Nuclear accidents and policy responses in Europe: Comparing the cases of France and Germany

Kristian Krieger, Ortwin Renn, M Brooke Rogers, & Ragnar Löfstedt

“This [Fukushima] accident is raising a certain number of questions throughout the world concerning the safety of nuclear facilities and energy choices. France chose nuclear energy, which continues to be an essential component of her energy independence and the fight against greenhouse gases. This choice went hand in hand with an unwavering commitment to ensure a very high level of safety for our nuclear facilities. [...] I remain convinced that we made the right choices”. French President Nicolas Sarkozy 24/3/11

“In Fukushima, we have had to recognise that even in technologically highly developed countries such as Japan the risks of nuclear energy cannot be controlled safely”. German Chancellor Angela Merkel 9/6/2011

„The phase-out of nuclear energy will be undertaken until 2022 and is irreversible” Premier Minister Bavaria (Germany) Horst Seehofer 30/5/2011

This paper discusses the varying effects of major nuclear incidents on nuclear energy policies in different countries. The statements presented above offer a good illustration of the question this paper sets out to answer: What explains the different responses to major nuclear incidents in European countries? More specifically, why does Nicolas Sarkozy underline the French commitment to nuclear energy while Angela Merkel and Horst Seehofer undertake a complete U-turn in their nuclear energy policy for Germany in the aftermath of the Fukushima accident?

On first inspection, the difference in responses to Fukushima is particularly puzzling for the cases of Germany and France: Neither France nor Germany have experienced any major nuclear incidents on their territory. Both countries were – at the time of the Fukushima disaster – governed by centre-right governments with a pro-nuclear stance. Both countries have strong and advanced nuclear industries with an interest in developing and exporting nuclear technologies. Both countries are members of the European Union and are thus subject to the EU regulations of the internal energy market – in addition to being liberal democracies and thus subject to public opinion pressures. When all these factors point to convergence in policy responses to an event such as Fukushima, how can we explain the sharp contrast in post-Fukushima nuclear policies? In fact, as we will show in our paper, the responses to the major accident in Chernobyl also displayed significant variation while policy responses to the Three-Mile Island incident in 1979 were less pronounced in both countries and led to similar policy responses. The differences in responses to major nuclear incidents between the two countries also highlights that policy responses are not predominantly shaped by the particular technical nature of the incident but rather by political associations that each of these incidents triggered (Peters and Slovic 1996).

This paper argues that institutional structures, the degree of centralism versus decentralism in political governance and broad ideas of the role of the state in economy and society are essential for understanding variation in the evolution of nuclear energy policies in the aftermath of significant nuclear incidents. Before delving more deeply into the institutionalist analysis of German and French nuclear energy policies, it is important to point to the limitations of placing institutions in the forefront of the analysis: First, there are non-institutional factors, in particular the (evolution of the) economics/relative costs of nuclear energy, that make a difference and might influence institutional responses. However, this paper takes a neo-institutionalist perspective that reflects the significant role of political and
economic actors in the nuclear debate who often reflect economic circumstances but also symbolic associations that show hardly any reference to factual differences between the two countries. A case in point is the fact that ‘non-institutionalist’ factors such as economics are embedded and shaped by discourse about its meaning in a political debate. Costs were hardly considered in the German debate about nuclear energy because all parties assured the public that safety was the prime objective and economic considerations were not allowed to compromise any safety standard. In France, however, the case for nuclear was made partially on the argument that it provides inexpensive and reliable energy to the public.

Second, France and Germany experienced a number of near-misses and minor accidents throughout their nuclear history\(^1\). These minor incidents were highly amplified in the German media leaving the impression that this technology is ridden with failures. In contrast, the French press emphasized the ingenuity of French engineering demonstrating that the French technical elite was able to master any even unlikely incident in its nuclear operations (Rucht 1990).

Third, many policies have evolved between disasters without being necessarily driven by the effects of major disasters (e.g. the liberalisation of energy markets in the 1990s was driven by a wider adoption of neoliberal policies among European policy elites). These institutional changes were not linked to incidents but had major effects on policy arenas in both countries.

That notwithstanding, the focus of the paper is on the impact of disasters and major incidents because of the significant role scholars assign to these events for triggering policy reflections and changes. They are often regarded as ‘critical junctures’ in the institutionalist literature (Pierson 2000) or of the “window of opportunity” in the aftermath of disasters in the policy change literature (Kingdon 1984). Finally, this paper does not analyse in detail whether and, if so, how the distinctive nature of incidents (e.g. that Chernobyl happened to a Soviet-style reactor while Fukushima occurred in one of the most advanced nuclear countries) affected policy and regulatory approaches. This is because even though the nature of incidents differed strongly, the policy responses in France (TMI, Chernobyl and Fukushima) and Germany (Chernobyl and Fukushima) turned out to be relatively similar in its absorption of the technical differences of each of these incidents. It was not the technical details that can explain the differences between the two countries in their response to the three mentioned incidents but rather the structure and implications of the following national discourse pointing to the importance of institutions and symbolic politics.

Institutions filter the effects of nuclear incidents and subsequent mobilisation of and changes in public opinion and social mobilisation. Moreover, these factors do not only shed light on the differences between countries but in the same country after incidents at different points in time. Ideas concerning the role of the state in the economy and society held by the political elites shape the degree of involvement of the state in the energy industry. This in turn filters the impact of public scrutiny and economic pressures on decision-makers, utilities and other corporate stakeholders in the nuclear energy sector. While the existence of particular institutional structures and ideas does not rule out change in policies, existing (institutionalised) ideas and institutions shape and can be expected to continue shaping response to incidents.

The paper will show that the institutionally complex polity of Germany with a large number of heterogeneous players/points has shaped the evolution of Germany’s nuclear energy policies. The government’s role in the energy industry has – in line with the ideas of Germany’s social market economy – traditionally been hands-off although interventions have

\(^1\) E.g. since 2000, 33 ‘anomalies’ (INES scale 1 out of 7) and 3 incidents (INES scale 2) have occurred in Germany. No serious incidents (INES scale 3) occurred.
become more frequent since the 1990s in order to promote renewable energy. In France, authorities/agencies in the energy policy field, as well as state-dominated energy corporations formed a tight community that withstood outside pressures for change even after major disasters. The centralised state of France – following a dirigiste tradition of state intervention in the economy – assumed a strong role in the energy industry in order to promote industrial competitiveness and national energy independence after World War II. It is also important to note that the development of nuclear energy was pursued for military ends. The industrial-military complex is not only far better organized in France than in Germany, its role for national security and prestige is also much less contested than in post-war Germany with a strong public sentiment against military interventions.

This paper develops this argument as follows: Part 1 provides a snapshot of the nuclear policy evolution since in France and Germany, with particular reference to the responses to the three major incidents of Three Mile Island, Chernobyl and Fukushima. Part 2 engages with the explanation of the variation in policy responses. In the policy fields related to high-risk technologies, democratic governments are frequently argued to be following the lead of the public opinion in their policy responses. However, public opinion in the two countries broadly points into the same direction, making it necessary to seek other factors that vary. The two countries have distinctive institutional structures in which nuclear policy-makers are embedded, as well as the different ideas held by the political elites concerning the role of the state and energy policies. Section 3 concludes the paper by putting the two cases into a broader international context, as well as the wider scholarly debate about the changing relations between the public, experts and policy-makers in relation to large-scale technologies.

1. A short history of nuclear energy in France and Germany

After World War II, the primary economic goal of governments in Europe was reconstruction and industrial development. To this end, policy-makers sought to ensure that energy would be available reliably and at low prices. At that time, this meant – for the supply of electricity – the support of the coal industries. However, the power of the two nuclear bombs that the United States dropped on Japan inspired not only the minds of military decision-makers but also those of decision-makers concerned with the supply of energy.

Policy-makers in France and Germany were not immune to the attractions of nuclear energy. In France, the interest was driven on the one hand by military interests. The first two reactors in Marcoule – built under the first nuclear energy plan of the government (1947-1952) – were designed for military purposes. On the other hand, French interest in nuclear development was triggered by its energy dependence and lack of indigenous energy resources. Figure 1 demonstrates current levels of dependence from the nuclear industry in terms of energy production.
In Germany, the interest in nuclear energy among energy policy-makers was initially not central to energy policies. Whenever the government decided to intervene into the energy sector at all, it did so in favour of coal. This reflects the strength of coal interest in Germany’s post-war politics underpinned by their strong economic clout in the largest state of North Rhine-Westphalia. However, nuclear energy was viewed favourably by the government – and a dedicated Ministry of Atomic Affairs was established in 1955. The specific drivers of the nuclear programme in France and elsewhere – the military use of nuclear material and the energy dependency – were not central here: After World War II, Germany’s political elite did not pursue nuclear weapons – in line with the preferences of the Allies. Significant coal reserves mitigated the challenge of energy dependence. Figure 2 illustrates the continued central role of coal in Germany’s energy generation.

1.1 The development of the nuclear sector – some data

While the motivation to develop the nuclear sector is distinctive in the two countries, the subsequent development of the sectors is similar until the Chernobyl accident in 1986 occurs. Figure 3 shows the number of civilian nuclear reactors in operation from the early 1950s to
estimated 2025. Note that the French decline after 2020 is based on the expected reactor lifetimes of about 40 years which may be extended or replaced by new reactors. However, there is currently only one new reactor under construction that is expected to go online by 2016. The decline is Germany is due to a political decision to phase out nuclear energy.

Figure 3: Nuclear reactors in operation, France and Germany, 1955-2025

This raises the question of why Chernobyl had such a distinctive impact on the development of the nuclear sector in the two countries. The impact is strongly shaped by nuclear energy policies.

1.2 The evolution of nuclear policies – an overview

The following sections discuss two aspects of nuclear energy policy in the two countries, namely the actors that emerged to govern nuclear energy over the course of time, as well as the policies, regulations and political dynamics between the actors.

1.2.1 From the early days of nuclear energy to the late 1970s
Before engaging with the actors and policies found in France and Germany, it is important to understand that EU actors and policies had a rather limited impact on national energy policies in this phase. This is surprising because two of the founding pillars were concerned with energy policies. The European Coal and Steel Community (ECSC) was established in 1952 with the Treaty of Paris. As coal accounted for 80% of primary energy use in the early 1950s and conflicts over coal reserves contributed to hostilities between France and Germany, the architects of the ECSC foresaw a key role for the institution in the European integration process. Although the High Authority of the ECSC was formally provided with supranational powers, it failed to act against the interests of major European governments (e.g., Germany's and France's import barriers to protect domestic coal in the late 1950s). Hence, Milward concluded that “the High Authority was but a powerful international committee within which separate national representatives urged for separate national policies” (Milward, 1992).

As a second pillar of a European energy policy, the founding fathers of the European integration process, primarily the French Jean Monnet, established 1957 the European Atomic Agency (Euratom). Euratom was to ensure that there was enough energy to form a stable basis for economic growth and that a European nuclear energy sector was established (Deubner, 1979). Although France, the most advanced country in Europe in terms of nuclear research, took a special interest in Euratom, the institution and the planned European nuclear market did not take off. France hoped for a European nuclear policy that would create a common European nuclear market, a supply mechanism for uranium and a European enrichment plant. However, the United States could supply uranium more cheaply and offered to do so to Germany. As a result, the Euratom integration scheme was dubbed “stillborn” by scholars (Deubner, 1979), the US became the main supplier of uranium and France developed its own national nuclear sector. Despite Euratom’s funding of joint research projects, Italy and German intensified their national research efforts on nuclear energy as they wanted to prevent a further dominance of France in the nuclear sector.

In the absence of supranational actors and regulations, it is the national actors and policies that shaped the nuclear energy development in France and Germany. In France, a set of central government actors was situated at the heart of the nuclear sector, from the Ministry of Industry and the central Planning Commission of the French government to the government’s nuclear research and development authority CEA (Commissariat a l’energie atomique) and the state-owned electricity utility EDF (Electricite de France). The CEA in particular became the central architect of the nuclear energy development until the 1990s thanks to their expertise, manpower and ownership of/involvement with other key actors of the nuclear industry (e.g., the nuclear plant construction company Framatome) (Rucht, 1994). Organisations that were established in the nuclear field in 1970s were integrated or closely linked to the existing, pro-nuclear state-dominated actors: For instance, COGEMA has been set up as a CEA-owned uranium mining company; the safety regulator for nuclear plants, SCSIN, established 1973, was supervised by the Ministry of Industry.

Beyond this integrated core of nuclear development and policy-making in the first three decades after World War II, the 1970s saw the emergence of Green Parties and anti-nuclear movement organisations, reflecting a growing concern about environmental issues. In response to protests organised by local and national movement organisations, the government established a Ministry of Environment and set up the committees for public information and communication (Haut Comité de l’environnement and the Conseil supérieur de la sûreté et de l’information nucléaires (CSSIN)) (Rucht, 1994).

While Germany also established a set of dedicated state actors, their involvement in nuclear energy development was much more limited. At the Federal level, the pro-nuclear Ministry of Atomic Affairs was founded in 1955 (and replaced by specialist commissions, including SSK, in the early 1970s) (Rüdig, 2000). It was supported by an expert committee, the German
Atomic Commission, from 1956 on. This Commission comprised representatives from the Federal administration, the sciences, the nuclear industry and trade unions. The nuclear industry in Germany primarily meant Siemens and AEG both involved in reactor design and construction, as well as utilities. While the activities of Siemens and AEG (including the institutionalisation of a tight collaboration between the two companies in the form of the *Kraftwerksunion* (KWU) in 1969 – the Federal state did not assume majority ownership of utilities and nuclear construction companies. Since the early 1970s, local protests groups, the so-called *Buergerinitiativen*, proliferated and engaged in protests against the siting of nuclear power plants (*Hatch, 1986*).

Table 1: Key nuclear policy actors established between 1945 and 1979

<table>
<thead>
<tr>
<th>Year</th>
<th>Key actors</th>
<th>France</th>
<th>Germany</th>
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<tbody>
<tr>
<td>1945</td>
<td>CEA</td>
<td>Commisariat a l’energie atomique is established for developing nuclear weapons – Central institution for nuclear expertise in France</td>
<td>1955</td>
</tr>
<tr>
<td></td>
<td>&amp; EDF</td>
<td>Electricite de France is established as part of the nationalisation of energy production and to develop civilian nuclear power generation</td>
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<tr>
<td>1955</td>
<td>PEON</td>
<td>Commission to assess the costs of nuclear energy development and comprising high-ranking officials from CEA, EDF, le Plan, the Ministries of Industry, Environment and Finance, and the nuclear industry</td>
<td>1956</td>
</tr>
<tr>
<td></td>
<td>1971</td>
<td>1972</td>
<td>Advisory Commission to Ministry comprising representatives of science, industry, trade unions and politics</td>
</tr>
<tr>
<td></td>
<td>In response to increasing environmental awareness, the MOE was established</td>
<td>Elaborates technical specifications and standard for the safety regulation and comprises members of operators, producers, regulators/authorities, experts and others</td>
<td>State-owned uranium mining company was established</td>
</tr>
<tr>
<td>1973</td>
<td>SCSIN &amp; CSSIN</td>
<td>1974</td>
<td>Mid- to late-1970s: Green Parties</td>
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<tr>
<td></td>
<td>The Central Authority for the Safety of Nuclear Installation and the Advisory Commission for Public Information were established</td>
<td>Commission on Radiological Protection (SSK)</td>
<td>Green Parties were established</td>
</tr>
<tr>
<td>1976</td>
<td>COGEMA</td>
<td>SSK replaces the Atomic Commission in advising the responsible ministry (then Ministry of Interior) on nuclear matters</td>
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Three-Mile Island, March 1979
In terms of policies and regulations, the first three decades after World War II were shaped by pro-nuclear policies (see table 2). In the 1950s and 1960s, policies revolved around developing and/or selecting suitable reactor designs, as the initial installations of research reactors (e.g. the two research reactors in Germany in 1957) and the development of country-specific designs (e.g. the French GGR reactor, the German high-temperature reactor developed in the national nuclear laboratory in Juelich). The development of nuclear energy in France was driven by specific nuclear energy five-year plans (that existed alongside with general energy development plans) whilst Germany’s nuclear development programme was founded on the 1960 German Atomic Law.

Nuclear programmes in Germany and France experienced a major boost after the first Oil Crisis. The oil crisis from 1973 exposed the two countries’ vulnerability to supply and price shocks. In France, Prime Minister Pierre Messmer announced a plan in 1974 to massively expand nuclear energy with the aim to generate all electricity from nuclear. In Germany, the government move from its relatively limited involvement in the development of energy markets into designing more concrete energy industry development plans; the planning focused on energy efficiency measures but also included a commitment to nuclear energy as key source of electricity.

In response to the official expansion policies, the localised resistance against individual sittings of nuclear power plants turned national in the mid- to late 1970s (Hatch, 1986). The protests culminated in large-scale demonstrations and occupations of nuclear sites: In 1975, the local campaign against the siting of nuclear power plant in Wyhl, Germany, turned violent and led to a deep gulf between pro-nuclear and anti-nuclear interests in Germany. Even the subsequently government-initiated “Buergerdialog Kernenergie” (Dialogue with Citizen on Nuclear Energy) did little to mitigate the opposition to nuclear energy in Germany. In France, a similarly important event was the large-scale protests in Malville against the siting of the fast breeder SuperPhenix. In the course of the protests, one protester got killed.

Table 2: Selected nuclear policies and regulations between 1945 and 1979

<table>
<thead>
<tr>
<th>Policies &amp; regulations</th>
<th>France</th>
<th>Germany</th>
</tr>
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<tbody>
<tr>
<td>1950: Energy Plans</td>
<td>Planning of energy supply/industry development through government commences through four-year plans</td>
<td>1960 German Atomic Law</td>
</tr>
<tr>
<td>1952: Nuclear Energy Plans</td>
<td>First five-year plan for the development of the nuclear industry for military and civilian purposes</td>
<td>Defines licensing and operational requirements, as well as state responsibilities and penalties for non-compliance, including provisions that power plants that run orderly cannot be shut down easily</td>
</tr>
<tr>
<td>1974/75: Messmer Plan “Tout electricite, tout nucléaire” programme</td>
<td>A programme to increase nuclear share in meeting total energy needs from 3% (1973) to 25% (by 1985)</td>
<td>1973 Oil crisis shock and Federal energy programs</td>
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<td></td>
<td>1.2.2</td>
<td>From Three-Mile-Island to Chernobyl</td>
</tr>
<tr>
<td>Three-Mile Island, March 1979</td>
<td>From Three-Mile-Island to Chernobyl</td>
<td>8</td>
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Intriguingly, the impact of the TMI accident in Harrisburg in the United States on nuclear policies in France and Germany was fairly limited. In France, there was a brief realignment of the trade unions and the French Socialist Party (led by the presidential candidate François Mitterrand) with the environmental groups by signing an anti-nuclear petition calling for ‘an alternative energy policy’. Moreover, once in office in 1981, Mitterrand stopped construction on five power plants and reduced the number of approved plants for 1982 from 9 to 6. However, Mitterrand did not question the overall commitment to nuclear energy and – as figure 1 demonstrates – the number of nuclear power plants increased steeply during his presidency.

In Germany, the Social Democrats were in government as TMI happened. Chancellor Helmut Schmidt came out in opposition to abandoning nuclear power. He concluded that “the withholding of nuclear technology could mean that the benefits of nuclear will be lost for the future” (Corey 1979:59). In fact, the Schmidt government was the first to undertake a so-called ‘convoy licensing’ of three nuclear power plants of the same design type in 1982. While Germany’s political and economic elites remained committed to their pro-nuclear stance, the Green Federal Party was founded in 1980 drawing on the anti-nuclear and other social movements for their support (Renn, 1995). While initially not exactly being an establishment party, the Green Party entered the German Federal Parliament (Bundestag) as early as 1983 and joined the SPD in government in the state of Hesse in 1985.

1.2.3 From Chernobyl to Fukushima

While TMI had a limited impact on actor constellation and policies in both countries, the Chernobyl accident had a significant impact on German nuclear policies and policy-making, its impact in France was much more limited.

In France, the government’s response to the accident was to keep tight control over information on Chernobyl, as well as to emphasise that the Chernobyl reactor type is not in operation in France. The French nuclear programme therefore continued its expansive course initially at a rapid pace (between 1986 and 1991, nine additional reactors went online) but slowed down in the 1990s. This slow-down was partly driven by a tightened safety regime. However, non-safety or Chernobyl-related changes in nuclear policies also need to be taken into account.

Important adjustments in the organisational settings of the French nuclear energy policy began in the course of the 1990s only, in fact towards the late 1990s, and only some of them are related to the safety issues raised by the Chernobyl disaster. Safety-related changes include that the safety regulator IPSN became joint responsibility of the Ministries of Industry and Environment, that it was separated from CEA in 2001 and finally – in 2006 – reorganised with extended powers into ANS. The dominant CEA also had to give up some of its control over the management of nuclear waste (a new agency called ANDRA was established independent of CEA in 1991) and the expert authority IRSN (established in 2002).

Other important changes in the organisational settings were concerned with the competition on the energy markets and the structure of the energy industry. A case in point is the creation of CRE, the French energy regulator, in 2000. CRE’s remit includes issues such as market/network access and pricing.

These changes towards liberalised energy markets have to be seen in a European context. From the early days of ECSC and EURATOM, the role of European institutions in energy policies changed, however, in the mid-1980s with the advent of the Single European Act (SEA). The Single European Act, a response to the strong economic performance of the USA and Japan and driven by economic and policy elites, launched the EU internal market, a program based on the widely shared political attitude emphasizing deregulation in order to
achieve efficiently functioning markets (Hatch, 1986). The SEA was based on the 1985 White Paper by the European Commission. Although energy policy was not included in the initial inception of the Single EU market, the concept of a Common Market, with its emphasis on competition and transparency, constituted a contestation of the national energy markets, often – as seen in France – shaped by their national energies monopolies. Energy markets were officially added to the SEA in 1988. Against significant resistance of energy companies, particularly the monopolistic entities in various European markets, work started by the European Commission’s developing of a package of directives, initially on open access to gas and electricity supply. Due to this resistance and the intergovernmental European Council’s reluctance to adopt the energy policy of the supranational Commission, directives of each of the packages were accepted gradually, with the EU directives on Gas and Electricity only adopted in 1997 and 1997 respectively. These policies were particularly challenging for the French energy sector where the largest utility EDF held a market share of 90% in the electricity market (compared to Germany where the largest held 34%).

In Germany, the Chernobyl accident had a significant impact on nuclear policies. Most notably, a new ministry was formed (the Ministry for Environment and Reactor Safety) that took over the responsibility for nuclear energy generation and safety from the Ministries of Interior and Industry. The shift in emphasis from expanding energy generation to the safety of nuclear power plants is also reflected in the establishment of the Federal Office for Radiological Protection in 1989. However, the most important changes occurred in the realm of policies and politics. It is these changes that explain why the last reactor went online as long ago as 1989.

Table 3: Key nuclear policy actors established between 1986 and 2011

<table>
<thead>
<tr>
<th>Key Actors</th>
<th>Chernobyl, April 1986</th>
<th>Germany</th>
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<tbody>
<tr>
<td>France</td>
<td>1991: ANDRA independent ANDRA, authority in charge of managing nuclear waste, becomes independent of CEA 2000: Establishment of Energy Regulator (CRE) Following the 1994 reports and EU regulations, CRE was established 2002: IRSN established An independent expert authority IRSN is established in the field of nuclear, independent of CEA and jointly supervised by Ministries of Health, Defence Industry and Environment. 2006: Safety Regulator ANS established ANS succeeds the SCSIN (Central Authority for the Safety of Nuclear Installations) but obtains extended powers</td>
<td>1986: The establishment of a Ministry of Environment (BMU) Taking over from the Ministry of Interior, the BMU also assumed responsibility for nuclear reactor safety and waste 1989: Federal Office for Radiation Protection (bfs) Federal authority to protect citizens and environment from radiation from nuclear reactors, waste and other matter 2005: Bundesnetzagentur established as German energy regulator</td>
</tr>
</tbody>
</table>
There are two key policy developments in the 1990s in France that explain why the nuclear expansion slowed down. On the one hand, competition in the energy sector was promoted. This is a result from supranational policy pressures in the form of the (de-)regulation and liberalisation of the internal energy market by the EU (to be discussed below) and parallel domestic developments in the form of the 1994 Souviron and 1993 Mandil reports (DGEMP 1993; French Government 1994). The competitive and financial pressures on state-owned companies such as EDF that resulted from the market liberalisation and privatisation programmes across Europe aggravated the adverse financial impact of the overcapacity and overproduction that EDF generated as a result of the massive expansion of nuclear energy since the 1970s.

At the same time, the Green Party became one of the junior partners in the French government in 1997. They successfully applied pressure on the PS to tighten the safety regime for nuclear energy, as well as ending the construction of the SuperPhenix fast breeder.

The policy dynamics set off by Chernobyl in Germany were much more damaging to the nuclear ‘project’. Most fundamentally, the Social Democratic Party (SPD) – at that time in opposition – decided in 1986 to adopt an anti-nuclear stance, culminating in the request for a phase-out within 10 years (Kern et al. 2003). This had major repercussions because states with a centre-left government (or a government involving the Green Party such as Hesse) now adopted policies aiming for a phase-out. While the German Atomic Law puts the Federal government in charge of nuclear legislation, state authorities are responsible for the licensing and supervision of the operations of nuclear power plants. As a result, the centre-left governments, e.g. Rhineland-Palatine, Hesse, Lower Saxony and Schleswig-Holstein at that time, were able to block any expansion plans of the Federal government. At the same time, however, the centre-right government at the Federal level remained committed to nuclear energy. This stand-off between the Federal and Laender governments effectively blocked any changes in nuclear energy development until the Federal elections of 1998 resulted in a Red-Green government.

The Red-Green government emphasised sustainable development as underlying principle of their energy policy, resulting in the three broad goals energy supply security; competition and economic efficiency and environmental compatibility. In terms of the desired fuel mix, the government sought to promote renewable, continue the use of coal and phase-out nuclear energy. The phase-out, however, constituted a major political and legal challenge: Unless – as the Atomic Law requires – a nuclear plants does not operate in an orderly manner, the closure of a plant would create a risk for significant compensation demands by the utilities. The coalition agreement therefore aimed to amend the Atomic Law and enter negotiations with the utilities about a consensual phase-out. However, these changes also turned out to be tricky because a phase-out and closure – along with the ending of nuclear waste transports – would potentially violate long-term agreements on waste reprocessing and management with the UK’s BNFL and the French COGEMA.

In the end, the government started negotiating with the utilities without a revised Atomic Law in place. The government and utilities reached an agreement in 2002, the so-called “Atomkonsens”, that foresaw a phase-out within 32 years. Key element of the result was however that the amount of electricity for each reactor was fixed (favorably for the utilities) and that these amounts could be transferred from one reactor to the other, thereby extending the lifetime of individual reactors beyond 32 years.

After the CDU led the government again in 2005, the decision to phase our nuclear energy was again under scrutiny. Industry and utility companies urged the new government to change the timing of the phase-out and to use nuclear energy as a longer “bridge” between the fossil and the renewable era of energy production. It took the new government until its re-election in
2008 before it actually proposed a new law extending the time limits for the phase-out and providing more flexibility for energy utilities (Renn and Dreyer, 2013). While the government was strongly criticised for the reversal of the phase-out, the centre-right government only changed course again once Fukushima-Daiichi occurred in March 2012.

Table 4: Selected nuclear policies and regulations between 1986 and 2011

<table>
<thead>
<tr>
<th>Policies &amp; regulation</th>
<th>France</th>
<th>Germany</th>
</tr>
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<tbody>
<tr>
<td>Tighter supervision for EDF</td>
<td>SPD passed a resolution to exit nuclear within 10 years</td>
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<tr>
<td>Creation of a regulatory authority to ensure greater competition on energy markets</td>
<td>Phase-out becomes official Federal policy</td>
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<tr>
<td>Closure of fast-breeder; independence of IRSN</td>
<td>Amount of energy to be produced by each reactor was fixed (even though they could be transferred)</td>
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<tr>
<td></td>
<td>2008: Centre-right-liberal government at Federal level</td>
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<tr>
<td></td>
<td>Phase-out with extended time limits (in exchange for higher spent-fuel tax on utilities)</td>
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### 1.1.1 After Fukushima

France’s centre-right government – as the quote at the very beginning of the paper shows – remained committed to nuclear energy even in light of the Fukushima-Daiichi disaster. The response to Fukushima included two interested aspects, first a policy aspect (the French reactor safety stress test) and a change in the position on nuclear by the Socialist Party, which captured the French presidency and was thus able to start a package of nuclear regulatory reforms.

The French government – like the German – decided to conduct an audit of its own (stress test) on all its reactors (Joskow and Parsons, 2012). This is partly driven by the European level. In March 2011, the European Union decided to issue stress tests on all 143 reactors in its 27 countries (EC 2011). These audits were conducted to investigate the tolerability of all nuclear structures against all extraordinary events including earthquakes, flooding, and all other initiating events potentially leading to multiple losses of safety functions (EC 2011). The results of the tests were published in 2012. The major lessons drawn from the test was that European reactors were safe in principle but needed substantial improvements. The Commission urged each country with nuclear power installations to conduct a more detailed test in order to identify weak points and design measures to improve safety.

In France, the French Nuclear Safety Authority (ANS) was charged with carrying out safety assessments of all nuclear facilities in the country. The ANS stated that France’s 58 nuclear reactors have a sufficient level of safety and therefore, none of them should be closed (ANS 2011). The ANS also stated that these reactors’ continued generation requires increasing their
robustness in the face of situations beyond the safety margins they already have. After the audit was completed the government announced that it would introduce substantial investments to improve safety at existing sites. Some of the oldest sites are supposed to be refurbished and others will be updated. The demanded improvements of the plants have been estimated to cost more than 10 billion Euros.

Developments confirm this concern with safety: in July 2011, EDF revised the completion date of the Flamanville reactor (Generation III European Pressurized Reactor, EPR), to 2016, with an additional cost of €6 billion; the delay stems in part from the need to carry out new safety tests (WEC 2012). In September 2011, EDF awarded contracts for the replacement of steam generators for the 13 MW-class-fleet. These include 20 reactors on eight sites. Three months later, a contract was put in place to upgrade monitoring and control systems.

Despite its continuous support for nuclear power, the late government of Nicolas Sarkozy also introduced plans to boost energy efficiency and to increase the share of renewable energy. A government report issued near the election date (Energies 2050, Feb.2012) emphasized the country’s policy to support efforts of increased energy efficiency and the development of renewables along with the plans to extend the life of the country’s existing nuclear fleets. This combination was heralded as the best way to meet energy challenges in the future.

During the presidential campaign, the Socialist candidate Francois Hollande announced to close 24 nuclear reactors in France and to limit French dependence on nuclear power by investing more heavily in renewable energy sources (Joskow and Parsons, 2012). However, since his inauguration as the president, he has not met his campaign promises. He only announced that the oldest reactor in Fessenheim (close to the German border) will be shut down in the near future. In fact, in autumn 2013, the French government announced to extend the maximum lifespan of nuclear reactors from 40 to 50 years (le JDD 2013). In the past, members of the Socialist party have supported the country’s commitment to nuclear power partly for the reasons that France has no domestic energy sources, partly for the reason that the energy sector in France secures high employment and reasonable energy prices.

In light of growing criticism of the nuclear policies in particular from environmental groups, the Socialist government issued a new plan for safety improvements. The regulator ordered EDF (the national electricity company) to install additional safety equipment and procedures which include diesel generators for backup power, rapid response teams and bunker-like control rooms. EDF must ensure core equipment can withstand earthquakes 50 percent more powerful than what probably occurred over the past 20,000 years. The company also must explain to the regulators within due time how it plans to strengthen the structure of spent-fuel pools, the ASN said. In response to these regulatory requirements, EDF has said it plans to spend about 55 billion euros ($75 billion) through 2025 to improve safety and extend the lives of its existing 58 nuclear reactors that provided 73 percent of French power production in 20122.

Overall nuclear policies in France were not reversed or dramatically altered after Fukushima. Even if it is not clear of how the new socialist government will respond to new demands form environmental groups to follow Germany in its policy to phase our nuclear power, it will likely be a continuation of nuclear power production but with stricter safety standards,

increased audits and reviews, and more governmental supervision. It is, however, very unlikely that France will build new reactors as it had planned and promised in the past. The most probable scenario is that some of the existing plants will be replaced so that the share of nuclear energy will remain more or less stable in the near future.

In Germany, the disaster of Fukushima fell into a phase in which the centre-right government was under significant pressure by opposition and civil society organisations as a result of their decision to reverse the nuclear phase-out decision issued by the previous Red-Green government. Amidst the financial crisis, Chancellor Merkel had completed an agreement with the large power companies to raise the spent fuel tax for nuclear power plan in exchange for postponing the phase-out of nuclear energy. Although the government denied any link between the two measures, the German public and specifically all the media were convinced that this agreement was a deal made behind closed doors. The opposition parties blamed the government for compromising public safety in exchange for revenues. Many of the environmental groups rallied against the decision to postpone the phase-out and had organized powerful demonstrations against the government's plans (Buchholz, 2011). This pressure was further accentuated by the loss of the traditionally conservative state of Baden-Württemberg in the state-level election a few days after the Fukushima disaster to a Green-Red coalition, installing the first state Premier of the Green Party.

The response to Fukushima therefore saw a radical departure from the centre-right Federal government’s existing policies. First, it included an organizational innovation in the field of energy policy, namely the establishment of an ad hoc Ethics Committee to map the future energy policy. What is interesting about this committee is that it departs from the traditional German model of specialist/sectoral committee in its composition. Rather than energy or nuclear experts and industry, the commission was composed of elderly statesmen from all political parties, functionaries of the major scientific organizations in Germany, social scientists and philosophers of ethics, the two major religious groups, Catholics and Protestants, and, as usual in the corporatist regulatory style of Germany, representatives of the corporate sector (not from the energy industry though) and the unions. Moreover, the committee’s sessions, including the hearing of energy experts, were public and broadcasted live in the Internet.

Second, in terms of policies, the government decided to shut down seven of its oldest nuclear units and not to re-open one unit that was out of operation during that time on March 15, 2011 (Renn and Dreyer, 2013). In addition, they requested the German nuclear safety commission (SSK) to conduct a stress test on all the remaining 11 nuclear units in Germany. Similar to France the SSK did not detect any major weakness in German reactors and a high degree of resilience against events that went beyond the design accidents used for licensing these reactors. However, they also confirmed that the older reactors would be vulnerable to large earthquakes and all reactors to terrorist attacks (Bruhns and Keilhacker, 2011).

Moreover, the government endorsed the recommendation of the ethics committee. The ethics committee’s recommendations included the phase-out nuclear energy within a 10 year period, as well as to promote energy efficiency and the installation of renewable energy sources. The committee also recommended that the government would establish an auditing committee to make sure that the energy transition would run smoothly and an energy public forum to boost acceptance for the new energy policies (Ethik Kommission, 2011; Nachhaltigkeitsrat 2012). In June 2011, all parties represented in the German Bundestag voted in favor of the new energy transition law (however, there were a few representatives who voted against the law or abstained from voting). The law mandated a phase-out of all the remaining nuclear power plants by 2022. In addition, the new law included provisions to reduce the share of fossil fuel from over 80% in 2011 to 20% in 2050. Energy efficiency was to be increased by 40% compared to the average efficiency rates of 1990. The reactors that were shut down
immediately after the accident were not re-opened and remained closed (Renn 2011).

In the time between June 2011 and the end of 2012 the new energy transition law had already major effects on energy supply and consumption. The share of renewable energy in energy production increased dramatically from 17 to 23% and the share of nuclear fell from 23 to 16%. Moreover, Siemens, the construction and engineering conglomerate that had built all 17 of Germany's nuclear power plans announced in September 2011 that it would stop building nuclear power plants anywhere in the world and also dropped plans to work with the Russian Rosatom to build new plants (WEC, 2012).

It seems very unlikely, that even under the constraints of recent energy price hikes and problems with energy security due to volatile energy consumption (Economist 2014; Wassermann und Renn 2013), Germany will reconsider its decision to phase out nuclear energy. In terms of installed capacity, nuclear energy has already been surpassed by renewable energy. There is little doubt that the former share of 23% nuclear energy can eventually be replaced by the growing renewable energy sector. Second, the consensual agreement to phase out nuclear energy by the ethics committee as well as the overwhelming majority vote in the parliament demonstrated the unity of commitment to the energy transition from industry to the major players in science and technology and to representatives of the environmental groups.

Table 5: Nuclear actors, policies and regulations after 2011

<table>
<thead>
<tr>
<th>Actors</th>
<th>Fukushima-Daiichi, March 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Actors</strong></td>
<td></td>
</tr>
<tr>
<td>2011: Establishment of an Ethics Committee</td>
<td>Government tasked commission with developing a roadmap for future energy policies in Germany. Commission comprised of members of politics, churches, civil society and the sciences but no specialists in energy/nuclear</td>
</tr>
<tr>
<td>2012 Government report “Energy 2050”</td>
<td></td>
</tr>
<tr>
<td>Emphasis on renewable and energy efficiency</td>
<td>March 2011: Immediate Federal response</td>
</tr>
<tr>
<td>2012 Presidential Campaign-Hollande’s anti-nuclear platform</td>
<td>Shut-down of seven old reactor units; one reactor not in use at that time remained closed; stress test on the remaining reactors</td>
</tr>
<tr>
<td>Promise to close 24 reactors but so far limited action on these promises</td>
<td>June 2011: All-party consensus in Parliament in favour of ethics committee’s recommendations</td>
</tr>
<tr>
<td>At the end 2012 ANS requires additional safety measures and EDF announces to invest 55 billion Euros for improving safety and security of existing plants-</td>
<td>The recommendations include phase-out within 10 years, promotion of renewable and energy efficiency</td>
</tr>
<tr>
<td></td>
<td>Est 2013/2014: Pending court cases utilities versus government</td>
</tr>
<tr>
<td></td>
<td>Utilities seek financial compensation from government for policy reversal</td>
</tr>
</tbody>
</table>

In sum, this overview of the evolution of nuclear energy in Germany and France revealed
three important issues: First, nuclear disaster can have a different impact on policies in different countries. Second, change in the evolution of policies is not exclusively driven by accidents and safety challenges. A major element is the construction and diffusion of associations and meanings generated in a process of discourse among and between the major societal actors. Third, disasters at different points of time have different impacts in the same country. This raises the question of factor that can explain the evolution of nuclear energy policies in the two countries. How can we explain this variable impact of disasters on policy change?

2. Explaining diverging responses to the nuclear disasters

There are a number of factors that are commonly associated with changing policies and institutions. In the area of risk and technology policy, one of the important lines of argument explores the negative public perceptions of large-scale technologies and their impact on institutions in charge of these technologies (Beck, 1992, Slovic, 1987, Slovic et al., 1981). Negative perceptions of risks associated with nuclear energy, given its potentially catastrophic consequences, have also contributed to the mobilisation of local citizens against the siting of nuclear power plants and waste repositories in both countries. But can public perceptions of risk and nuclear energy technology explain the variations identified in the previous section?

2.1 Public perceptions of nuclear energy

Table 6 provides an overview of internationally comparable opinion polls that ask representative samples of the German and French population about the risks and benefits associated with nuclear energy. Unfortunately, there are no opinion polls available for the period of time before the TMI accident.

The TMI accident seemed to have a limited impact on the largely positive view on nuclear energy within the two countries. This is puzzling given the large-scale protests seen in both countries towards the end of the 1970s. In both countries, a larger number of survey participants perceives more benefits than risks in developing nuclear energy while a smaller proportion associated nuclear energy generation with unacceptable risks.

Table 6: Internationally comparable opinion polls on nuclear energy, 1982-2011

<table>
<thead>
<tr>
<th></th>
<th>France</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>The development of nuclear power plants to produce electricity...</td>
<td>... is worthwhile (Agree)</td>
<td>... is worthwhile (Agree)</td>
</tr>
<tr>
<td></td>
<td>... involves unacceptable risks (Agree)</td>
<td>... involves unacceptable risks (Agree)</td>
</tr>
<tr>
<td>Three-Mile Island, March 1979</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB17 Spring 1982</td>
<td>60%</td>
<td>35%</td>
</tr>
<tr>
<td></td>
<td>44%</td>
<td>39%</td>
</tr>
<tr>
<td>EB22 Autumn 1984</td>
<td>62%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>54%</td>
<td>37%</td>
</tr>
<tr>
<td>Chernobyl, April 1986</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EB26 Autumn 1986</td>
<td>47%</td>
<td>49%</td>
</tr>
<tr>
<td></td>
<td>33%</td>
<td>61%</td>
</tr>
<tr>
<td>EB28 Autumn 1987</td>
<td>51%</td>
<td>45%</td>
</tr>
<tr>
<td></td>
<td>36%</td>
<td>57%</td>
</tr>
<tr>
<td>EB31A Spring 1989</td>
<td>45%</td>
<td>51%</td>
</tr>
<tr>
<td></td>
<td>36%</td>
<td>57%</td>
</tr>
</tbody>
</table>
This positive attitude pattern experienced a major drawback in both countries after the Chernobyl disaster. In Germany, all opinion polls taken after Chernobyl show a majority of participants rating nuclear risks unacceptable or at least more significant than the benefits gained by nuclear energy. A majority expressed the opinion that Germany should not pursue this line of energy generation any longer. In France, the image turned to more ambivalence but not outright opposition. The shares of pro- and anti-nuclear opinions are often of similar size. However, out of the eight comparable opinion surveys taken between 1986 and 2011, five polls show that the percentage of anti-nuclear opinions exceeded the percentage of pro-nuclear opinions in most polls, but the two camps were close to each other. In the time period shortly before Fukushima, two opinion polls from 2006 and 2010 respectively show a stronger opposition to nuclear energy than in Germany. Opinion polls after Fukushima display a strong opposition to nuclear power in both countries, with four out of five Germans and two out of three French opposing the nuclear way of producing electricity.

In short, given the broadly similar shifts in public opinion in the two countries, public risk perceptions cannot explain the distinctive nuclear energy policies in France and Germany.

2.2 Ideas, institutions and the differential impact of disasters and public opinion

This section explores two interconnected factors, ideas and institutions that explain the different consequences of disasters and shifting public opinion in France and Germany.

2.2.1 France

<table>
<thead>
<tr>
<th>The development of nuclear power plants to produce electricity</th>
<th>... is worthwhile (Agree)</th>
<th>... involves unacceptable risks and should be abandoned (Agree)</th>
<th>... is worthwhile (Agree)</th>
<th>... involves unacceptable risks and should be abandoned (Agree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB35 Spring 1991</td>
<td>27%</td>
<td>18%</td>
<td>21%</td>
<td>51%</td>
</tr>
<tr>
<td>EB46 Autumn 1996</td>
<td>19%</td>
<td>19%</td>
<td>12%</td>
<td>52%</td>
</tr>
<tr>
<td>Energy policy preference: Continue nuclear development</td>
<td>Energy policy preference: Abandoning nuclear energy</td>
<td>Energy policy preference: Continue nuclear development</td>
<td>Energy policy preference: Abandon nuclear energy</td>
<td></td>
</tr>
<tr>
<td>Ipsos-L’express Spring 1999</td>
<td>18%</td>
<td>22%</td>
<td>5%</td>
<td>28%</td>
</tr>
<tr>
<td>EB271 Autumn 2006</td>
<td>56%</td>
<td></td>
<td>51%</td>
<td></td>
</tr>
<tr>
<td>EB324 Autumn 2010</td>
<td>53%</td>
<td></td>
<td>52%</td>
<td></td>
</tr>
<tr>
<td>Support/oppose nuclear way of producing electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fukushima-Daiichi, March 2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ipsos/Globaladvisor Spring 2011</td>
<td>34%/67%</td>
<td>21%/79%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This positive attitude pattern experienced a major drawback in both countries after the Chernobyl disaster. In Germany, all opinion polls taken after Chernobyl show a majority of participants rating nuclear risks unacceptable or at least more significant than the benefits gained by nuclear energy. A majority expressed the opinion that Germany should not pursue this line of energy generation any longer. In France, the image turned to more ambivalence but not outright opposition. The shares of pro- and anti-nuclear opinions are often of similar size. However, out of the eight comparable opinion surveys taken between 1986 and 2011, five polls show that the percentage of anti-nuclear opinions exceeded the percentage of pro-nuclear opinions in most polls, but the two camps were close to each other. In the time period shortly before Fukushima, two opinion polls from 2006 and 2010 respectively show a stronger opposition to nuclear energy than in Germany. Opinion polls after Fukushima display a strong opposition to nuclear power in both countries, with four out of five Germans and two out of three French opposing the nuclear way of producing electricity.

In short, given the broadly similar shifts in public opinion in the two countries, public risk perceptions cannot explain the distinctive nuclear energy policies in France and Germany.

2.2 Ideas, institutions and the differential impact of disasters and public opinion

This section explores two interconnected factors, ideas and institutions that explain the different consequences of disasters and shifting public opinion in France and Germany.

2.2.1 France
French post-war energy policy evolved in a broader context of strong state interventionism into the French economy. As Peter Hall remarks “the leaders of France were eager to declare a military victory but anxious about the prospect of economic defeat in a more open world economy. A third of the nation’s labour force was still employed in agriculture, and many of its firms were too small to compete on the world stage. Accordingly, French officials decided to break with the past and modernize the economy from above” (2001:49). The envisaged renaissance of the French economy revolved around the idea of state-driven development of high-tech sectors with larger, competitive companies at their centre. This can be understood as a response to the perceptions of the political elites that the previous industrial structure of smaller, family-owned companies was a cause of the defencelessness of Franche in World War II (Hecht 1999).

As a consequence, in 1946, the post-war government set up the “Commissariat general du Plan” which develops national plans for reconstructing the economy. These general plans were complemented by sectoral indicative plans. The plan achievement was furthermore aided by funds were channelled by state-owned banks to the identified priority sectors, as well as para-public institutes to undertake R&D for the sector in question. In addition, these planning activities were complemented by the nationalisation of producers in certain sectors.

Such a centralised planning approach reflected the institutional structure and technocratic governance culture of the French state. Power is concentrated in Paris in the executive branch populated by political, economic and bureaucratic elites that share a similar educational and social background. The structural set-up ensured a high degree of autonomy of decision-makers from societal pressures while the technocratic culture underpinned faith in the capacities and the need of the state to plan the economy and a high capacity to implement even unpopular decisions.

Energy policy-making was a key field of interest to French policy-makers, driven by past conflicts with Germany over coal resources, the awareness of a lack of indigenous energy resources, as well as the importance of reliable and inexpensive energy to rebuild the country and its industrial base. Since uranium was the only fuel resources that was found abundantly in France and its overseas territories and nuclear had the additional advantage of offering military uses, the emphasis on economic development revolving around high technology and the desire to develop capability to project military and economic strength in a more open global economy rendered the development of nuclear energy an appealing option to French policy-makers. French policy-makers felt vindicated for their strong emphasis on developing indigenous energy sources when the 1973 oil crisis demonstrated the economic consequences of import dependencies in the energy field.

Energy policy-making therefore became an area of strong state-driven planning and significant state ownership. The energy sector was subject to five-year plans and saw the nationalisation of supply companies of all fuels, e.g. Charbonnage de France (coal), Gaz de France (gas), Total (petroleum products) and Electricité de France (EDF) (electricity). The nuclear programme was also subject to planning. In fact, EDF was set up through the second nuclear plan to complement the primarily military research and development authority CEA.

One of the important consequences of the state involvement in the energy sector of France is the creation of a cohesive policy community around the promotion of nuclear energy (Baumgartner 1989) (Delmas and Heiman, 2001). The CEA concentrated all expertise under a veil of (military) secrecy and thus became the central actor in a well-insulated policy network around nuclear development. CEA was joined by Framatome (monopoly rights over construction of reactors initially designed by CEA) and EDF (established as a utility with the aim to incorporate nuclear into the national grid). These three organisations controlled most of the nuclear sector development between 1946 and the 2000s. Their dominance and insulation
was a result of their technocratic expertise and a wider policy context that values and promotes the role of technocratic experts. A French regulator, interviewed for a research project in 2005, describes the technocratic management of the energy sector as follows: “In France, the elite is coming from the technical high school, then move on to the Polytechnique, then, if you are among the first, the crème de la crème, then you belong to the group that is responsible for the energy system. They are a small elite driving the scenes, but they are altogether linked and they are obliged to succeed. (...) People have a great opinion of the knowledge or the capacity of them. (...) However, the problem is that we are having a problem with control. (...) If you say there is a big problem, they say “Don’t worry about that (...) We will speak about that with a glass of champagne” (FP1).

Political oversight of the nuclear expert community or external scrutiny has been limited: The wider political elites assumed a largely passive role that can be illustrated by the fact that the major expansion plan by Messemer 1974/75 was not even debated in the French Parliament (Hatch 1996). Another case in point is the centralised fast-track planning procedure for nuclear power plants that reduced publicity and veto points for outside actors in the development of the nuclear energy project (Hatch 1996). One French regulator interviewed in 2005 described interactions with civil society organisations as follows: “Before 2000, few things happened. More or less all energy policy relevant institutions consider themselves as a fortress against an army of evil and ignorant people outside” (FP1).

Given the insulation, wide acceptance of the competence and leadership of technocrats in the nuclear energy development in France, as well as its wider fit with the vision of a high-tech France, the resilience of the nuclear energy programme against disasters, changes in government, and shifting public opinion becomes more understandable. It is important to note though that the pressure on the nuclear policy community has increased significantly: For instance, in the 1990s, economic and EU regulatory pressures interfered with the intended further development of nuclear energy (in particular the EPR reactor), as well as the involvement of the Green Party in the government. In the 2000s, the development of other indigenous fuel sources, i.e. renewables, became part of the government’s central energy policy objectives.

That notwithstanding, the response to Fukushima was – at least in parts – benign for the nuclear industry: First of all, they continue to operate with continued support of the major parties. Second, the new safety standards require major investment and refurbishment of existing nuclear sites. At the same time, however, the new regulations also increased operating costs.

2.2.2 Germany

In Germany, the ideational and institutional set-up was different: Nuclear armament was ruled out not only by an initial ban by the Allies (even though they installed their own nuclear weapons on German soil later) but also by the vast majority of German political elites and population. At the same time, issues of energy dependence were – in view of the coal reserves – not of key importance while the recovery and industrial development in Germany benefited from the “institutional inheritance from late industrialization that included strong industry unions, well-developed employers associations, collaborative institutions for skill formation, and a Bismarckian welfare regime” (Hall 2001:46).

The development of nuclear energy can therefore mostly be understood as a project initially driven by the interests of technocrats, industry and some policy-makers (such as the first Atomic Affairs Minister Franz-Josef Strauss) in the dominant parties in Germany. The pro-nuclear forces created a web of institutions such as the Atomic Commission and the Federal Ministry for Atomic Affairs that viewed nuclear favourably.
In contrast to France, however, this emerging policy community was embedded in a wider institutional context that rendered its insulation from political and external oversight and scrutiny precarious. In response to the experience of the Nazi dictatorship and the weakness of democracy before 1933, the German political system was re-designed in a particular manner. Power concentration was to be prevented through different sets of checks and balances, primarily a federalist structure with powerful states (Länder) at federal and state level, a strong and independent judiciary and a constitution whose basic rights were inalterable. Stability and social cohesion was ensured through corporatist structures that would facilitate co-operation between the labour and capital and an election system that strengthened the position of large parties, emphasized, at the same time, fragmented decision making by relying on a federalist system with strong Länder competencies.

It is these checks and balances in the system that effectively stopped the nuclear expansion after the Chernobyl disaster and slowed it down in some instances even before the 1986 disaster. Opponents from outside the policy-making system were able to directly appeal to courts on multiple claims (as done by the anti-nuclear movement from the very beginning of their activities, e.g. in Wyhl), obstructing the government’s power to implement controversial decisions swiftly. In addition, indirect pressures can be applied through (alliances with) powerful intermediary organisations (such as trade unions, local and regional party organisations) and through frequent elections on local, state- and Federal level (e.g. pressures on the government of Lower Saxony in the context of the Gorleben nuclear waste repositories decisions). The election systems on federal and state level that favour coalition governments enabled the anti-nuclear Green Party to become junior partner to the SPD in several state governments and, since 1998, on the Federal level.

The centre-right government therefore faced a major challenge when Fukushima happened: the main opposition parties SPD and Green Party were strongly anti-nuclear; the overall public opinion has viewed nuclear energy predominantly negatively since the Chernobyl 1986 disaster and the anti-nuclear movement in Germany had been remobilised as a result of the reversal of the 2002 nuclear phase-out by the centre-right government (Buchholz, 2011).

Key factors in shaping responses to the incidents have been the symbolic associations that key actors have assigned to each event and its meaning in the national context of opinion forming and policy making discourses. Symbols are powerful carriers of emotions and behavioural triggers, they are normally independent of distance (Fukushima was far away from Germany, but still Germans purchased more iodine tablets than the Japanese population) and only marginally related to technical questions such as reactor design, safety provisions or emergency preparedness. While the French public associated national pride and technical superiority with their own nuclear program to which the accidents in Japan and Russia posed hardly any threat, the German population associated with nuclear reactors uncontrollable risks that were only undertaken for reasons of energy security and profit seeking of the utilities. Any incident, in particular in those countries that also have invested heavily in risk reduction poses a major threat to the nuclear industry as it demonstrates the uncontrollable nature of this technology which forbids any form of trade-offs or compensation. Interestingly enough, the majority of the German Ethics Committee supported the statement that the risks of nuclear energy as so overwhelming that they cannot be compensated by any extension of expected benefits (Ethics committee 2011). But even those who believed that risk-benefit trade-offs were ethically acceptable shared the belief that there were less dangerous alternatives available so that the goal of energy security could also be met by alternative means. Lastly, the German nuclear debate in 2011 offered a strong argument for pro-industrial, conservative stakeholders (normally inclined to embrace nuclear power). They were sold on the idea of a fast phase-out by pointing out that Germany had become an industrial leader in renewable energy technology but lost its leadership in nuclear technology. So the argument was crafted
that Germany’s global competitiveness and technical world-wide leadership would be supported by concentrating all efforts onto renewable energy technologies. Nuclear was seen as the past, renewable as the new opportunity for Germany’s export-driven economy. In contrast, the French public found it reassuring that the accidents happened outside of France, which reinforced their belief that their reactors were better controlled and better built than the ones abroad. Furthermore, the alternative of renewable energy or coal did not seem very attractive and promising particularly why Germany was ahead in both areas having sufficient amount of local coal and having invested more money and R&D in renewable energy technology.

In sum, while public opinion is an important driver of politics in liberal democracies, it is important to take into account the institutional structures that filter the effects of public opinion on decision-makers, and include the emergency of meaning associated to different policy option in the course of public debate and discourse. These two drivers can strongly influence the impact of disasters on policies, as the cases of France and Germany’s nuclear sector and policies illustrate.

3. Conclusions

This paper focused on presenting and explaining the varying political choices regarding the development and regulation of nuclear energy in France and Germany. The paper provides a number of interesting lessons for researchers that seek to understand the impact of accidents on nuclear energy.

• First of all, it is important to note that not all accidents have political repercussions. In the case discussed here, the TMI had very limited effects in both country cases while Chernobyl and Fukushima had important political repercussions mostly in Germany. There are a number of reasons for the limited impact, including institutional factors such as the exclusiveness and coherence of the political, technocratic and economic elites in support of nuclear energy. Most important, however, has been the assignment of meaning to the circumstances and implications of each of these events in the public discourse.

• Second, not all policies and policy change can be explained in reference to disasters. Again, this has not been at the heart of this paper’s discussion but the emergence of economic pressures in the 1990s has affected nuclear energy development, involved actors and overall institutional settings in the nuclear energy field significantly. If state aid and guarantees to the nuclear industry are withdrawn and private investors need to be found, then these investors would be concerned about issues such as stability of political support for nuclear energy, about possible follow-on costs such as nuclear waste management, liability insurance and decommissioning, about tightening safety regulations, and more. Once the German industry started to believe that there was more to gain from investing in renewable energy technology and sustainable energy systems the investment into nuclear technology lost its attractiveness.

• Third, and this is at the heart of the paper, the responses to disasters differ between countries. Understanding these differences often requires a closer look at the institutional settings, the dominant discourse topics and broader political ideas that underpin nuclear policy-making. In fact, given the military origins and government-driven initiation and promotion of nuclear energy, an institutionalist viewpoint can be argued to be particularly valuable when analysing the impact of disasters on nuclear policies. In Germany, the fragmentation of power (e.g. between Lander and Federal level; with the judicial system; through an election system favouring coalition governments) and a lack of a widely
shared motivating idea that makes nuclear energy development a key national project made decision-makers more vulnerable to outside pressures and the nuclear policy community more prone to disintegration (e.g. the switch in the position of the SPD after Chernobyl). In France, a strong commitment to large-scale technology development combined with an institutional insulation of the nuclear policy community from outside pressures and internal scrutiny have mitigated the impact of adverse public opinion on the nuclear energy development. Most important might be the major association of nuclear with national achievement and technical superiority in France, both of which had little repercussions in the German population.

These are important insights into the role of disasters and incidents in triggering/shaping policy change. They potentially help us develop a more nuanced understanding of the responses to nuclear accidents across countries but also of other accidents caused by large-scale technologies. Universalist takes on risk and society suggests that societies have moved from deep trust in the positive value in high technology as well as those that manage these technologies on our behalf (a culture of experts) to a much more sceptical view of technologies (Giddens, 1999, Beck, 1992, Lofstedt, 2005) – and that this is reflected in the emergence and international adoption of policy principles such as the precautionary principle and of political actors such as NGOs and Green Parties (Ewald, 2002). While these general shifts can indeed be observed (Renn 2008: 80ff.), it is important to take a closer look at the politics (and economics of nuclear) in individual countries.

The response to Fukushima across Europe is as diverse as we could expect from countries with such different nuclear histories and institutional settings. For instance, in Italy, a moratorium on the construction of nuclear plants for one year was adopted by the government. In the Netherlands, the government noted that the lessons learned from Fukushima will be taken into account in the definition of requirements for a new nuclear plant to be built in 2015. In Slovakia, the ongoing construction of two new reactors will be continued albeit with updated safety requirements for earthquake resilience. In Russia, President Putin asked for a review of the ambitious nuclear expansion plans. In Switzerland, the authorisation process for three new nuclear power plants was frozen by the government. Similar to Germany, Switzerland decided to phase out nuclear energy but agreed on a more comfortable time frame to accomplish this goal.

Both the German and French cases are peculiar. Germany’s radical departure from nuclear after having been a major producer of nuclear energy and of associated technology is as interesting as the heavy reliance on nuclear in France. Many countries observe Germany’s path with interest – given the potential trade-offs between ‘safety’ from nuclear may have implications on energy security (reliable supply without nuclear base load and in the face of import dependence from Russia), climate change (coal is expected to replace at least some of the nuclear supply) and affordability of the national energy transition project Energiewende (some argue that once nuclear plants operate (and the initial investment is undertaken/written off), they produce power relatively cheaply). The French case is also unique because of the country’s strong dependence on nuclear energy for its energy production, unmatched anywhere else in the world.

However, all of these policy objectives, energy security, affordability, environmental quality and safety are spelled out across Europe as objectives in energy policies. To what extent the German or French path allow the achievement of these goals remains to be seen. Disasters and incidents – one could therefore conclude – have at least the potential to stimulate policy innovation and experimentation – strongly shaped by institutional, discursive and ideational conditions.
Bibliography


Le JDD (2013): L'État va prolonger le nucléaire de dix ans, see: http://www.lejdd.fr/Economie/L-Etat-va-prolonger-le-nucleaire-de-dix-ans-633771


