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Does ideology influence the ambition level of climate and renewable energy policy? Insights from four European countries

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ABSTRACT

We investigate whether political ideology has an observable effect on decarbonization ambition, renewable power aims, and preferences for power system balancing technologies in four European countries. Based on the Energy Logics framework, we identify ideologically different transition strategies (state-centered, market-centered, grassroots-centered) contained in government policies and opposition party programs valid in 2019. We compare these policies and programs with citizen poll data. We find that ideology has a small effect: governments and political parties across the spectrum have similar, and relatively ambitious, decarbonization and renewables targets. This mirrors citizens' strong support for ambitious action regardless of their ideological self-description. However, whereas political positions on phasing out fossil fuel power are clear across the policy space, positions on phasing in new flexibility options to balance intermittent renewables are vague or non-existent. As parties and citizens agree on strong climate and renewable power aims, the policy ambition is likely to remain high, even if governments change.

KEYWORDS

Political ideology; climate policy; energy policy; europe; european Union; renewable energy; flexibility

1. Introduction

The electricity sector is transforming in response to multiple environmental, economic, political, and technological challenges. This transformation is both driven and constrained by desires to meet the three traditional aims of a sustainable power system, i.e., environmental sustainability (e.g., decarbonization), security of energy supply (e.g. system stability), and economic sustainability (e.g. affordable energy) (EC 2014, 2016). In turn, the three pillars are both dynamic and normative, meaning that their interpretation and the relative emphasis put on each varies between actors, places, and times. The implications of climate policy for the energy sector have been and remain the focus of a heated debate. There is increasing consensus in academia that the temperature targets of the Paris Agreement require complete decarbonization of the energy system (IPCC 2018), but globally, decarbonization targets remain insufficient to reach those targets (Watson et al. 2019). There are widely diverging opinions, in science and in policy and across society at large, on how fast and how far the energy and electricity systems should be decarbonized, and about how to achieve decarbonization and which technological combinations are most beneficial for each context. Renewables are critically important in any zero-

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carbon future, but which types of renewables should be built, where and in which proportion is disputed: large- or small-scale generation, with or without a continent-spanning transmission system, domestic or traded power are all in principle feasible options, but have diverging economic, social, and environmental impacts (Tröndle et al. 2020).

Discussions and debates on how to best decarbonize energy and electricity can be expected to reflect ideological positions (Lilliestam and Hanger 2016; Sabatier 1988; Verweij and Thompson 2006). Ideology, understood as a set of beliefs or principles guiding partisan actions in a political (sub)system, leads to different perspectives on both the content of policy and its procedural aspects, such as diverging views on the role of the state versus the market or on the relationship between humans and nature. Energy systems are socio-technical systems that co-evolve with the political systems that govern them (Geels 2002; Geels et al. 2016), so that the energy system at any point in time is shaped by the sum of all policy decisions preceding that time – by the *policy pathway* that led up to it. Hence, the future is shaped by the policy pathway leading to it, and that pathway is created based on what we today think it should look like. Normative visions are the guiding principle for the policy decisions that shape the future – and these policy decisions are at least partly driven by ideology.

Political decisions in a given jurisdiction address a problem that the dominant policy coalition views as relevant at the time. These political positions depend both on hard facts (e.g. whether the power system is stable) and on broader political and landscape factors (Geels 2002), such as ideological factors exogenous to the energy system (e.g. fundamental views on market vs. state; economic efficiency vs. equity, etc.) (Dryzek 1997). We can expect ideological divides to exist in all policy areas: ideology is likely to influence the views, aims, and preferred means – including both the governance choices and technology mixes – also of climate and energy policy. In this article, we focus on electricity decarbonization (as the key sector for energy decarbonization), and investigate the effect of ideology on three key aspects of decarbonization policy in Europe:

- European and national climate targets.
- European and national renewable electricity targets.
- Flexibility preferences. As the share of fluctuating renewable electricity grows, flexibility – measures to balance the system – is needed, for example grid expansion, storage, or renewable dispatchable generation.

For all those three aspects, we hypothesize that different ideological positions lead to differences in target ambition and (technological) preferences for flexibility provision: how fast should countries decarbonize, what should they phase out, how fast, and what should they phase in to replace the old technologies and stabilize the system? In this, we expect green positions (represented by the grassroots-centered pathways) to seek fast decarbonization, as equity and environmental protection are its core values. As the remaining carbon budget is rapidly decreasing, such strategies must specify solutions for arising problems, including flexibility provision. We expect hierarchical positions (state-centered pathways) to put more focus on security and controllability, thus being more uncomfortable with the fluctuating nature of many renewables; this concern would increase the focus on dispatchable zero-carbon supply but also limit the decarbonization ambition of state-centered pathways to the pace that flexibility options can be phased in. In individualistic positions (market-centered pathways), we expect climate and renewable energy ambitions to be lowest and flexibility options to be weakly represented, as these pathways are driven by cost-minimization, causing a reluctance to pick winners or set strict long-term targets that may constrain market actors' freedom to decide (see Foxon (2013)). In addition, flexibility preferences may be affected by ideology, especially regarding the scale and level at which technologies operate: state-centered pathways may be more comfortable with large-scale, centralized solutions such as grids, whereas grassroots-centered pathways may rather seek decentralized solutions such as batteries and reject large-scale options and additional transmission (Lilliestam and Hanger 2016).

We investigate the above-mentioned hypotheses empirically in two ways. First, we analyze policies and proposed policies for climate protection and decarbonization of society in general. We also analyze renewable energy policies as key for achieving the climate targets in four European countries. To cover the entire ideological spectrum, we analyze both government policies and climate and energy strategies of parties not in government and identify their positions on the three aspects. To do this we build on the policy space concept developed by Foxon, Hammond, and Pearson (2010b) and compare the energy transition policy pathways that are ideology-driven (market-centered, state-centered, and grassroots) for Germany, France, Spain, and Italy. We focus on what the positions are and how they differ, while not investigating the domestic politics of how the positions arise.

Second, we analyze previously published data (Lazáro Touza, González Enríquez, and Escribano Francés 2019; Wolf 2020) on perceptions of citizens in Spain and Germany, to see how their views on the three aspects (climate targets, renewable targets, and flexibility) are influenced by their general political preferences/ideology and whether citizen views correspond with the partisan positions of citizens' self-reported ideological position.

We show, against our expectations, that ideology does not strongly affect climate and energy policy preferences: across the policy space, we find similarly high ambition levels for decarbonization and renewable energy expansion, both for political parties and citizens. We also find that regardless of the ideological orientation, future flexibility options are not on the political agenda of either governments or opposition parties.

2. Methods

We use two different methods to approach our research question, analyzing 1) differences in positions of governments and political parties and 2) citizen perceptions of climate and energy policies. The two methods are different and also provide different results. However, because policy and public opinion co-evolve and influence each other, the findings are also interrelated. The parties' positions can be viewed as the supply-side of a market, and citizens' – and voters' – represent the demand-side: voters either "buy" or reject the parties' energy and climate political positions (Averchenkova and Lázaro-Touza 2020). Consequently, if there is a misfit between societal actors' view and government strategy, there will be a social pull to adapt policies and aims (Averchenkova and Lázaro-Touza 2020; Börzel 2000). If instead our findings from both analytical perspectives were similar, then the two sets of results would support each other: because if there are no strongly divergent views and party positions represent public opinion, the national climate, and energy strategy is unlikely to change fundamentally and the identified standpoints are the "corner points" of the feasible future energy transition policy space.

2.1. National policy pathways

2.1.1. Analytical framework

For national policy pathways, our analytical framework is based on the notion that every policy debate, including energy policy, is inherently normative and thus characterized and determined by the presence of multiple mutually exclusive rationalities. There are several rationality-based theories, including a general one like the anthropology-centered Cultural Theory (Lilliestam and Hanger 2016; Scrase and Ockwell 2010; Thompson, Ellis, and Wildavsky 1990). We base our analysis on the energy transitions. Logics framework (Foxon 2013; Foxon, Hammond, and Pearson 2010b; Foxon et al. 2013), which is an energy system-specific framework and hence particularly useful for the operationalization of our study. We adopt the view that energy systems are human artifacts, to a large extend created and shaped by energy policy decisions that set the rules of the game for all sector stakeholders to work with (Hughes 2013). As incumbent actors have thus far failed to reduce carbon emissions sufficiently fast, a multi-faceted elaborate policy-mix is needed to induce and accelerate the desired sustainability transition in the power sector (Rogge and Reichardt 2016). In

this view of policy-driven radical change, the energy future and the associated technological pathways are created by discourse-centered decisions. As a result the future energy system can be viewed as a function of all policy decisions between today and the future, say, 2050 (Ellenbeck and Lilliestam 2019). Because governments (and public opinion, see section 2.1.2) change, pathways are not certain but may change. For this reason, we need to assess the aims and strategies of actors covering the entire policy space, which is precisely what the Logics framework allows us to do in a systematic manner. However, with the focus on the policy-driven decarbonization ambitions we ignore other dynamics outside and inside the energy system, such as nuclear accidents or disruptive innovation, that may lead to additional radical change in public opinion, policy, and consequently the energy sector.

The Logics concept draws on the Multi-level perspective on sociotechnical transitions (Geels 2002; Geels et al. 2017) and complements it by adding explicit normative governance choices, which are used as starting points to distinguish the Logics from each other (Foxon 2013; Foxon et al. 2010a; Geels, McMeekin, and Pfluger 2020; Hughes 2013; Smith, Stirling, and Berkhout 2005). It assumes that there are multiple ways in which the energy transition can happen, and that there is a policy space within which all energy transition policy decisions are located. The space lies between three corner points, each indicating the complete dominance of one set of actors favoring one ideology-driven logic of how to govern the energy transition: the market-centered, the government-centered, and the grassroots-centered logic Figure 1.

In the state-centered logic, the central government leads the transition, keeping the transition under close state control, often following a masterplan-like strategy. Here, the state is the central actor, both in governing and carrying out the transition itself. In the market-centered logic, the role of the government is limited to setting the overall targets and defining (and enforcing) the "rules of the game". Energy policy focuses only on correcting market failures, leaving all other decisions to market actors. Finally, in the grassroots-centered logic, the transition is carried out locally, with the resources available to each individual community, enabled by state policies.

Foxon and colleagues propose that this framework provides three ideal-typical and empirically defendable transition policy pathway-types, each based on a distinct governance logic. All possible energy transition policy decisions are located in this policy space, and proponents of each logic seek to "pull the center of gravity to their corner", so that the actual policy outcome reflects the power balance between actors in each corner. Thus, if governments and political majorities change, the direction of a country's energy policy may also change, if the new and the old governments adhere to different energy transition logics.

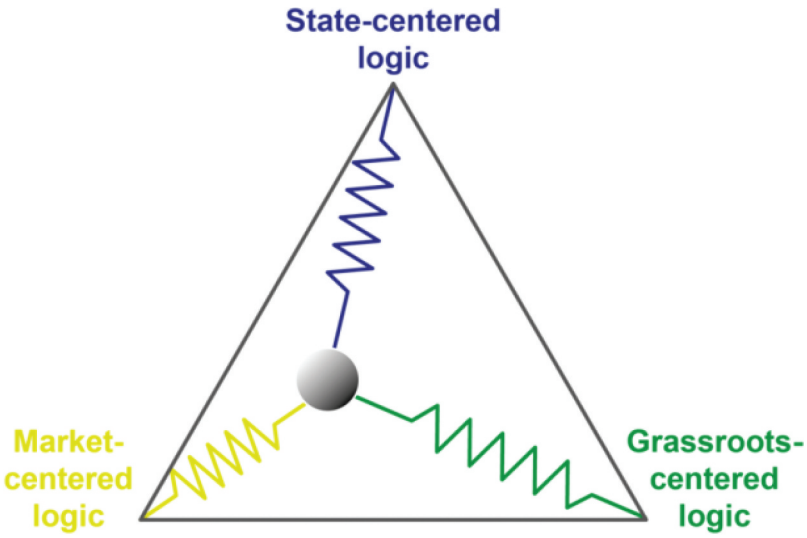

Figure 1. The energy policy transition space of the Logics framework. Source: Lilliestam et al. (2019) based on (Foxon 2013).

2.1.2. Case studies and case selection

For our case studies, we focus on the four largest EU electricity markets (France, Germany, Italy, and Spain), together responsible for 60% of the EU27 power demand (Eurostat 2020). These countries, and especially Germany and Spain, have well-developed political and public energy debates, and understanding the choices of these countries can be expected to reflect a wide range of ideological approaches to energy policy-making.

For the pathway analysis, we build on Foxon's Logics framework and identify for each country the pathways representative for the three corners of the Logic's policy space. We diverge from Foxon's approach in that we do not define the policy pathways in interaction with stakeholders but base the pathways on the governments' planned or implemented climate and energy policies or on suggested policies of parties not currently in government. For each country, we identify actual party/government positions that closely correspond to the ideal-typical corner positions, without being identical to them (see below). This way, we identify the most divergent but still real political positions in the energy transition policy space. Among these ideology-dependent positions, spanning the entire transition policy space, we then look for differences regarding the three variables of interest (climate targets, renewable power targets, and flexibility preferences).

We analyze government and opposition party strategies and identify positions that closely represent the ideal-typical position of each corner of the policy space. This selection is based on the judgment of experts of each national energy policy debate, following strict criteria. First, only parties with a realistic chance of shaping policy in the future are considered, i.e. they should be present in national or local parliaments today. Second, we specifically looked for parties advocating closely in line with the Logics. For all countries we were able to identify green and/or left parties that advocate for grassroots pathways, liberal parties propagating market-centered pathways, and social democrat and/or conservative parties advocating state-centered approaches. Across all countries, we found parties arguing closely in line with the ideal-typical corner positions. We could not identify any party following the market-centered logic and presenting a clear and holistic energy vision for Italy, and so we have only two Italian pathways. We elaborate on the details of the party selection for each country in the supplementary material (sections S1.1, S2.1, S3.1, S4.1), where all collected data and the list of policy document references are provided.

Political positions, and especially those of sitting governments, are mediated by political realities and trade-offs and are not always "pure", exactly corresponding to an ideal-type in the policy space corner. For example, most parties rely to some extent on "market forces" – being the dominant politico-economic paradigm in Europe – including party positions otherwise strongly following state- or grassroots-centered Logics. In addition, government positions can be expected to be less ideologically "pure", as governments are often coalitions and their positions have gone through the process of deliberation and compromises, possibly taking into account positions of actors beyond the government itself. Empirically observed positions are thus shaped not only by ideology but also by the *Realpolitik* of each country's context. Hence, party and especially government positions should be seen as representative of, but not identical to, the ideology-driven ideal-typical corner positions of the Logics policy space. Our policy pathways are empirical, guided by the Logics framework but based on actual policy decisions of representative parties regarding their climate and energy transition aims and strategies to decarbonize the electricity system.

We summarize the selected representative parties per country in Table 1. In a few cases, multiple candidates for a corner existed – there we chose the party with best developed energy policy position. As both parties adhere to the same Logic and call for the same kind of strategy, the effect of this selection is not significant. For Germany, we used the documents produced by the long-standing "grand coalition" as the position of two parties joined together. We describe and justify the choice of each single party as representative of the Logic in the supplementary material (sections S1.1, S2.1, S3.1, S4.1).

To ensure comparability of the pathways we use the positions at the time of data collection in September 2019. For the government positions, we base our data on the draft National Energy and Climate Plans (NECPs) as all EU Member States are required to present roadmaps by the end of 2019

Table 1. Case selection of representative political parties. See supplementary material (sections S1.1, S2.1, S3.1, S4.1) for details on the party selection.

	France	Germany	Italy	Spain
Market	La République En Marche	Liberal Democratic Party	-	Partido Popular
Grassroots	Europe Écologie – Les Verts	Green Party	Movimento Cinque Stelle	Unidas Podemos
State	Parti Socialiste	Christian Democrats & Social Democrats	Partito Democratico	Partido Socialista Obrero Español

(EU/2018/1999 2018) to achieve their 2030 climate goals, but also use other – currently implemented and valid – government policies and aims for issues that were not addressed or remained under-specified in the NECPs. We rely on the most recent documents describing or deciding party positions, including energy position papers and election programs but also proposals to change existing laws. While draft NECPs were published in 2018–2019, the documents underlying the opposition party positions have wider time frames as regards their adoption dates. Some sources go back longer, for example the German "Energy Concept" (BMWi and BMU 2010), adopted in 2010 and still guiding a few government policies, including the long-term (post-2030) renewables targets. Hence, the positions we identify sometimes reflect somewhat different realities, because they were adopted at different times, including some positions held before the Paris Agreement. Overall, the problem is a minor one, as the relevant data points are almost exclusively adopted in 2018 or 2019. Nevertheless, we see a slight tendency toward stricter aims expressed in strategies adopted later.

For two target variables (climate and renewables), countries are constrained and guided by external political or technical factors, especially the EU's climate and energy policy frameworks, which are in turn influenced by the Paris Agreement. Whereas the 2030 climate and renewables targets are binding only at the European level, the national indicative targets are negotiated and agreed upon in the NECP process; beyond 2030, despite proposals for climate neutrality by 2050 (EC 2019b, 2020), there are no adopted European targets, so that countries may set any long-term target. Which technologies to use and which sectors should lead is decided by each Member State based on various criteria, such as countries resource endowments, their past experience regarding renewables and climate protection, national industrial and economic interests, and the ideology of the party formulating the strategy.

As regards renewable energy strategies around the world, fluctuating renewable generation from wind power and photovoltaics plays an increasingly important role. With this increase, fundamental properties of the power system change, making supply less controllable and requiring a renewed effort to increase flexibility to keep the system stable. Each country must thus formulate not only overall renewable power share targets and phasing out fossil fuel power, but also decide on how to keep the system stable by phasing in new flexibility options – and different options are perceived differently by people with different worldviews. On the supply side, dispatchable carbon-free generation can be used to balance the system during low wind/sun phases, including dispatchable renewables. On the demand side, sector-coupling – especially electro-mobility and electric heating – may add flexibility by including large loads that can be shifted in time. On the infrastructure side, various storage options (including batteries and power-to-X) or grid expansion and trade of (dispatchable) renewables may provide system flexibility (Brown et al. 2018; Grams et al. 2017; Lilliestam et al. 2018, 2016; Pfenninger and Keirstead 2015; Schlachtberger et al. 2017).

In this paper, we only present the relevant subset of the quantitative policy pathway data collected, namely the overall climate and renewables targets, and the preferences in flexibility options. When collecting the data, we also built qualitative governance narratives for each pathway, including instrument preferences. For details on these narratives, and the narratives themselves, please refer to Lilliestam et al. (2019).

2.2. Citizens' perceptions

In addition to the national policy pathways, we investigate citizens' perception of climate and energy transition policies in two of the countries with well-developed national public energy debates: Spain and Germany. In order to do this, we use data from citizen polls carried out by Elcano Royal Institute (*Real Instituto Elcano*, RIE) for Spain (Lazáro Touza, González Enríquez, and Escribano Francés 2019) and by the *Institute for Advanced Sustainability Studies* (IASS) for Germany (Wolf 2020). We thus base our analysis on primary data but have not collected this data specifically for this article.

The analysis is based on primary data collected for other purposes and published in two publicly available reports. Hence, we had no influence on the specific questions asked in the two surveys. As the questions differ slightly between the two surveys, we only compare their findings qualitatively. The questions are indicated in the corresponding Figure captions. Analogously to the national policy pathways (see Section 2.1), we investigate citizens' views of ambitious climate protection (Spain), their view of a far-reaching transition to a renewables-based energy system (Germany & Spain), and the preferences for a range of flexibility options (Germany).

2.2.1. RIE polling on climate attitudes in Spain

The data used in the analysis of Spanish citizens' attitudes toward climate change and toward a renewable energy transition comes from Elcano Royal Institute's (RIE) phone survey conducted from the 8th to the 26th of April 2019 using a representative sample of 1,000 residents over 18 years of age. The survey used stratified sampling according to regional data. Age and gender quotas were used to select interviewees that were proportional to the population's distribution for each of the strata. The sampling error for a 95.5% confidence level is ±3.2%. Socio-economic and ideological questions were included in the final section of the questionnaire. Regarding ideology, respondents were asked on a scale of 0 to 10, being 0 the far left and 10 the far right, where they would place themselves on this scale. The fieldwork was conducted by a market research company, Random Strategy, and the pilot questionnaire was distributed by researchers at the Elcano Royal Institute as well as by professors from Cardenal Cisneros University College.

Based on the Theory of Reasoned Action (Fishbein and Ajzen 1975), Elcano's survey asked citizens, among other things, about their knowledge regarding climate change, their concern about climate change as a threat to the world, their ecological world-views (Dunlap et al. 2000), and their perceptions regarding whether enough is being done to address climate change at the national and international level. It also asked about support for a Climate Change and Energy Transition Law, using a dichotomous question. Further, respondents were asked about their support for different elements, instruments, and processes that should be considered when developing such framework climate laws (Averchenkova 2019) using a 5-point Likert scale. Closely related to the research question, these elements included: greenhouse gas emission reduction goals and support for a fully renewable power system.

2.2.2. IASS social sustainability barometer Germany

The data set of the German population used in the present study was obtained as part of the Social Sustainability Barometer (www.iass-potsdam.de/en/barometer), which is an annual survey study of the Institute for Advanced Sustainability Studies (IASS) to analyze and monitor subjective experiences and attitudes toward the energy transition in Germany (Setton 2019; Wolf 2020). The survey holds a wide range of questions measuring public responses to both general and governance- and technological-specific aspects. The household-level data for Germany were collected through an online- or teletext-based survey implemented by the Forsa institute over the period from October 16th to November 6th 2019. Respondents were randomly selected from the nationally representative household panel forsa.omninet which includes 75,000 potential respondents. A total of 6,117 respondents completed the questionnaire. The sample mean age was 57 years, compared with the German mean, 44 years (German Census Bureau 2018); 42% were female (50.7% in Germany); households had an average size of 2.1 persons (1.9 persons in Germany). The average household income was €3,200 to

3,700 per month (€3,400 in Germany) and 25% had a college degree (17% in Germany). Eight percent identified with the Left Party, 18% with the Green Party, 17% with the Social Democratic Party, 5% with the Liberal Democratic Party, 23% with the Christian Democrats (CDU/CSU), 7% with Alternative for Germany (AfD) and 17% identified with other parties or no party.

The Social Sustainability Barometer measured respondents' general support for the promotion of renewable energies using a dichotomous question. Additionally, participants indicated their level of support for policy targets and the expansion of specific renewable power technologies and power lines on a 5-point Likert scale from 1 (strongly oppose) to 5 (strongly support). We here use data for three flexibility options, indicating how German citizens view the expansion of interregional power grids, biomass plants, and geothermal energy. The political ideology was obtained by asking the participants to indicate the political party in Germany they most identify with: Left Party (Die Linke), Green Party (Bündnis 90/Die Grünen), Social Democratic Party (SPD), Liberal Democratic Party (FDP), conservative Christian Democrats (CDU/CSU), and the right-wing populist Alternative for Germany (AfD).

3. Results

3.1. Policy pathways

3.1.1. Decarbonization ambition

Regarding the ambition of the overall climate targets, we find that ideology is not strongly related to the level of decarbonization ambition Figure 2. All pathways foresee more stringent decarbonization targets, 21–55% by 2030 (compared with 1990) and 75–100% by 2050. There is no clear difference in ambition between pathways following each logic/ideology, although the three market-centered pathways (Italy has no explicit market-centered pathway) are somewhat lower than the others (75% (France) and 80% (Germany and Spain) decarbonization by 2050), whereas the grassroots-centered pathways aim for higher ambition (85% (France) and more than 95% (Germany and Spain)) and the state-centered pathways show a broader range (75% (France) and 100% (Italy) decarbonization ambition in 2050).

However, there is also a tendency that decarbonization goals that were adopted early (around 2010, such as the 2050 goal in the German state-centered pathway) had lower targets than those of the pathways decided later, indicating that the implication of the Paris Agreement – complete elimination of energy-related CO_2 emissions – and the discussion about the 2030 target framework has influenced policies in Europe. This is at least a contributing factor for the market-centered pathways having lower ambition: these policies are also among the older ones in the dataset. For about a decade, the shared vision in Europe was an 80–95% emissions reduction by 2050 (EC 2011), and this of course affects national strategies formulated in that period, whereas some of the draft NECPs (EC 2019c), which are the basis for the currently implemented pathways (all state-centered), pick up the 100% energy decarbonization goal. Importantly, none of the pathways aims for decarbonization before 2050 –

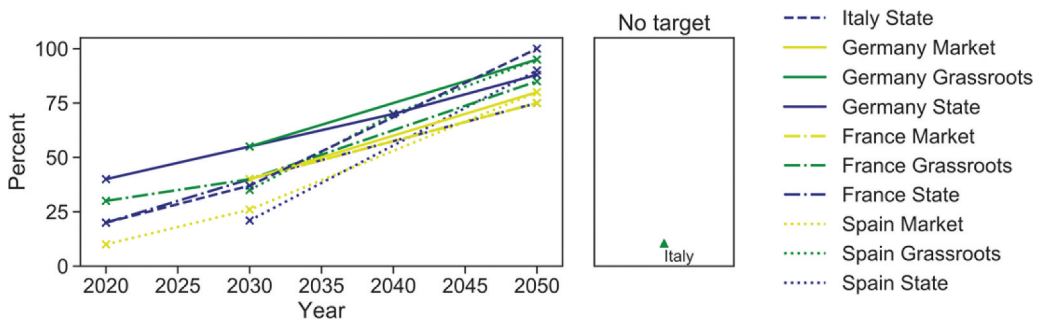

Figure 2. Decarbonization ambition of the national policy pathways in the four investigated countries. Data: see supplementary material.

a policy aim that, many argue, would be necessary for the 1.5 degrees goal of the Paris Agreement, and possibly for the 2 degrees target (IPCC 2018). Finally, we observe that the French climate targets are lower than those of the pathways of other countries; presumably, the French with their large carbon-free nuclear power and very small number of coal power plants perceive a lower pressure than its neighbor countries. Indeed, such connections between technology/industry and energy/climate policy have been observed elsewhere, notably in Germany – helping explain the relatively high decarbonization ambition there (Schmidt, Schmid, and Sewerin 2019; Schmidt and Sewerin 2017).

3.1.2. Renewable power ambition

In the power sector, we find a low influence of ideology on the renewables expansion ambition, with parties across the spectrum having either very ambitious long-term targets or no power sector-specific target at all Figure 3. There is ubiquitous support for renewable power sources with renewable penetration goals of 50–65% in 2030 (except France), and the German greens proposing 100%. By 2050, all four grassroots-centered and one state-centered (Spain) pathways aim for 100% renewable power, with the German (80%) and French (50%) state-centered pathways lying clearly below this. Grassroots pathways are somewhat more ambitious than the state-centered ones, except for Italy where the Grassroots pathway has not formulated an intermediate goal before 2050 and ends up on the same level (100% renewables by 2050) as the state-centered vision.

A striking and ideologically driven difference is the lack of renewable power targets in all but the French market-centered pathways. This is a central feature of these pathways, which foresee the definition of an overall, economy-wide climate target and an economy-wide carbon price as the single policy instrument to correct the carbon externality, but seek to leave implementation "to the market", limiting state intervention to the bare minimum to improve the cost efficiency of climate protection. Hence, only the French market-centered pathway has a renewable power target, and a possible reason is that the Macron government needed a 2030 aim for the NECP; indeed, that pathway only sets that necessary target, but does not have a renewables target beyond 2030.

There is a relationship between ambition and date of strategy adoption. For example, the current German government vision of 80% renewables for 2050 was decided in 2010 (Bundesregierung 2010) and has not been updated since, whereas the 2030 goal has recently been increased to better fit the decarbonization ambition negotiated in Brussels.

The other two outliers are the French market and the state-centered pathways that both foresee 50% renewables by 2050. In addition to renewables, however, they foresee 50% nuclear power, so that the French power mix is to be completely carbon-neutral by 2050. This low renewable power ambition level thus reflects more a French national specificity in technology choice than an ideology-driven difference in policy.

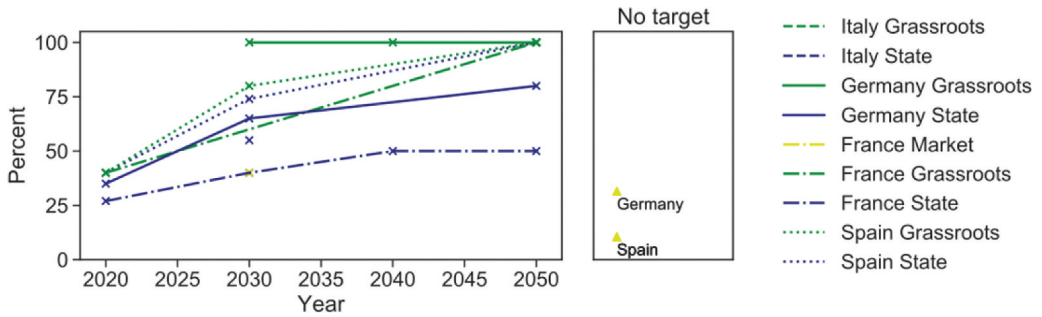

Figure 3. Renewable power targets of each pathway in the four investigated countries. Data: see supplementary material.

3.1.3. Flexibility strategies

As regards power system flexibility we see no ideology-driven patterns. All pathways share a common blind spot. No pathway has a clear flexibility strategy Table 2. All pathways are explicit about their plans for existing fossil and nuclear flexibility sources, but they are very vague about how to replace them.

For example, the future role of natural gas is unclear. Today, it is used in many European countries as the main supply-side flexibility option, and in all but the grassroots-centered pathways, gas will continue to play a role beyond 2030. In theory, countries can continue using fossil fuels in the future if power stations are equipped with carbon capture and storage (CCS) (Cloete and Hirth 2020). However, no vision includes concrete CCS expansion goals – and seven grassroots and state-centered pathways explicitly rule out CCS as an option for the power sector Table 2. Only the Spanish market pathway includes it as a possibility but has no concrete CCS deployment target. It thus seems highly unlikely that fossil power stations with CCS will be brought to maturity as a flexibility source in any of the countries studied, and in consequence CCS is unlikely to be available as a technology option, unless it is developed in a third country. To achieve climate-neutrality without CCS, all fossil fuels, including natural gas, must be phased out eventually, but only the grassroots-centered pathways of France and Germany have phase-out dates for natural gas.

In terms of adding dispatchable renewables, only the Italian pathways and the German and Spanish state-centered pathways have any explicit position at all, and only the Spanish pathway plans a mentionable addition of dispatchable renewables – 5 GW new Concentrating Solar Power (CSP) by 2030 (see Table 2, and supplementary material S1.2; Lilliestam et al. (2020)). The same applies to storage and, especially, renewable power trade: these options are often mentioned as future possibilities in the energy strategies, but almost no pathway has a clear ambition regarding such solutions, and no pathway has a clear governance idea or policy instrument to expand these flexibility options. Only interconnections – flexibility provision through the power grid – are mentioned by most pathways as a means of having flexibility, but no pathway, implemented or proposed, goes beyond the EU interconnection requirements for 2030: grid expansion is currently not attractive in any Member State.

Finally, the issue that has been described as "the next big thing" for the energy transition – sector coupling (Olczak and Piebalgs 2018) – remains largely unspecified in all pathways. Electro-mobility is considered in many energy strategies, but the level of ambition is generally not specified, except in Spain. Similarly, the electrification of heating (heat pumps) is mentioned in several strategies, but without any specific targets or measures to achieve it. This lack of sector-coupling strategies has implications for the potential of demand-response as a flexibility measure: as heaters and car chargers are among the most flexible loads, large electricity demands from these sectors would increase the flexibility of the power demand (Aryandoust & Lilliestam, 2017). Hence, sector coupling may be the *next big thing* in the power sector in Europe, but it is certainly not the *current big thing*, for all strategies regardless of their ideological roots.

3.2. Citizen perspectives

For the citizen perspective on climate and renewables targets, as well as flexibility options, we draw on original data from two citizen surveys carried out in 2019 by the RIE for Spain (Lazáro Touza, González Enríquez, and Escribano Francés 2019) and the IASS for Germany (Wolf 2020). We do not have access to citizen polling data for France and Italy and hence do not present results for these countries here (see Methods, section 2.2). As with the pathways, polling results from Spain and Germany show strong support for ambitious climate and renewables targets, with a weak gradient from left (strongest support) to right (slightly weaker support). In Germany, support for key flexibility options is strong, again with a slightly falling support level from left to right. This suggests that citizens of these two countries broadly support the ambitious policy aims, that opposition against such policies is probably small, and that from today's perspective, there is little reason to expect popular pressure on parties to trigger major shifts in parties' energy political positions.

Table 2. The future role of potential flexibility options in selected European policy pathways. Colors indicate the presence or absence of a target, and text entries indicate the year of concrete targets (phase-out or expansion). Data: see supplementary material.

	France			Germany			Italy		Spain		
	Market	Grass-roots	State	Market	Grass-roots	State	Grass-roots	State	Market	Grass-roots	State
Fossil and large-scale Thermal											
CCS	0	0			0	0	0	0			0
Nuclear	50% (2025)	0 (2032)	50% (2025)	0 (2023)	0 (2023)	0 (2023)	0	0		0 (2025)	0 (2040)
Natural Gas		0 (2030)			0 (2030)		Goal (2030)	Goal (2030)			Goal (2030)
Dispatchable Renewables											
Hydropower						Goal (2030)	Goal (2050)	Goal (2030)			
Biomass						Goal (2030)	Goal (2030, 2050)	Goal (2030)			Goal (2030)
CSP								Goal (2030)			Goal (2030)
Geothermal							Goal (2030)	Goal (2030)			
Electricity Storage											
Battery					Goal (2030)	Goal (2030)					Goal (2030)
Pumped Hydro											Goal (2030)
Power to X			Goal (2050)			Goal (2030)					
Sector Coupling											
Electrification											
EV-Chargers	Goal (2030)		Goal (2030)								Goal (2030)
Power-to-Heat			Goal (2030)		Goal (2040)	Goal (2030)					
Trading Renewables											
Interconnectors											Goal 2030
Trade in dispatchable renewables											
Physical import of renewables											
Statistical transfer of renewables											
Explicit trade of CSP or hydropower											

0				
Phase out or strong reduction	Decreasing role	No goal	Expansion desired but no concrete goal	Concrete expansion goal

3.2.1. Spain

The support for climate policy and an energy transition is high in Spain: 93% of respondents supported the adoption of an upcoming Climate Change and Energy Transition law. This support is very strong across the political spectrum but is especially pronounced on the left side of the political spectrum (98% support) and slightly lower, although still very high, on the right (84% support, see Figure 4). This corresponds to the slight split in ecological positioning among Spanish citizens in

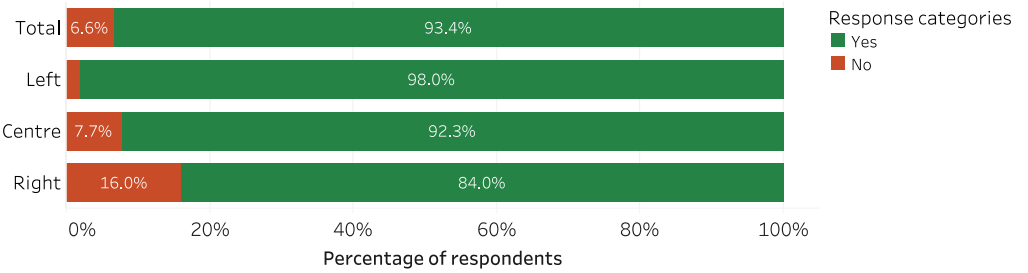

Figure 4. Agreement with the statement 'Spain should have a climate change and energy transition law, total and according to ideology (number of respondents = 1,000; results in %. Source: Lazáro Touza, González Enríquez, and Escribano Francés (2019).

various issues: individuals on the left of the political spectrum have a higher pro-ecological worldview, whereas right-wing respondents are more prone to think there is disagreement among scientists as regards the existence of climate change and are, for example, significantly less willing to pay higher road taxes (Lazáro Touza, González Enríquez, and Escribano Francés 2019).

This also closely corresponds to previous surveys showing the great concern of the Spanish population over climate change: almost 90% of Spanish citizens perceive climate change as a very serious problem, necessitating strong action by the national government and the EU (Eurobarometer 2017, 2019a). Note however that the special Eurobarometers on climate change do not report ideological data: the reported number is an average of the general population. In contrast, the special Eurobarometer on Europeans' attitudes on EU energy policy reports ideology-related data on EU citizens' responses as a whole; that study indicates that EU policy implies shifting from fossil fuels to renewables according to respondents, but more so to respondents on the left (49%) than on the right (39%) of the political spectrums (Eurobarometer 2019b).

In terms of support for renewables, there is a broad consensus among the Spanish population regarding the need for a fully renewable power system: 87% support this Figure 5. As was the case regarding the adoption of a Climate Change and Energy Transition Law, the support for a renewable power system is very strong across the political spectrum, but stronger on the left (91% support) than on the right (81% support) of the political scale, even if this means having to pay higher prices for electricity for some time (Lazáro Touza, González Enríquez, and Escribano Francés 2019).

3.2.2. Germany

The data from the 2019 IASS Sustainability Barometer show that 87% of Germans support the continued promotion and expansion of renewable energy. Public support for a general expansion of renewable

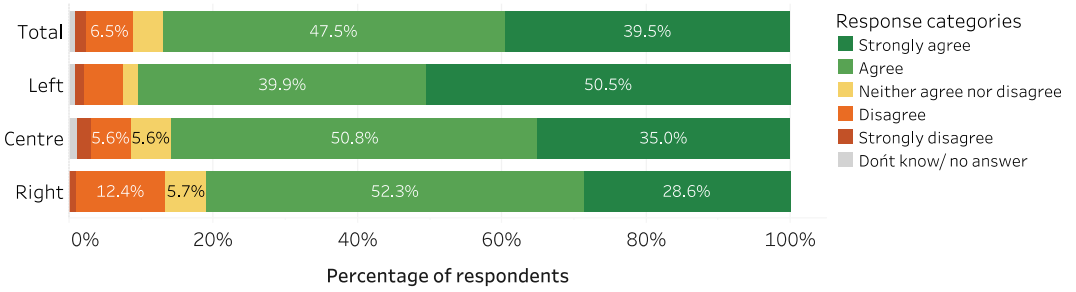

Figure 5. Degree of agreement with the statement 'The power we produce should come from renewable energy sources as soon as possible, even if this means we have to pay extra for our energy for some years', according to ideology (number of respondents = 934 who agree to having a climate change law; results in %). Source: Lazáro Touza, González Enríquez, and Escribano Francés (2019).

energy is very strong across parties, exceeding 80% and generally approaching or exceeding 90% support, except for supporters of the right-wing populist Alternative for Germany (AfD) Figure 6. There is limited variance across the political spectrum, with supporters of the left and leftish parties (Left, Greens, Social Democrats) exceeding 90% support, but the support among liberal and conservative citizens is also very high, at just below 90%. An additional chi-square test revealed a significant effect of party affiliation on the general support for the expansion of renewable energy ($\chi^2(16) = 696.98$, $p > .001$). These findings suggest that there is no strong pressure from the population to stop supporting and expanding renewable energy – on the contrary, across the political spectrum support for the *Energiewende* remains very strong.

This corresponds to the findings of the Eurobarometer, where a great majority (75–81%) of Germans – without any statement on their ideological position – perceive climate change as a very serious threat, requiring strong national policy action by both the national government and the EU (Eurobarometer 2017, 2019a).

The support for specific flexibility options shows a similar picture as the general support for renewables, albeit at a slightly lower level. The support for new interregional grids Figure 7a and geothermal power Figure 7c is 66% or higher (in some cases much higher), whereas the support for new biomass power Figure 7b is lower but still exceeding 50% in all cases, except for AfD sympathizers. As in Figure 6, there is a slightly decreasing support from left to right, with the right-wing AfD sympathizers deviating from the general picture by showing less support for all options. The most polarizing issue is the expansion of interregional power grids. Interestingly, in contrast to the other flexibility options the strongest supporters were found in the middle of the political spectrum, i.e. Social Democrats, Liberals, and Christian Democrats. A one-way ANOVA supported the descriptive findings of partisan divides for all three technologies (power grids: $F(8, 5813) = 20.35$, $p < .001$; biomass plants: $F(8, 5978) = 7.70$, $p < .001$; geothermal energy: $F(8, 5958) = 7.53$, $p < .001$). These results indicate that support for supply- and system-side flexibility measures is high, but also that citizens are clearly more skeptical about more specific measures than about renewables in general: there is broad support, but also first seeds of rejection of particular projects, especially biomass power.

4. Discussion

4.1. The role of ideology in climate and renewable energy policy

In this paper, we analyzed the influence of ideology on the ambition level of climate and renewable energy policy as well as technological preferences for power system flexibility in France, Germany,

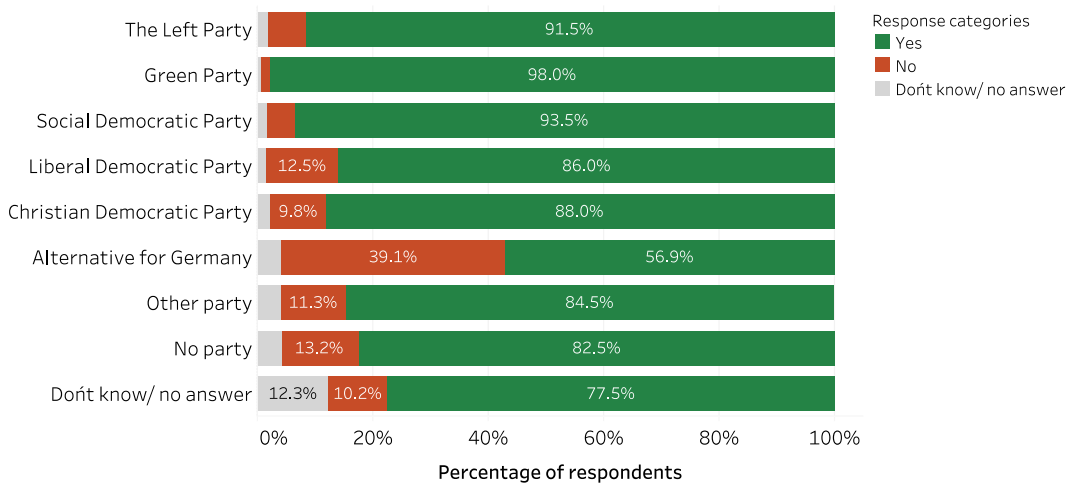

Figure 6. General support for expanding renewable energy in Germany. Source: Wolf (2020).

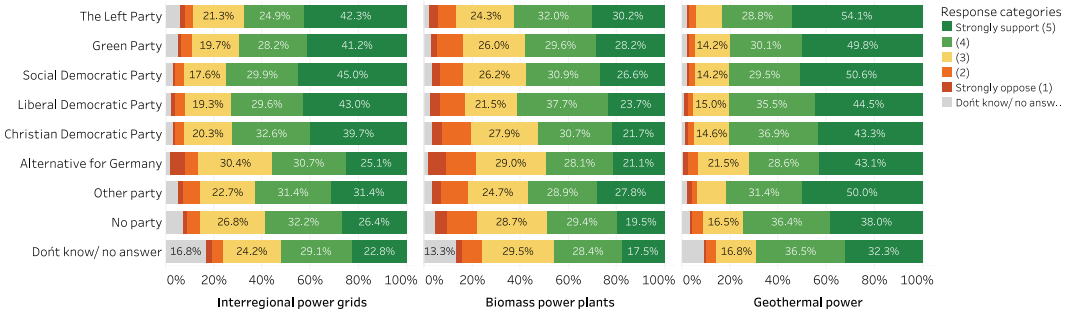

Figure 7. Support of German households for the expansion of specific flexibility options. Support for the expansion of interregional power grids (a), biomass power plants (b), and geothermal power (c). Source: Wolf (2020).

Italy, and Spain. Contrary to our expectations, the results show that ideology-driven political positions are not related to very different preferences regarding target ambition for climate and energy policy. All identified positions – reflected in national policy pathways (enacted/government policy or proposed/opposition positions) and in citizens' perceptions in Spain and Germany – show high support for very far-reaching decarbonization and deployment of fluctuating renewables in the respective countries, and on the other hand low support for gas, CCS, and, in all cases except France, nuclear power. Because party positions representative of all corners of the energy transition policy space support full or almost full decarbonization and very high, including 100%, shares of renewables, this ambition level is very likely to remain in place even as governments change. This target stability is reinforced, at least in the investigated countries Spain and Germany, as it also overlaps with public opinion: across the political spectrum, except a minority of the right-wing populist supporters, citizens support the strong decarbonization and renewables deployment aims of the governments.

Just as with the overall aims, there is little difference across ideological standpoints regarding how to stabilize a future largely/fully renewable power system: parties in all three policy space corners are joined by a lack of a clear flexibility strategy and the results from the German survey point out that citizens' views on flexibility are vague, but also that there is little opposition against the different flexibility options included in the poll. The pathways from all countries and across all policy space corners have rather explicit views on when to phase out undesired fossil fuel power supply options currently used to balance the power system, but no pathway has anything even resembling a concrete plan for providing flexibility. From a technical perspective this is a problem as it may, should no further measures be implemented, result in a flexibility gap when existing flexibility options are taken off-line.

In sum, we reject our hypotheses: there are no strong differences across the ideology-related positions representative of each policy space corner, neither in terms of climate and renewable energy ambition nor regarding technological flexibility preferences. Indeed, we see slight differences across the policy space as hypothesized, with the market-centered tending to have lower ambitions and grassroots-centered higher ambition, with state-centered pathways in between, but the differences are small: no pathway deviates strongly from the others.

4.2. Limitations

Using the lenses of the energy transition Logic framework enabled us to verify how ideology-driven positions spanning the entire energy transition policy space are related to differences in target ambition and flexibility provision preferences. However, we do not know to what degree our results can be generalized: the results and findings presented here apply to the political and citizen levels in two countries (Germany and Spain) and the political level in two further countries (France and Italy) in 2019. Hence, we do not draw conclusions for Europe as a whole, nor for any other country and time. We have

little reason to believe that the ambition of climate and renewable energy policy will differ strongly across parties with different ideologies in other European countries; we do not know and call for further research into this question. Nor have we systematically investigated the role of national energy narratives, such as why France (policy and population) is generally pro-nuclear whereas Germany and Spain (policy and people) are more anti-nuclear – and arguably both across the political spectrum. We therefore call for future research about the role of national energy narratives and their role for energy policy making.

We recognize that the countries we investigate are not entirely free to set their own climate and energy targets: there are a set of EU targets for 2020 and 2030 that were negotiated between European institutions and the Member States (EC 2018b), although countries are free to set higher national targets, and the opposition parties will also use them as orientation. This constrains and makes target setting more uniform, but at the same time, most party positions for 2050 targets are more ambitious than the required 80% minimum decarbonization adopted by the European Council (EC 2011): evidently, countries do set their own targets, by deviating upwards. Possibly, the increasing number of strategies and proposals for national climate- or carbon-neutrality by mid-century has influenced the Commission's proposal for European climate-neutrality by 2050 (EC 2020), and probably the ambitious climate and energy positions of governments and opposition in the investigated four large and influential countries increases the chance that this target is eventually adopted. Regarding flexibility, countries are largely free to define their own flexibility strategies, as the power mix is a national and not European competence. As regards interconnections however minimum EU targets are in place (EC 2019a) and no country or party seeks to deviate significantly from the EU target (see Table 2 and Lilliestam et al. (2019)).

The absence of specific flexibility strategies is a striking commonality across pathways, and somewhat surprising especially for the state-centered pathways and their desire for control. Possibly, flexibility provision is perceived by policy-makers as a future problem but not a current one; indeed, so far fluctuating renewables have always been sufficiently balanced by existing (fossil fuel) flexibility options. Further, parties and governments may perceive system stability as a technical matter, to be handled by transmission operators or power suppliers, but not directly by governments. Third, supporting currently expensive and uncompetitive technologies is unattractive for policy-makers, and most dispatchable zero-carbon supply and storage options are currently expensive. Further research is needed to identify why flexibility is absent in political positions. Regardless of the reason, the lack of flexibility strategy has important implications for European policy, and the next step in energy strategy development must hold more details on flexibility provision. As parties from all corners of the policy space agree on the need to scale up fluctuating renewables and phase out fossil fuels, there is a risk of a future flexibility gap in all investigated countries – which, in turn, could threaten the further progress toward the renewables and decarbonization targets.

4.3. Conceptual and epistemological contributions

Our work and research aim are mainly empirical, but nevertheless we see three main conceptual and epistemological contributions of this paper. First, we show that the three Logics exist and are observable not only in stakeholder positions (Foxon 2013; Foxon et al. 2013; Trutnevyte et al. 2014), but to a large degree also in party positions. Second, although their ideological-based roots are very different, the overall aims of political parties can be very similar, with important policy implications (see below).

Third, our paper shows that there is a striking deviation between our identified party positions and what energy system and integrated assessment models find to be "necessary" or "optimal", for example regarding carbon capture and storage (CCS). Whereas models regularly find that staying below 2 degrees warming is expensive or impossible without CCS (IPCC 2018; Johansson et al. 2012), our results show which options parties and citizens find desirable and are willing to support – and no party in any investigated country currently envisions any CCS in the power sector at all. This may imply that policy-makers are blind to "necessities" related to the 2 degrees target (Trutnevyte et al. 2014). However it also shows, irrespective of modeled "necessities", that CCS is not an emerging reality in these countries. When no government or party wants to expand CCS it is very unlikely to be developed and deployed in and by

those countries within the near future. Unless other countries, for example China or the US, develop and improve the CCS technology, this means that CCS is unlikely to develop and go through its learning curve, making it an expensive option in the longer term. Hence, our policy-centered approach to describing possible futures complements the economics-centered approach of IAMs, describing not what energy policy options are necessary, but which ones are likely to emerge.

4.4. Policy implications

Our findings have two major policy implications. First, it appears unlikely that a government change in any of the investigated countries would bring a radical shift in policy ambition: regarding both climate and renewables expansion, political parties across the traditional European left-right policy spectrum have similar ambitions levels. It is likely that the energy transition in the investigated countries will continue, and that it will be carried out mainly or only with renewable sources. This similarity is supported by the Europeanization of climate and energy policy, and by the increasingly stringent climate and renewables ambition in the EU (EC 2019b), but it is remarkable that parties share this vision, regardless of their ideological position or degree of enthusiasm for the European Union. Although citizens on the far right are somewhat less supportive of climate policies and of renewable power expansion, the parties they support, the right-wing populist parties, often support the continued expansion of renewables – including France (*Rassemblement National*) and Italy (*Lega*) – on grounds of energy independence or natural protection; the German *AfD*, which rejects renewables in general and wind power in particular, an exception (see Schaller and Carius (2019) and Lilliestam et al. (2019)). Hence, even if these parties reject climate policy, or deny the existence of climate change, and seek to withdraw from the Paris Agreement, they generally do support renewables deployment. In sum, a complete abandonment of existing renewables targets appears unlikely. This does not mean that the renewable energy future will be conflict-free: although parties broadly agree on the target, they may diverge strongly in their instrumentation and governance preferences.

Second, given a continued expansion of intermittent renewables while phasing out existing carbon-intensive but flexible fossil fuel generation, all investigated countries are likely run into a flexibility problem. Only France, with up to 50% nuclear power in two of the identified pathways, plans to have a substantial share of non-fluctuating generation; however, nuclear power is an inflexible technology, largely unable to quickly ramp up or down to balance fluctuations. Regarding flexibility, there is today little difference between ideologies and countries: there are no clear preferences or plans for flexibility provision, in any country or in any corner of the policy space. A part of the answer may also lie on the European level where legal frameworks exist for developing both flexible technologies and ideas for further integration and cooperation on flexibility (EC 2018a; EU 2017). In the coming decade, regardless of who is in power, increasing the power system flexibility will be a major energy political challenge.

Declaration of interest

All authors declare that they have no conflicts of interest.

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