Energy Justice and Policy Change:

An historical political analysis of the German nuclear phase-out

The German government presented the decision to phase out nuclear energy as a nationally accepted rebalancing of inequality in the energy sector. We expose how this radical change was delivered through a myriad of change agents, most notably *through the rise of small energy companies*. Critical junctures, in this case the Chernobyl disaster rather than Fukushima, offer moments in time when national policy systems are destabilized. They provide opportunities for changing policy in a perceived pro-energy justice direction if a new consensus can be forged. The paper concludes with a discussion on how energy scholars must engage more with policy analysis frameworks if long-term effective solutions are to be found to persistent energy inequalities.

Keywords: Energy justice; historical institutionalism; policy analysis; policy change; nuclear energy

1. Introduction

The decarbonisation of the energy sector must be accompanied by long-term societal buy-in [1, 2]. At the heart of this endeavour lies the requirement to implant equity and justice (termed as 'energy justice') into the fabric of energy

1

systems [3]. We often think of the processes that need to happen for energy justice to occur – reframing policy values [3-5], integrating energy systems [6, 7], reducing consumption [8-10], increasing energy 'capabilities' [11-13], ensuring human security [14], mitigating climate change [2, 15], re-interpreting activism [16] and projecting ethics [1, 17]. Existing research is heavily driven by spatial or place centred explanations of change. We have not properly considered in the energy justice literature when and how policy change takes place. This paper responds to this gap through exploring how notions of critical junctures [18] and change agents [19] help us understand when and how energy justice can be achieved in the context of policy change.

We focus on both in the development of nuclear energy policy in Germany. Rehner and McCauley [20] revealed in their study of German nuclear policy that a wide range of government, business and civil society actors consider the phase out of nuclear energy to be a perceived *just* outcome. Sovacool, Andersen [21] go further by arguing that society should reject nuclear power to achieve energy justice. Achieving energy justice is therefore based upon value judgements on which energy technologies should be supported, and which should be rejected [22]. In terms of German policy on nuclear energy, the final value judgement by policy actors was to consider that nuclear energy should be rejected to further energy justice [23].

Within this context, our paper investigates how this final judgement came about. It is often wrongly assumed [20, 24-28] that the Fukushima disaster led to a seismic alteration in nuclear policy in Germany, driven by an opportunistic German government. Studies on public opinion suggest a major shift in the German psyche after Fukushima [29-34]. We focus on the less studied role of

2

policy actors in German nuclear policy and reveal below that the process began much earlier after the Chernobyl disaster – what we term as the 'critical juncture'. This disaster initiated an opportunity window for policy change on nuclear. Our analysis reveals that *emerging small businesses*, rather than simply government actors, were critical during this time for succeeding to re-orient German nuclear policy towards phase-out. We conclude the paper with reflections on key conclusions and implications for both interdisciplinary research in energy.

2. Energy justice, critical junctures and change agents

We position our study within an emerging literature set on energy justice as well as the more established scholarship in historical policy analysis. The application of the latter to energy justice offers a new definitional and analytical framework, which emphasizes temporal reflection in relation to critical junctures, change agents and, more broadly, shifting policy trajectories. This framework emphasizes the need for engineers and economists in the energy sector to be cognizant of how policy structures and processes change over time.

2.1 Energy justice in the context of policy change

The combination of historical policy analysis and energy justice requires a new complementary definitional and analytical framework to existing approaches. The first existing group of definitions are *normative* statements based upon creating fairer energy systems [6-8, 35, 36]. Such definitions miss the complexity of the shifting nature of values and norms over time. A second set of definitions on energy justice is *philosophical*, underlining cosmopolitan approaches in prioritizing energy delivery for all individuals [11, 37-40]. They fail to adequately

consider the processes through which policy actors seek to deliver their version of energy justice. The third definitional category of energy justice literature is *analytical*, in so far as energy justice is defined as an analytical framework, whether it be three [4, 41, 42] or four [43] dimensions involving numerous measurements [17, 37]. These studies have failed to adequately recognize longitudinal complexities in policy change, opting for a more cross-sectional understanding of energy justice.

Energy justice in the context of policy change requires a new definition, as well as a new (in so far as it has not yet been applied to energy justice) analytical framework (see section 2.2) which is sensitive to understanding change over time. From this *temporal* perspective, we define energy justice in the context of policy change as the adoption and subsequent reformation of an agreed plan of action or policy framework designed by multiple actors with the stated purpose of enhancing principles of fairness and equity in or between energy systems. Our approach is focused upon uncovering the processes through which policy actors agree, review, and deliver what they understand to be energy justice in terms of national policies. It is based upon assumptions in historical institutionalism found in political science of embracing the fluidity of time [44-46] and the agency of political actors [47, 48].

We contribute historical policy analysis as a means for assessing energy justice in the context of policy change [19, 44, 49-51]. Its analytical focus is centered on identifying major shocks to a policy system – known as critical junctures [18] – and then assessing how effective policy actors are in exploiting these opportunities – known as 'agents of change' or 'change agents' [19]. We argue below that the rise of small businesses as key change agents in the wake of

Chernobyl disaster has driven policy change on nuclear energy in Germany. In this way, we respond to Jenkins, McCauley [52: 2] "call for greater attention to different temporal questions of justice…considering when and how transitions take place and resultantly, when energy justice can be achieved".

2.2 Critical Junctures and change agents

Critical junctures and change agents are dominant ideas in historical policy analysis, or historical institutionalism [19, 44, 49-51]. It is "historical because it recognises that political development must be understood as process that unfolds over time" [53: 29]. It is institutionalist because "it stresses that many of the contemporary implications of these temporal processes are embedded in institutions, whether these be formal rules, policy structures, or social norms" [54: 29]. Pierson [54] refers to historical institutionalism as essentially the study of "politics *in time*". Energy justice, and its multiple understandings, similarly unfolds over time. We offer the first contribution to time based reflections applied to energy justice literature through the application of historical institutionalism for understanding critical junctures, change agents and more broadly policy change.

Critical junctures are events that set processes of policy change in motion. Our examination focuses on nuclear disasters – Chernobyl in particular – as potential critical junctures in national policies. A crisis takes place leading to ideational and radical policy change [55]. The study of critical junctures involves, therefore, an examination of historical causation. A given moment in time, such as Chernobyl, can have major long-term transformative impacts on society. The *critical* nature of a juncture is therefore in the outcomes produced in one historical moment, which persists over time. This juncture does not, however, create in itself

5

a shift from previous established trajectories. It more precisely marks the loosening of constraints in societal structures to which various agents respond in an attempt to retain or move away from the *status quo* [56].

In addition to critical junctures, agents' choices are critical variables in defining outcomes. Critical junctures are indeed rare moments in time [18]. This has led to a number of researchers [19, 47, 57-59] investigating the role of 'change agents'. Capoccia and Keleman [56] comment further, "we define critical junctures as…periods of time during which there is a *substantially* heightened probability that agents' choices will affect the outcome of interest". In other words, agents are more able to influence outcomes during critical junctures, than the preceding or proceeding timeframes.

Choice is explored in the opportunity space of a critical juncture. Similar to Kingdon's [60] policy streams and Kriesi's [61] political opportunity models, entrepreneurs, social movements or more broadly societal agents attempt to gain influence during windows of opportunity. We draw more explicitly from Mahoney and Thelen [19] on policy change and change agents. We contribute to this approach by specifying that such agents can seek to achieve continuity (i.e. resisting any change in policy), as well as change (i.e. seeking to modify or displace existing policy). The notion of *agency* (discussed further in section 6.2 below) involves the identification of such agents (both change and continuity) in a given critical juncture process. From this perspective, we re-conceptualize the 'change agents' within the framework of 'agents of change' and 'agents of continuity'.

3. Methodology

A key factor in country selection is the evidently contrasting experiences of Germany on nuclear policy with its European counterparts. France, as the leading European nuclear nation, has not replicated the much-publicized roll back of the German nuclear industry. The German government decided to phase out all of its nuclear electricity capacity by 2022. It declared on 15th March 2011 that 8 (from 17 in total) of its oldest nuclear reactors would be immediately placed out of operation. This resolution symbolized the flagship project of the so-called Energiewende (energy U-turn), also designed to increase the share of renewables whilst reducing oil and gas imports [62, 63]. Nuclear still provides a substantial 16% of German electricity. France is an eye-catching juxtaposition with over 75% of electricity originating from the second (behind the US) largest nuclear industry in the world with 58 reactors generating more than 60 GWe [64, 65].

Our overall research question is therefore why Germany started the process of phasing out nuclear energy whereas other European nations chose not to. Our primary research question is – *why did the agents of change succeed in moving German nuclear policy when the agents of continuity did not?* To answer this, we need to identify (1) who these agents are and (2) what strategies did they enact. We identify the Chernobyl accident, rather than Fukushima, as the critical juncture moment for German nuclear policy. The Fukushima disaster only served to maintain this critical juncture. This ultimately led to Germany and other EU nations' nuclear policies dividing in terms of whether to retain the technology in the national energy mix. We explore each event in more detail in the next section.

In terms of research data collection and analysis, we have no specific quantitative or engineering application that one might expect in Applied Energy. Instead, we address the key knowledge gaps (as also identified in the broader

special issue) in energy ethics literature when applied to energy systems through qualitative analysis, namely (a) the procedural principles for encouraging a sustainable and inclusive energy transition (b) policy interactions between different levels of governance (e.g. national-regional-municipal) and their implications for procedural justice (c) social struggles and strategies to engage energy justice issues across different levels of governance.

We followed the qualitative approach dominant in historical policy analysis [51, 54]. This contrasts starkly with the quantitative methods normally employed by engineers [66-68] and economists [69] when confronting the phase out of nuclear energy in Germany. Similar to Zehavi [70] and Spohr [71], we use a combination of oral history interviews (22 in total in between 2014 and 2017) and historical documents such as reports, newspapers and other relevant material. This approach is in line with the same approach in existing research on historical policy change [49, 70, 72, 73] where 15-20 in-depth oral history interviews are conducted and complemented with documentation.

We conducted 22 interviews with ex-employees or long-term employees of businesses (KPMG, E.ON, RWE), NGOs (Attac, Burgern-Begehren Klimaschutz, Powershift) and state representatives (Federal Office for Radiation Protection, Ministry of Environment and European Nuclear Safety Regulation Group). We followed a snowball sampling strategy where interview candidates were referred to us by interviewees in line with other similar research [74, 75]. Oral history interviews are best undertaken with representatives with substantial experience [76, 77]. We asked interviewees (in English) to reflect on key events in the past in relation to German nuclear policy and its development. The interviews were then transcribed in English and coded for analysis based on key events in policy

development as outlined in the next paragraph. The interview structure was therefore designed in a way to elaborate on their understandings of these past events. Some interviewees requested anonymity, and as a result we have anonymised the interview data. This was necessary to benefit from the input of experienced officials, in lie with Zehavi [55] and Spohr [56].

We numbered all 22 interviews, randomized their order, and then present them in text as (#1) or (#4) etc.. The focus was on critically evaluating their discourse. We coded the data based on events, rather than themes. The interviews are used in a way to validate historical events (such as when key policy or strategy decisions were made for example the first turnaround in policy in 2010, or when changes in policy attitudes emerged directly after Chernobyl) and provide analysis on them. This is in line with the approach undertaken by Zehavi [55]. We complement this data with existing literature, reports and selected newspapers. The focus is on developing a triangulated robust account of events in nuclear policy development through comparing our interview data with policy documentation and historical records. We also note the key limitations of our study in not engaging with quantitative methods, through for example content analysis, or being able to develop a comprehensive quantitative analysis of causal relationships between key variables. This was a necessary focus for our paper.

4. Assessing the role of change agents

Chernobyl opened a lengthy phase of uncertainty with regards to nuclear policy. In historical policy analysis, there are normally three categories of actors [19, 47, 48]. This is in addition to public opinion which dominates engineering and particularly economic based research on nuclear and social acceptability [24, 29,

34, 78, 79]. The first is the state, as a multi actor agent with institutions at a local, regional and national level. The second is business involving large and small companies, with sectoral and multinational interests. Civil society is the third set of agents that are often associated with local and national protest or lobbying. We assess each of these actors below.

4.1 The State

In the German case, relationships between state agents as well as their contributions to policy processes have been dominated by a constitutionally enshrined dispersal and fragmentation of power. Katzenstein [80] describes Germany as a 'semi-sovereign state'. It is a political system that displays an unusually large number of veto players in decision-making. The need to reach consensus means that policy change or reform has tended to be modest and incremental rather than abrupt and radical. Policy change on nuclear energy is negotiated in Germany between various state agents, the *Bundestag* and *Bundesrat*, often following an incremental and path-dependent (i.e. where policy is difficult to change due to the lock-in of past policy decisions) course of action.

Prior to the German nuclear energy phase-out, state agents had been moving between *continuity* (i.e. nuclear energy status quo) and *change* (i.e. nuclear energy phase-out) for some time (#11), making a consistent government position "almost impossible to discern, even along party lines" (#3). This process started with a pro-nuclear stance in the post-war period, which was crucial to Germany's economic recovery. Cracks in the government's nuclear policy appeared from the 1970s onwards eventually contributing towards a first phase-out position in 2001, temporarily reversed by another Federal Government in

2010, before the second instigated– and (arguably) final - phase-out was introduced in 2013. State agents were influenced by – and at times confronted with – "consensus scenarios" involving different sets of (veto) agents representing different government levels (local, Länder, Federal), stakeholder interests (civil society versus business) and party-political agendas (#4).

A vital contributing factor in the shaping (and shifting) of Germany's nuclear policy has been the electoral system. It produced several coalition governments at Länder and Federal levels. These coalitions included small parties, which proved influential in the nuclear policy discourse. At the Federal level, the Greens pushed for policy change i.e. a first phase-out in 2001 under the Schröder-Fischer Government (1998-2005), while the Free Democratic Party (FDP) contributed towards a temporary reversal in 2010 in the direction of policy continuity under the Merkel-Westerwelle (2009-2013) government. The final phase-out was "almost certainly down to the departure of the FDP", the small collation pro-nuclear partner (#3). The subsequent Grand Coalition of the Social Democratic Party (SPD) and the Christian Democratic Union (CDU) / Christian Social Union (CSU) 2013+ is now pursuing a generally anti-nuclear approach.

However, to argue that the policy shift can be attributed solely to political parties and their coalition constellations would be "a serious mistake in analysis if taken in isolation, despite the common consensus on this" (#4). Individual politicians' nuclear policy journeys from continuity to change are significant also, with the most notable one being Angela Merkel's shift towards the phase-out shortly after Fukushima (#4). Described by Huß [81: 434] as Merkel's 'new favourite policy project', change was implemented despite warnings from civil servants and other continuity agents regarding the potential legal and corporate

compensation costs of such a move.[1] Interestingly, the political calculation over negative voting behaviour resulting from a pro-nuclear stance seemed to outweigh the potential financial costs that would occur later with a phasing-out, "an act of self-harming myopic political suicide for a country, but perhaps not for a party seeking votes, or for an ambitious individual" (#5).

Indeed, Merkel opted for an anti-nuclear policy because - a) she did not want to lose vital votes from core CDU voters (#11), b) she 'stole environmental votes' from her opponents - the SPD and the Greens (#5), and c) she thereby made a future coalition with the Greens possible (#11). In addition to this political reality, Merkel mobilized significant anti-nuclear sentiment through the establishment of an Ethics Commission. The 17 member commission, headed by Klaus Toepfer former head of the United Nations Environmental Programme, recommended a national programme of nuclear phase-out [82]. One interviewee (#4) stated the committee was "only symbolic of a decision that was made years ago…we just didn't realise it". Emphasis from several respondents (#4, 5, 6, 11) was placed rather on agreeing the *Renewable Act in 2006* programme as a key moment that effectively challenged the big 4 energy companies, as assessed below.

4.2 Business

Energy companies in Germany are far from unitary or autonomous. They consist of small and large companies with vested interests in a large, profitable energy sector. They are also influenced by both German and EU law as well as wider

---

[1] See *Spiegel* 10/2015 'Ablage Papierkorb', pp.34-36.

energy market forces. A key distinction can be made between those companies that embraced the *Energiewende* (i.e. the German policy of sustainable energy transition, incorporating a wide range of actions including the nuclear phase-out and the expansion of renewables – first explicitly mentioned in 1980 by the Environment Ministry and then legislatively in 2010) and those that have sought to resist such a policy change (#1, #6). Interestingly, the phasing out of fossil fuels did not feature as prominently as part of the *Energiewende* policy.

The four large, somewhat oligopolistic, German energy companies (E.On, RWE, Vattenfall and EnBw, also known as the *Big 4*) have invested heavily in nuclear technology (having built the post-war nuclear fleet and allocated large resources to maintain the fleet in future). Early attempts by smaller companies to implement a decentralisation of energy capacity in the 1990s were resisted by the Big 4. In other words, "it was evident to all that the *Big 4* lobbied in favour of a centralised energy sector" with an emphasis on economies of scale in traditional/ conventional technologies (#7). Their opposition to smaller scale renewables was, however, significantly hindered, or "killed dead" (#8) with the implementation of the Renewable Energy Act in 2006. This had been introduced by the SPD-Green Federal government coalition before their departure later that year. The government, in doing so, created a spring board for renewables. In the same year, the original law to phase-out nuclear was introduced in tandem, compensated by an expansion of renewables to ensure future electricity capacity. Mostly private "investors, project developers and even farmers" were then able to invest in smaller scale renewables (#2).

While the incumbent energy companies failed to invest in decentralised renewable capacity, they "hedged their bets on future reinvestment in centralized

electricity systems" (#2), expecting that the decentralised renewable energy sources would remain marginalized [83]. Lobbying of pro-nuclear institutions continued in order to convince policy makers about the security and suitability of installed fossil and nuclear electricity capacity (#7).

Furthermore, the industry had deep concerns over the most recent (and possibly final) nuclear phase-out move. It referred to this decision at the time as "potentially catastrophic" (#2, #7). There are, however, indications that some actors involved in the industry had already accepted the end of the industry with the last phase-out, considering any further investment in nuclear energy as a 'gamble' if not 'bad business' [84]. Without a pro-nuclear political party in government and the final phase-out decision after the Fukushima incident backed by almost all political parties, renewables were no longer considered as marginalized energy sources. They emerged as increasingly dominant technologies within the future energy mix [83].

The fact that business agents – and specifically the *Big 4* - failed to maintain the status quo/ *continuity* by influencing both state and civil society agents and cushioning the impact of Fukushima, suggests that *agents of continuity* lost out in the policy discourse - in relation to nuclear energy only – perhaps not in relation to fossil fuels [85] (an area for further research). Chernobyl had initiated an opportunity space for anti-nuclear sentiments to gain momentum in the business sector. What split the business agents further was also the connection made between renewables and the nuclear phase out; both policies were introduced and conducted together simultaneously.

4.3 Civil society

The anti-nuclear stance that dominates mainstream German politics today has origins in social movements (#8). This arguably radical stance evolved into a mainstream policy stance supported by mainstream civil society and their political representatives. The shift from a narrow radical policy demand for change on the margins of politics to mainstream commitment in German society and politics is significant. To understand how Germany's civil society agents have sought to influence nuclear policy, it is necessary to look at contributing factors and strategies undertaken within the opportunity space (i.e since Chernobyl).

Firstly, while the federal system is often associated with slow incrementalism, in the case of nuclear phase-out, "federalism has played a facilitating role" in the political discourse (#8). The Federal level could not ignore the debate as nuclear energy is shared between government levels, involving also the *Bundestag* and *Bundesrat* in law-making. In effect, the federal structure, usually hampered by veto points, did not represent a deterrent to the anti-nuclear message. In fact, it helped to organise and channel the message of policy change across all vertical (and, indeed, horizontal) levels of governance. When civil society groups in Länder (for instance, Hesse and Lower Saxony) showed their opposition towards nuclear energy, this then had a knock-on effect on other Länder. This "was also the case for the Federal level" as the matter of nuclear energy is shared by all requiring some degree of consensus of all levels (#8).

The German electoral system helped, secondly, to transmit the anti-nuclear message from civil society to parliament and government (#10). It offered the anti-nuclear movement a means to voice its concerns in parliament and government (at all levels) via the Green Party and large parts of the SPD while also sensitising the other parties to 'environmentally sensitive voters' [81]. Indeed,

losing green votes to opponents was something that Merkel sought to avoid in view of Länder elections that were due to take place, as discussed in section 5.1 above. This concern was justified as demonstrated shortly after Fukushima when the CDU did lose its stronghold in Baden-Wuerttemberg and the Greens took office in Stuttgart.

The relationship between the civil and military use of nuclear power was, thirdly, a means to "propagating anti-nuclear policy stances" (#9). In contrast to France [86], where a perceptive link between civil and military use of nuclear is not only established but also fostered as part of the country's national identity and security, in Germany, nuclear power, be it civil or military, generates negative connotations. In military terms, post-war Germany never intended to pursue a nuclear programme but focused instead on the civil use of nuclear energy. To abandon nuclear power therefore does not affect Germany's security or sense of security, nor does it affect Germany's national identity. On the contrary, any risk to German civil society is identified in the safety of (or lack of) nuclear power plants rather than Germany's ability to defend itself in military terms.

4.4 From agents of continuity to change

Change agents can often shift their allegiances from continuity to change or vice versa throughout the lifetime of a policy. This is a more sophisticated view on the role of agency within policy systems, rather than understanding actors as simply locked into pre-set logics of preference. Before Chernobyl, local and regional actors were lobbying for a more anti-nuclear policy. These included regional governments, green political representatives and civil society. Small and large businesses, national government, mainstream party representatives maintained a

16

cautiously pro nuclear stance. Chernobyl injected a significant level of disruption into these policy constellations, representing a critical juncture. Local protests against nuclear energy took place across the country through the sustained management of civil society organisations. The 1990s witnessed (1) the rise of Green Party as well as (2) new energy related businesses through efforts to decentralize energy supply. These two phenomena are identified as the critical shifts in agency.

The Green Party strategically manoeuvred in this opportunity space to exploit the dual purpose of phasing out nuclear energy and promoting renewable energy in its place [87]. It entered into government in 1998 in coalition with the Social Democrats. It also coincided with the rise of Angela Merkel who took over as leader of the Christian Democrats, positioning herself as a more progressive and green minded politician. Between 1998 and 2005, the red green government established the basis of the renewable act signed in 2006. This proved more crucial than either the 2001 phase out or 2010 phase in legislation. During this period, smaller energy companies acted decisively in lobbying this favourable government, thereby encouraging the growth of new anti-nuclear business in Germany. We argue that strategic manoeuvring from these actors resulted in a collective ability to respond to the Fukushima disaster in 2011, leading to the official adoption of a nuclear phase out policy.

5. Conclusion and policy implications: Achieving energy justice

Reflecting on our central empirical research question, *why did the agents of change succeed in moving German nuclear policy when the agents of continuity did not?* In terms of context, our answer is not the Fukushima disaster. We point to the critical

role played by the Chernobyl disaster instead (as detailed in section 4). It opened up the space for government and new emerging businesses to agree upon the Renewable Act in 2006. This set in motion a significant change in German nuclear policy. The momentum for change was instigated by favourable party constellations and individuals in government, emerging renewable energy companies and civil society. We reflect on the broader implications of this research for both policy and energy research below.

5.1 'Critical' junctures in policy are more than simply events

Events offer opportunities, not change. We should not expect that certain events lead to significant shifts in policy trajectories. It is up to societal actors to establish the groundwork, strategize and then mobilize at the right time. Analysts in nuclear energy policy are concerned with major events such as accidents or instances of contamination [24, 88, 89]. This is of course understandable given the nature of the technology in focus. Our paper underlines the importance of including such events in our analyses but placing such occurrences within the limitations of agency. This observation has significant implications for nuclear policy. The construction of a policy is a robust and long-term endeavour involving a wide range of policy actors [57].

We must not expect that an event in the future will lead us to realise or achieve energy justice, but it can initiate a period of crisis and uncertainty – or policy opportunity window – for change agents to exploit. Real change takes place over a long period. In following Mahoney and Thelen [19], it involves the slow development of new ideas to take hold within path dependent policy structures. Civil society, political parties, businesses all provide various levels of input into a

combined vision of what a given political entity's (nation, region, community etc.) understanding is of an energy 'just' future. This vision will inevitably emerge from competing priorities.

Chernobyl led to an opportunity for a common German understanding of energy justice to develop based upon the Energiewende policy frame of phasing out nuclear and increasing the deployment of renewable energy. Our study highlights how this national frame of energy justice became the product of shifting views from a wide range of state, civil and business organisations. The fluid dynamics of coalition politics, the energy business sector and anti-nuclear civil society resulted in competing views on nuclear and renewables, often in confrontation with long-term path dependent policy trajectories. We demonstrate the critical nature of events in allowing policy actors to forge national frames of energy justice. Once constructed, critical events can initiate periods of time during which there is a substantially heightened possibility that agents can affect policy [90], as we outlined in the period between Chernobyl and Fukushima.

5.2 *Agents of change and continuity are drivers for energy justice*

Whilst our study focused on the ability of change agents to shift policy, we must also consider in future research that agents of continuity can also be important for our understanding of policy change. The US example is a good case in point. A post-Obama era may rely more upon agents of continuity (who helped build a path towards the Paris Climate Treaty) than change on energy matters. Our German case demonstrates that a comprehensive analysis of change agents must of course include an understanding of which actors resist policy change. As new policy trajectories take hold, such as the phase out of fossil fuels, so must new agents of

continuity strategically manoeuvre to ensure its lock-in. This approach acknowledges, above all, the fact that the positions of policy actors can change over time – oscillating between taking up positions as agents of change and continuity at different moments.

Policy development – and the understandings of energy justice that are at the focal point of this process – is constantly under negotiation. Businesses were at one point agreed on the continuation of policy on nuclear in Germany. The rise of emerging renewable companies created a shifting dynamic in the preferences of business. In terms of government, ruling parties and coalitions change all the time. We revealed that new government coalitions combined with these emerging companies were able to generate a long-term shift in policy thinking on nuclear. State, business and civil society interests formed and then reformed their approach towards achieving organisational or sector policy objectives. Energy justice involves the same interplay between policy agents and process. Views of energy justice are not static or individually manufactured. They are formed, reformed and then renegotiated in response to other views over time.

Energy justice literature has prioritised the influence of civil society organisations as the drivers for change [16, 42]. Policy change does benefit from community based pressure [91]. The German case demonstrates that some form of government pressure is equally beneficial for ensuring a process of policy change takes place. For this reason, we must be aware of how policy is constructed by multiple actors [92]. In addition to this observation, we show that the positions of each can change dramatically within the lifespan of a policy. Those actors that previously supported change can often manoeuvre as agents of continuity, and vice versa. We therefore call on energy justice researchers to critically reflect on

the strategies of elite actors [20, 93], as well as the more traditional community bottom-up drivers of change [16, 91, 94].

5.3 *Energy Justice Now! Reflections from historical policy analysis*

"We must come out of nuclear energy now...it is the only way that we can have a safe and just energy future" (#12), stated a German activist. We should not conclude that such pressure directly leads to policy change. A policy is a robust or 'sticky' [18] institution, a frequent conceptualisation in political science where an "institution is understood as rules constraining the actions of the participating actors" [95], that remains highly path dependent. Historical policy analysis encourages authors in energy justice to be more cautious about observing significant change. Within a European context, it is still debatable whether Chernobyl sparked a critical juncture (as argued in this paper) in national nuclear policies beyond Germany, not to mention Fukushima. We should therefore critically reflect when faced with claims of significant policy change.

Critical junctures are currently undervalued in energy research as significant moments in policy trajectories that open policy opportunity windows. We must understand when such events take place, and, above all, how change agents successfully exploit them. When we consider the 'stickiness' of policy structures and processes, we must understand that change takes place over a long time. We therefore must adopt more radical low carbon solutions today with a view to infiltrating policy structures in the future. Bell and Rowe [96] present insights into how this may be achieved. Within this context, we need to appreciate that energy systems, and their consequent inequalities, do not respect national boundaries. The phase out of nuclear energy in Germany is in contradiction with

other European States such as France. The need for European integration (or Energy Union) on energy decisions has never been so apposite.

The identification of 'change agents' is as important as 'critical junctures'. Chernobyl or Fukushima do not simply change public opinion which would be consider as a key component to social acceptability by economists [34, 78]. Events offer opportunities for agents to respond accordingly. Historical policy analysis must continue to examine seismic shifts in policy, but also the key agents of society that are involved in either hindering or encouraging change. This challenges scholars in the emerging field of energy justice and interdisciplinary scholarship in energy to engage more critically with the ways in which energy policy develops. Historical policy analysis chimes a sobering note to ambitious hopes for radical change when we consider the 'stickiness' of processes and structures. Inversely, we should respond with greater urgency in recognition of this challenge. We conclude with a demand for other policy analysis tools to be applied to energy justice, such as the more conventional discursive or rational choice institutionalism. This will help to build a more comprehensive picture on how energy justice can contribute to our understanding of enacting positive change.

Word Count: 8038 (including references)

References

[1] Heffron RJ, McCauley D. What is the 'Just Transition'? Geoforum. 2018;88:74-7.

[2] McCauley D, Heffron R. Just Transition: Integrating climate, energy and environmental justice. Energy Policy. 2018;119:1-7.

[3] McCauley D. Energy Justice: Re-Balancing the Trilemma of Security, Poverty and Climate Change. Basingstoke: Palgrave; 2018.

[4] McCauley D, Heffron R, Stephan H, Jenkins K. Advancing energy justice: the triumvirate of tenets. International Energy Law Review. 2013;3:107-11.

[5] McCauley D, Heffron R, Pavlenko M, Rehner R, Holmes R. Energy justice in the Arctic: Implications for energy infrastructural development in the Arctic. Energy Research & Social Science. 2016.

[6] Heffron RJ, McCauley D. Achieving sustainable supply chains through energy justice. Applied Energy. 2014;123:435-7.

[7] Jenkins K, McCauley D, Heffron R, Stephan H, Rehner R. Energy justice: A conceptual review. Energy Research & Social Science. 2016;11:174-82.

[8] Hall SM. Energy justice and ethical consumption: comparison, synthesis and lesson drawing. Local Environment. 2013;18:422-37.

[9] Walker G, Simcock N, Day R. Necessary energy uses and a minimum standard of living in the United Kingdom: Energy justice or escalating expectations? Energy Research & Social Science. 2016;18:129-38.

[10] Bouzarovski S, Herrero ST. Geographies of injustice: the socio-spatial determinants of energy poverty in Poland, the Czech Republic and Hungary. Post Communist Economies. 2016;29:27-50.

[11] Damgaard C, McCauley D, Long J. Assessing the Energy Justice Implications of Bioenergy Development in Nepal. Energy, Sustainability and Society. 2017;7.

[12] Day R, Walker G, Simcock N. Conceptualising energy use and energy poverty using a capabilities framework. Energy Policy. 2016;93:255-64.

[13] Gillard R, Snell C, Bevan M. Advancing an energy justice perspective of fuel poverty: Household vulnerability and domestic retrofit policy in the United Kingdom. Energy Research & Social Science. 2017;29:53-61.

[14] Sovacool BK, Sidortsov R, Jones B. Energy Security, Equality and Justice. London: Routledge; 2013.

[15] Bulkeley H, Carmin J, Castán Broto V, Edwards GAS, Fuller S. Climate justice and global cities: Mapping the emerging discourses. Global Environmental Change. 2013;23:914-25.

[16] Fuller S, McCauley D. Framing energy justice: perspectives from activism and advocacy. Energy Research & Social Science. 2016;11:1-8.

[17] Sovacool BK, Heffron RJ, McCauley D, Goldthau A. Energy decisions reframed as justice and ethical concerns. Nature Energy. 2016;1:16-24.

[18] Soifer HD. The Causal Logic of Critical Junctures. Comparative Political Studies. 2012;45:1572-97.

[19] Mahoney J, Thelen K. Explaining institutional change: Ambiguity, agency and power. Cambridge: Cambridge University Press; 2010.

[20] Rehner R, McCauley D. Security, justice and the energy crossroads: Assessing the implications of the nuclear phase-out in Germany. Energy Policy. 2016;88:289-98.

[21] Sovacool BK, Andersen R, Sorensen S, Sorensen K, Tienda V, Vainorius A, et al. Balancing safety with sustainability: assessing the risk of accidents for modern low-carbon energy systems. Journal of Cleaner Production. 2016;112:3952-65.

[22] McCauley D. An Energy Justice Road Map - Six Key Considerations. In: McCauley D, editor. Energy Justice: Springer; 2018. p. 75-103.

[23] McCauley D. Reframing Decommissioning as Energy Infrastructural Investment: A comparative analysis of motivational frames in Scotland and Germany. Energy Research & Social Science. 2018;forthcoming.

[24] Arlt D, Wolling J. Fukushima effects in Germany? Changes in media coverage and public opinion on nuclear power. Public Understanding of Science. 2016;25:842-57.

[25] Chassot S. Sustainable? A cross-country analysis of the socio-political acceptance of the nuclear phase out in Germany and Switzerland focusing on opportunities for strategic influence. Betriebswirtschaftliche Forschung Und Praxis. 2014;66:247-65.

[26] Knopf B, Pahle M, Kondziella H, Joas F, Edenhofer O, Bruckner T. Germany's Nuclear Phase-out: Sensitivities and Impacts on Electricity Prices and CO2 Emissions. Economics of Energy & Environmental Policy. 2014;3:89-105.

[27] Matthes F. Exit economics: The relatively low cost of Germany's nuclear phase-out. Bulletin of the Atomic Scientists. 2012;68:42-54.

[28] Winter G. The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law. 2013;25:95-124.

[29] Engels A, Hüther O, Schäfer M, Held H. Public climate-change skepticism, energy preferences and political participation. Global Environmental Change Part A: Human & Policy Dimensions. 2013;23:1018-27.

[30] Kepplinger HM, Lemke R. Instrumentalizing Fukushima: Comparing Media Coverage of Fukushima in Germany, France, the United Kingdom, and Switzerland. Political Communication. 2016;33:351.

[31] Park DJ, Wang W, Pinto J. Beyond Disaster and Risk: Post-Fukushima Nuclear News in U.S. and German Press. Communication, Culture & Critique. 2016;9:417.

[32] Scheer D, Wassermann S, Konrad W. The good, the bad, and the ambivalent: A qualitative study of public perceptions towards energy technologies and portfolios in Germany. Energy Policy. 2017;100:89-100.

[33] Wiliarty SE. Nuclear Power in Germany and France. Polity. 2013;45:281.

[34] Poortinga W, Aoyagi M, Pidgeon NF. Public perceptions of climate change and energy futures before and after the Fukushima accident: A comparison between Britain and Japan. Energy Policy. 2013;62:1204-11.

[35] Goldthau A, Sovacool BK. The uniqueness of the energy security, justice, and governance problem. Energy Policy. 2012;41:232-40.

[36] Reames T. Targeting energy justice: Exploring spatial, racial/ethnic and socioeconomic disparities in urban residential heating energy efficiency. Energy Policy. 2016;97:549-58.

[37] Heffron RJ, McCauley D, Sovacool BK. Resolving society's energy trilemma through the Energy Justice Metric. Energy Policy. 2015;87:168-76.

[38] Hernandez D. Sacrifice Along the Energy Continuum: A Call for Energy Justice. Environ Justice. 2015;8:151-6.

[39] Sidortsov R, Sovacool B. Left out in the cold: energy justice and Arctic energy research. Journal of Environmental Studies and Sciences. 2015;5:302-7.

[40] Sovacool B. Fuel poverty, affordability, and energy justice in England: Policy insights from the Warm Front Program. Energy. 2015;93:361-71.

[41] McCauley D. Global Energy Justice: Tackling Systems of Inequality in Energy Production and Consumption. In: McCauley D, editor. Energy Justice: Springer; 2018. p. 1-26.

[42] Finley-Brook M, Holloman E. Empowering Energy Justice. International Journal of Environmental Research and Public Health. 2016;13.

[43] Heffron RJ, McCauley D. The concept of energy justice across the disciplines. Energy Policy. 2017;105:658-67.

[44] Bulmer S. Politics in Time meets the politics of time: historical institutionalism and the EU timescape. Journal of European Public Policy. 2009;16:307-24.

[45] Ma S. Political science at the edge of chaos? The paradigmatic implications of historical institutionalism. International Political Science Review. 2007;28:57-78.

[46] Rixen T, Viola LA, Zürn M. Historical institutionalism and international relations : explaining institutional development in world politics. [Electronic book]: Oxford : Oxford University Press, 2016.

First edition.; 2016.

[47] Hay C, Wincott D. Structure, agency and historical institutionalism. Political Studies. 1998;46:951-7.

[48] Thelen K. Historical institutionalism in comparative politics. Annual Review of Political Science. 1999;2:369-404.

[49] McCauley D. Sustainability, Governance and Time: Exploring 'Critical Junctures' in the Governance of Genetically Modified Organisms in France. Environmental Policy and Governance. 2013;23:283-96.

[50] McCauley D. Sustainable Development in Energy Policy: A Governance Assessment of Environmental Stakeholder Inclusion in Waste-to-Energy. Sustainable Development. 2015;23:273-84.

[51] Pollitt C. Time, Policy and Management: Governing the Past. Oxford: Oxford University Press; 2008.

[52] Jenkins K, McCauley D, Foreman A. Energy Justice: A Policy Approach. Energy Policy. 2017:1-5.

[53] Pierson P. The path to European Integration: a historical-institutionalist analysis. In: Sandholtz W, Stone Sweet A, editors. European Integration and Supranational Governance. Oxford: Oxford University Press; 1998. p. 27-58.

[54] Pierson P. Politics in Time: History, Institutions and Social Analysis. Princeton: Princeton University Press; 2004.

[55] Donnelly P, Hogan J. Understanding policy change using a critical junctures theory in comparative context. Policy Studies Journal. 2012;40:324-50.

[56] Capoccia G, Keleman D. The study of critical junctures: Theory, narrative and counterfactuals in historical institutionalism. World Politics. 2007;59:341-69.

[57] Bell S. Do We Really Need a New 'Constructivist Institutionalism' to Explain Institutional Change? British Journal of Political Science. 2011;41:883-906.

[58] Hall P, Taylor R. The potential of historical institutionalism: a response to Hay and Wincott. Political Studies. 1998;46:958-62.

[59] Hall PA, Thelen K. Institutional change in varieties of capitalism. Socio-Economic Review. 2008;7:7-34.

[60] Kingdon J. Agendas, Alternatives and Public Policies. New York: Longman; 1995.

[61] Kriesi H. Political Context and Opportunity. In: Snow D, Soule S, Kriesi H, editors. The Blackwell Companion to Social Movements. Oxford: Blackwell; 2004.

[62] Schlor H, Fischer W, Hake J. Sustainable development, justice and the Atkinson index: Measuring the distributional effects of the German energy transition. Applied Energy. 2013;112:1493-9.

[63] Renn O, Marshall JP. Coal, nuclear and renewable energy policies in Germany: From the 1950s to the "Energiewende". Energy Policy. 2016;99:224-32.

[64] IEA. Technology Roadmaps - Nuclear Energy 2015. Paris: OECD; 2017.

[65] IEA. Statistics on Global Electricity Information. Paris2016.

[66] Eser P, Singh A, Chokani N, Abhari RS. Effect of increased renewables generation on operation of thermal power plants. Applied energy. 2016;164:723-32.

[67] Luzzi L, Cognini L, Pizzocri D, Barani T, Pastore G, Schubert A, et al. Helium diffusivity in oxide nuclear fuel: Critical data analysis and new correlations. Nuclear Engineering and Design. 2018;330:265-71.

[68] Volkanovski A, Ballesteros Avila A, Peinador Veira M, Kančev D, Maqua M, Stephan J-L. Analysis of loss of offsite power events reported in nuclear power plants. Nuclear Engineering and Design. 2016;307:234-48.

[69] Pattupara RM, Pattupara R, Kannan R. Alternative low-carbon electricity pathways in Switzerland and it's neighbouring countries under a nuclear phase-out scenario. Applied energy. 2016;172:152-68.

[70] Zehavi A. A Reform Less Ordinary? Historical Institutionalism, Punctuated Equilibrium, and Mental Health Care Privatization. Administration & Society. 2012;44:731-53.

[71] Spohr F. Explaining Path Dependency and Deviation by Combining Multiple Streams Framework and Historical Institutionalism: A Comparative Analysis of German and Swedish Labor Market Policies. Journal of Comparative Policy Analysis. 2016;18:257-72.

[72] Broschek J. Historical Institutionalism and the Varieties of Federalism in Germany and Canada. Publius: The Journal of Federalism. 2011;42:662-87.

[73] McLean C, Gray T. Liberal Intergovernmentalism, Historical Institutionalism, and British and German perceptions of the EU's Common Fisheries Policy. Marine Policy. 2009;33:458-65.

[74] Kunda-Wamuwi CF, Babalola FD, Chirwa PW. Investigating factors responsible for farmers' abandonment of Jatropha curcas L. as bioenergy crop under smallholder out-grower schemes in Chibombo District, Zambia. Energy Policy. 2017;110:62-8.

[75] Salazar DJ, Moulds LA. Toward an integrated politics of social justice and environment: African American leaders in Seattle. Society and Natural Resources. 1996;9:617-31.

[76] Lauer M. Oral Traditions or Situated Practices? Understanding How Indigenous Communities Respond to Environmental Disasters. Human Organization. 2012;71:176-87.

[77] Sheftel A, Zembrzycki S. Oral history off the record: toward an ethnography of practice. Basingstoke: Palgrave Macmillan 2013.

[78] Corner A, Venables D, Spence A, Poortinga W, Demski C, Pidgeon N. Nuclear power, climate change and energy security: Exploring British public attitudes. Energy Policy. 2011;39:4823-33.

[79] Pidgeon NF, Lorenzoni I, Poortinga W. Climate change or nuclear power—No thanks! A quantitative study of public perceptions and risk framing in Britain. Global Environmental Change. 2008;18:69-85.

[80] Katzenstein P. Policy and Politics in West Germany. Philadelphia: Temple University Press; 1987.

[81] Huß C. Energy Transition by Conviction or by Surprise? Environmental Policy from 2009 to 2013. German Politics. 2014;23:430-45.

[82] EC. Deutschlands Energiewende – Ein Gemeinschaftswerk für die Zukunft. Berlin: German Ethics Commission for a Safe Energy Provision; 2011.

[83] Wassermann S, Reeg M, Nienhaus K. Current challenges of Germany's energy transition project and competing strategies of challengers and incumbents: The case of direct marketing of electricity from renewable energy sources. Energy Policy. 2015;76:66-75.

[84] Kersten J, Uekoetter F, Vogt M. Europe after Fukushima: German perspectives on the future of nuclear power. In: Mauch C, Ritson K, Trischler H, editors. RCC Perspectives. Munich: Rachel Carson Center for Environment and Society; 2012.

[85] Heffron RJ, Ashley SF, Nuttall WJ. The global nuclear liability regime post Fukushima Daiichi. Progress in Nuclear Energy. 2016;90:1-10.

[86] McCauley D. Interest Groups in Comparative Perspective. In: Elgie R, Grossman E, Mazur A, editors. The Oxford Handbook of French Politics. Oxford: Oxford University Press; 2016.

[87] Evrard A. Political Parties and Policy Change: Explaining the Impact of French and German Greens on Energy Policy. Journal of Comparative Policy Analysis. 2012;14:275.

[88] Sovacool B. The costs of failure: A preliminary assessment of major energy accidents, 1907-2007. Energy Policy. 2008;36:1802-20.

[89] Visschers VH, Siegrist M. How a nuclear power plant accident influences acceptance of nuclear power: results of a longitudinal study before and after the Fukushima disaster. Risk Anal. 2013;33:333-47.

[90] Capoccia G, Kelemen R. The study of critical junctures - Theory, narrative, and counterfactuals in historical institutionalism. World Politics. 2007;59:341-+.

[91] McCauley D. Bottom-Up Europeanization Exposed: Social Movement Theory and Non-state Actors in France. JCMS: Journal of Common Market Studies. 2011;49:1019-42.

[92] Hall CM. Policy learning and policy failure in sustainable tourism governance: from first- and second-order to third-order change? Journal of Sustainable Tourism. 2011;19:649-71.

[93] Johnston A, Heffron RJ, McCauley D. Rethinking the scope and necessity of energy subsidies in the United Kingdom. Energy Research & Social Science. 2014;3:1-4.

[94] McCauley D. Environmental Mobilization and Resource-Opportunity Usage: The Examples of WWF-France, FNE and LPO in Policy Processes. French Politics. 2007;5:333-53.

[95] Blom-Hansen J. A 'new institutional' perspective on policy networks. Public Administration. 1997;75:669-93.

[96] Bell D, Rowe F. Are climate policies fairly made? . Joseph Rowntree Foundation: JRF; 2012.