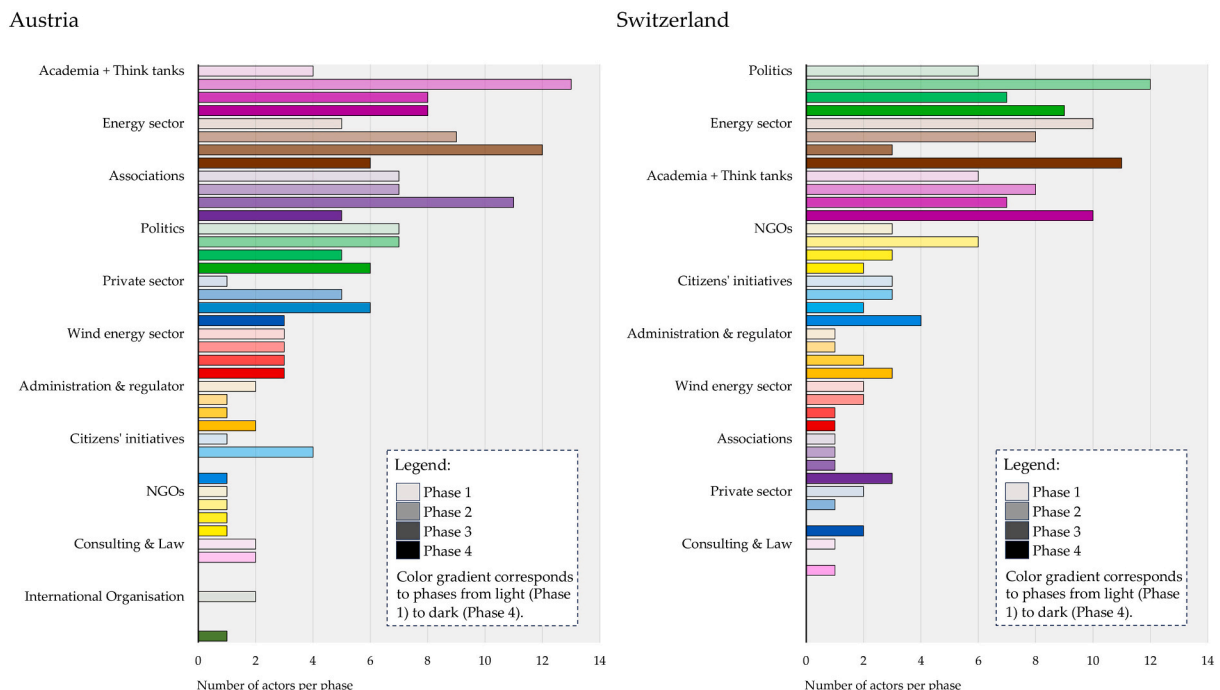


Fig. 6. Actor types present in the discourse over time in Austria and Switzerland.

5. Discussion & limitations

While numerous case studies have helpfully carved out the “road to technology legitimization” (Binz et al., 2016) in a variety of (typically single-country) contexts (e.g. Dehler-Holland et al., 2022; Kishna et al., 2017; Roberts and Geels, 2018), technology legitimacy has rarely been studied in a comparative framework. Yet, given the remarkable differences between countries' progress towards low-carbon electricity systems, comparing the construction and deconstruction of technology legitimacy *across cases* promises to yield important analytical leverage. In our case it helps explain seemingly puzzling divergences in transition pathways between Austria and Switzerland.

Apparently, the stark difference in wind power development between Austria and Switzerland can be related to differences in the degree to which wind energy is socio-politically accepted in these countries. While Austria has provided a reliable regulatory framework and support for wind energy throughout the period of investigation, Switzerland is still lacking a similarly effective framework. We proposed that to better understand these differences in socio-political acceptance, a systematic analysis of the processes of technology (de-)legitimation may be helpful. Exploring these processes in detail allows to identify the main lines of argumentation actors use to modulate the possibilities of technology deployment over time, and to ascertain the relative strength and persistence of discourse coalitions that use contending storylines in working towards the (de-)legitimation of technology.

Our analysis indicates several differences between Austria and Switzerland with respect to storylines surrounding wind energy, discourse coalitions, and actors involved. First, the relevance of storylines differs between the two countries. The storyline “*future-proof electricity system*” is prevalent in Austria to legitimize wind energy since 2010. In Switzerland, however, the storyline only achieves some discursive resonance as a legitimization strategy since 2018. Still today, the legitimacy of wind energy is frequently denied based on claims that it destabilizes electricity systems. This result ties in with recent evidence from a survey among stakeholders of the Swiss energy system, according to which the general objective of the Energy Strategy 2050 to expand wind energy considerably until 2050 is not aligned with many stakeholders' visions of the future energy system (Duygan et al., 2022). With respect to the “*risks and benefits*” storyline, the discourses in Austria and Switzerland differ regarding the specific arguments used. While concerns about landscape protection and risks for birds play an important role in the Swiss discourse, they are of minor importance in Austria. For Switzerland, this ties in with findings from a recent representative survey, in which physical landscapes were found to be the most salient factor among citizens when indicating their associations when thinking about wind energy (Cousse et al., 2020).

The most prominent storyline in the Swiss discourse is the “*small country*” storyline. This storyline contributes strongly to delegitimizing wind energy in Switzerland, in particular by questioning the feasibility and suitability of the technology. The main arguments here center around country size and geographical conditions, but also on better wind conditions, higher profitability, and better regulatory frameworks abroad. Taken together, these arguments are used to call for investments in wind energy abroad rather than in Switzerland (see also Gahrens et al., 2021). In Austria, by contrast, the storyline is rarely used to delegitimize wind energy.

Second, comparing discourse networks and actors, we find that the Austrian discourse networks become more fragmented over time, whereas the Swiss discourse is characterized by an increasing number of connections between different discourse coalitions. At the same time, after an increase from the first to the second phase, the number of actors appearing in the Austrian newspaper discourse decreases, while it increases throughout in Switzerland. In combination, these findings suggest that legitimacy struggles have calmed down in Austria, where wind energy has become a mainstream source of electricity. This corroborates Wolsink's (2007b, 2018) view that understanding social acceptance

requires paying attention to temporal dynamics, with social acceptance likely to increase once a technology becomes ‘locked in’ and normalized. In Switzerland, by contrast, where wind turbines are still a curiosity for most citizens, the discourse network analysis indicates an increasing fragmentation into several coalitions of roughly equal size. This suggests that the Energy Strategy 2050, adopted in 2017, might have done too little in providing a compelling vision of the future electricity system, with actor coalitions being in search of further discursive strategies to (de-)construct the legitimacy of wind energy.

In order to explain these differences, we need to link the discursive analysis back to the countries' energy history and initial conditions. As mentioned in Section 3.1, Austria and Switzerland are similar in many but not all respects. One key factor in which they differ is population density, with Switzerland being almost twice as densely populated as Austria. This, and the fact that Switzerland is home to a unique mountain landscape that nurtures a comparatively strong tourism sector, makes perceptions of landscapes a particularly salient factor (Kienast et al., 2017). Our discourse analysis reflect this well, as non-governmental organizations and citizen initiatives are the most relevant actor groups in the Swiss discourse, often raising concerns about potential negative effects of wind energy on the landscape as well as fauna, and flora. In Austria, on the other hand, these considerations are much less salient. The other factor in which Austria and Switzerland differ fundamentally is Switzerland's reliance on nuclear power and the associated conglomerate of interests surrounding this technology (Rinscheid, 2020). The nuclear legacy can be traced in our dataset as well, with wind energy frequently seen as a ‘too risky’ solution especially by representatives of the energy sector, whose professional views are deeply shaped by concepts of baseload power and central generation. By documenting how the presence of nuclear power tends to support the delegitimation of wind energy, our analysis tentatively adds to the argument that the presence of nuclear power crowds out renewable energies (Sovacool et al., 2020; Verbruggen et al., 2014).

Beyond these differences, our discursive analysis also reveals some commonalities. In particular, the storyline “*regulatory framework*” is prominently used in both countries, highlighting the importance of the regulatory framework for the deployment of wind energy, as emphasized in the literature (González and Lacal-Arántegui, 2016; Vuichard et al., 2022).

What implications can be derived from our analysis for energy policy? The path dependencies that shape electricity systems that have, in the past, relied strongly on centralized generation technologies, make it inherently challenging to provide simple recipes for change. However, Switzerland is not unique in when it comes to an underambitious development of renewable energies (Michalena and Frantzeskaki, 2013). We note three recommendations that derive from our discursive analysis. First, building on efforts to improve planning processes and governance structures more broadly (Thaler et al., 2019), our discourse network analysis demonstrates the known tendency of many actors in Swiss public discourse to bridge different perspectives. While Swiss political institutions have a built-in tendency for slow, incremental change, the capacity to forge enduring and accepted compromise should be more explicitly endorsed by those actors who see an important role for wind energy in modernizing the Swiss energy system. Instead of trying to find agreements predominantly on the desired *ends* (e.g., decarbonization), policymakers should try to induce more clarity about the *means*, which includes target-setting, clear zoning regulations, improved planning processes etc. with respect to wind energy, alongside other technologies. This would also significantly lower the costs and risks for investors. Second, while wind energy is not without drawbacks, legitimization strategies have so far only hesitantly articulated the drawbacks of the alternatives. Given that the impacts of climate change are now being felt more and more especially in the alpine regions, and that an important contribution Switzerland can make to climate change mitigation is to electrify its heating and transport sectors, we recommend the role of wind energy to be approached more holistically in the

policy discourse. And finally, taking into account the discussed tendency that social acceptance often increases once a new technology has been introduced at broader scale, we suggest policymakers should be ready to take the risk of being ousted in the next election if it helps to advance the prospects of wind energy in the longer run.

We close this section by highlighting some limitations of our approach. First, our research design is not suited to detect causal relationships in a straightforward way. Conceptually, we considered processes of (de-)legitimation to influence the socio-political acceptance of technology, which in turn has a bearing on both market and community acceptance and, in mutual relationships with the latter, shapes deployment trajectories. However, social acceptance and deployment pathways feed back into discourses about legitimacy, both in reinforcing and undermining ways. For instance, our case study of Austria indicates that once a strong deployment dynamic has been set in place and a technology is a well-established part of a socio-technical system, its legitimacy becomes less contested. In line with transitions thinking, it is therefore more accurate to conceptualize these relations as complex and co-evolutionary, and future research could employ more sophisticated research designs to better trace these complex causal patterns. Second, our analysis is characterized by certain temporal bounds (2010–2020). Thus, we do not capture early discourses about technology legitimacy, thereby to some extent – by design – de-emphasizing the path-dependent nature of policy-technology-society interactions. Likewise, we do not trace whether and which new storylines and discourse coalitions surrounding wind energy emerged in the wake of the European energy crisis in 2022. Third, in contrast to other recent work on discourses surrounding technology legitimacy (e.g., [Dehler-Holland et al., 2022](#)), our empirical analysis follows an explicitly qualitative logic and is hence characterized by certain limits regarding the amount of materials that can be analyzed. Future work may compare the results of our study with discursive analyses relying on computational approaches to investigate whether our conclusions would be corroborated by the latter. Fourth, for better comparability, the Swiss newspaper sample relies exclusively on German-speaking media. While the German-speaking part represents almost two thirds of the Swiss population, we cannot rule out that the legitimacy of wind energy is higher in the French- and/or Italian-speaking regions of Switzerland.

6. Conclusion

Why does the role of particular technologies on the way to low-carbon electricity systems differ between cases that are similar in many respects? Taking wind energy in Austria and Switzerland as an example, we proposed to investigate technology legitimacy and how the (de-)legitimation of wind energy unfolds in public discourses. Inspired by the literature on technology legitimation ([Bergek et al., 2008](#); [Markard et al., 2016](#)), we studied processes of (de-)legitimation empirically. We submit that linking the concept of technology legitimacy with the notion of social acceptance ([Dermont et al., 2017](#); [Wüstenhagen et al., 2007](#)) provides a conceptual innovation that not only bridges two separate but strongly related literatures, but also helps to better understand the sources of (lacking) socio-political acceptance. To operationalize our framework, we enrich the multi-dimensional discursive approach ([Rosenbloom et al., 2016](#)) with discourse network analysis ([Leifeld and Haunss, 2012](#)). This helps us to fruitfully analyze technology-society interactions in a comparative setting and in a way that pays more systematic attention than previous studies to the role of actors and coalitions in generating discursive resonance over time. Specifically, by analyzing 808 newspaper articles on wind energy in Austria and Switzerland, we identify four distinct sets of storylines that are used to either delegitimize or legitimize the technology in both countries, centering on (1) the contribution of wind energy in future-proof-electricity systems, (2) risks and benefits of wind energy, (3) regulatory frameworks for wind energy, and (4) the role of geography and scale.

Our analysis highlights three main differences between the countries. First, the number of newspaper articles legitimizing wind energy from 2010 to 2020 is much higher in Austria. While more than two thirds of articles are characterized by a legitimizing dominant storyline, more than half of all articles published in Switzerland have a dominant storyline delegitimizing wind energy. Second, the discourses in both countries focus on different topics. In the Austrian discourse, required institutional or policy changes and the next steps to better integrate wind energy into the electricity system are prominently discussed. The Swiss discourse, by contrast, is characterized by a more fundamental questioning of the technology as such and focuses more on possible negative consequences of the adoption of wind energy. Third, the composition of discourse coalitions differs between the two countries. While actors from academia, the energy sector and politics are represented strongly in both countries, renewable energy associations supporting wind energy are more relevant in Austria. In Switzerland, on the other hand, discourse coalitions are more dynamic over time, and NGOs and citizen initiatives are much more strongly represented than in Austria. These actors often raise their concerns about wind energy and its potential effects on landscape, fauna, and flora.

Our study demonstrates that the legitimacy of wind energy is highly contested in Switzerland, but less so in Austria. The strongly contested legitimacy of wind energy ultimately helps to explain the relatively low socio-political acceptance and deployment rates in Switzerland. More generally, by applying the DNA method in a comparative setting, our study enriches understanding of the role of actors in the construction and deconstruction of technology legitimacy.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.techfore.2023.122929>.

Data availability

The authors do not have permission to share the newspaper articles.

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