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“Nuclear Power? No, Thank You!”: Germany’s Energy Revolution Post-Fukushima

Draft, November 2012 [accepted for publication in: Manuela Achilles, Dana Elzey (eds):

Sustainability in Transatlantic Perspective: A Multidisciplinary Approach, Palgrave Macmillan’s “Climate and Energy Series].

When on March 11, 2011 the 9.0 Great East Japan Earthquake and resultant tsunami crippled the cooling systems at the Fukushima Daiichi nuclear power station, thus sending several reactors into core meltdown, the German outcry against nuclear energy was almost unanimous. On Saturday, March 12, some 60,000 people demonstrated against the continued operation of one of the country’s oldest nuclear power stations by forming a 45 kilometer human chain from the particular plant to the regional capital. Two days later, more than 100,000 demonstrators took to the streets in 400 towns and cities across the nation. Faced with the rising public pressure, the federal government shut down the country’s seven oldest reactors and imposed a technical audit on all nuclear power plants. In addition, the cabinet appointed an independent ethics committee on the safety of the nation’s energy future.¹ Upon completion of the review process, Chancellor Angela Merkel announced on May 30 that Germany would phase-out nuclear power by 2022. Parliament passed the respective bill with an overwhelming majority on July 8, 2011. A heated public debate had come to an end: nuclear power was done for and over with.

Notably, this radical backlash against nuclear power did not occur in Japan but in a country over 5,500 miles (9000 kilometers) removed from the Fukushima accident and arguably not directly affected by the radioactive fallout. The immediate formation of an inter-generational

¹ Ethics Commission for a Safe Energy Supply, “Germany’s energy transition – A collective project for the future,” Berlin, May 30, 2011.

cross-party consensus against nuclear energy is stunning especially if one considers the economic risks of the phase-out decision. As this article is being written, Germany is the world's fourth-largest economy and second-largest industrial exporter, with 1 million jobs in energy-intensive industries such as aluminum and steel. National prosperity relies, among other things, on the steady availability of cheap energy. In abandoning nuclear power, Germany has committed to replacing one quarter of its electricity supply within a decade. How is the country to achieve this task?

The easiest way to close the looming power gap would perhaps be to increase reliance on fossil fuels or buy electricity from France, which generates three-fourths of its electricity from nuclear sources and has significant excess capacity. German popular opinion, however, rejects these options. Although natural gas has gained currency as a “bridging technology,” the aim is to phase out nuclear power and at the same time meet the country's ambitious domestic climate protection targets. The latter involves cutting carbon emissions by 40% by 2020, 55% by 2030, 70% by 2040, and 80-95% by 2050, relative to the 1990 levels. To attain these targets, Germany needs to double the amount of electricity generated from renewable sources from 17% in 2011 to 35% by 2020. In addition, electricity consumption is to be reduced by 10%. The ultimate objective is to obtain 80% of all energy from renewable sources by 2050.² Requiring large investments in alternative technologies, as well as in new power lines and energy storage systems, this radical transformation of the German energy sector amounts to nothing less than a veritable “energy revolution” and is increasingly described in these terms.

² “The path to the energy of the future – reliable, affordable and environmentally sound,” BMU Website, http://www.bmu.de/english/energy_efficiency/doc/47609.php (accessed March 19, 2012)

What drives this remarkable experiment in national self-transformation? Surely, the images of exploding reactors and displaced families televised around the world from the site of the Fukushima disaster triggered strong responses also in other countries. Germany, however, is the first major industrialized power to completely cease using a form of energy generation that its supporters describe as carbon-neutral, plentiful and cheap. Why is the highly developed nation abandoning a technology that continues to enjoy some level of support in the United States, France and even Japan? What accounts for the intensity of the German reaction when public excitement never flared up or quickly muted elsewhere? This article explores the German nuclear phase out in two steps. The first part discusses the idea of a global nuclear renaissance promoted by industry circles as a weapon in the fight for energy independence and against climate change. Against this background, the German position appears particularly striking. To fully explain the rationale behind the country's shift away from nuclear and fossil fuels towards an untested renewable energy future, the second part looks towards the realms of history, politics and culture. As will be argued, the collapse of support for nuclear power in Germany is the outcome of fundamental societal changes that point back to the world historical conjuncture of 1945. The German case thus opens a window onto a discussion of sustainability that is sensitive to the global connectedness of environmental questions *and* the cultural-political determinants of the national response. The underlying question is whether Germany's energy revolution can be a template for other nations, including the United States.

I. Global Perspectives

While the German phase-out policy condemns the country's commercial nuclear power program to a slow death, the industry's global future is more difficult to predict. As of December 2011, a

total of thirty countries operated 434 commercial fission reactors with an installed capacity of about 370 GW (gigawatts or thousand magawatts).³ These plants produced about 13% of the world's electricity and about 5% of the total primary energy supply.⁴ Three-fourth of the global nuclear power generation was concentrated in eight countries. The United States had the largest nuclear fleet with 104 reactors, followed by France (58), Japan (50), Russia (33), South Korea (21), India (20), the U.K. (18), and Canada (18).⁵ The majority of these facilities was over twenty years old and one quarter was over thirty years old.⁶ The aging of the world's nuclear fleet has raised questions about the extension of reactor life-spans from forty to sixty years. These safety concerns have become more urgent after the destruction of the Fukushima Daiichi Nuclear Power Plant, which was first commissioned in the early 1970s.

The global nuclear fleet peaked at 444 reactors in 2002. Since then, permanent plant shutdowns have outnumbered new grid connections.⁷ Increases in production capacities in industrialized countries were due mostly to technical uprates that boosted the maximum heat output or power level for already existing reactors.⁸ In 2008, no new reactor unit was started up for the first time since the beginning of the commercial nuclear age in the mid-1950s.⁹ That year, however, saw ten construction starts, followed by twelve in 2009 and sixteen in 2010.¹⁰ More than sixty-five reactors were under construction in 2011, some of them for decades.¹¹ The

³ World Nuclear Industry Status Report 2010-2011: 12.

⁴ World Nuclear Industry Status Report 2010-2011: 11; IAEA 2010 report: 3.

⁵ Website of Nuclear Energy Institute (NEI); <http://www.nei.org/newsandevents/newsreleases/inpo-compiles-timeline-of-fukushima-events-after-japan-earthquake-tsunami> (December 2, 2011).

⁶ IAEA 2010 report: 6. More critical: The World Nuclear Industry Report 2010-2011: 8.

⁷ World Nuclear Industry Status Report 2010-2011: 12.

⁸ Cf. "Power Uprates for Nuclear Plants." Website of the United States Nuclear Regulatory Commission, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/power-uprates.html> (accessed February 20, 2012). See also: World Nuclear Industry Status Report 2010-2011: 13.

⁹ World Nuclear Industry Status Report 2010-2011: 7.

¹⁰ IAEA 2010 report: 1; World Nuclear Industry Status Report 2010-2011: 10.

¹¹ IAEA 2010 report: 10.

building time world record is held by the Tennessee Watts Bar Nuclear Plant Unit 2 in United States, which received its original construction license in 1973 and is scheduled to enter commercial production in 2013.¹²

The Fukushima Effect

The Fukushima disaster has had a profound effect on global public opinion. A survey by the leading British polling company Ipsos MORI conducted in April 2011 reported that 62% of citizens in 24 countries across the globe opposed the use of nuclear energy, with a quarter of those having changed their minds after the Fukushima accident.¹³ The most anti-nuclear nations were Italy, Germany, and Mexico at about 80% against. A multi-country poll for BBC World Service by the international polling firm GlobeScan found relatively high levels of public approval only in the United States, the United Kingdom, China, India and Pakistan. Support for building new plants was a minority view also in those countries, hovering around 40%.¹⁴

Public opinion plays an important role in Western-style democracies, and is considered an important factor in nuclear policy making.¹⁵ This is true irrespective of the fact that representative governments are generally thought to have a mandate to deliberate policy decisions with expert bodies and industry circles. As discussed in more detail in part two of this

¹² "TWA to manage Watts Bar 2 project." *World Nuclear News*, Oct. 20, 2011.

¹³ "Ipsos Global@dvisory: Sharp World Wide Drop in Support for Nuclear Energy as 26% of New Opponents Say Fukushima Drove Their Decision," *Ipsos.com*, June 20, 2011; Damian Carrington, "Citizens across world oppose nuclear power, poll finds," *The Guardian*, June 23, 2011.

¹⁴ "Opposition to Nuclear Energy Grows: Global Poll," Online – International News Network, <http://www.onlinenews.com.pk/details.php?id=186243>. For a comparison of the IPSO Mori and GlobeScan polls, see Richard Black, "'Nuclear power 'gets little public support worldwide'", *BBC mobile*; Nov. 24, 2011.

¹⁵ Cf. Felix Kolb, *Protests and Opportunities: The Political Outcomes of Social Movements* (Frankfurt am Main: Campus Verlag, 2007), especially p. 211 and ff.

article, the German political system was sensitive to anti-nuclear public pressure not least because of the strong structural and historical position of the environmentalist Green Party. In Italy, a popular referendum held in the wake of Fukushima thwarted Prime Minister Silvio Berlusconi's attempt to restart a nuclear program shut down in response to the 1986 Chernobyl accident.¹⁶ Belgium, which drew more than half of its electricity from nuclear power in 2011, decided to stand by a 2003 law that limits the life-span of the country's seven reactors to forty years and prohibits the building of new nuclear power plants.¹⁷ Switzerland, which generated about 40% of its electricity from nuclear fission reactors in 2011, decided to phase out nuclear energy by 2034.¹⁸

In Japan, which derived about 30 percent of its electricity from nuclear power and had the third-largest global nuclear energy capacity in 2010, the industry's future is subject to considerable uncertainty. Public opposition to building new nuclear power stations has grown significantly after Fukushima.¹⁹ Faced with its inability to contain the crisis, the national government has revised its pre-Fukushima goal of drawing about half of the country's electricity from nuclear power by 2030. At the local level, towns and prefectures have been refusing to allow nuclear reactors to be restarted after regularly scheduled routine maintenance.²⁰ The shutdown of virtually all Japanese nuclear power stations one year into the Fukushima disaster is not likely to be the final word, however. Since many rural communities depend on the industry

¹⁶ Barry Moody, "Italians say no to nuclear energy in referendum," *Reuters*, June 13, 2011.

¹⁷ Alessandro Torello, "Belgium Reviews Timing on Nuclear-Power-Exit," *The Wall Street Journal*, Feb. 15, 2012.

¹⁸ "Swiss to phase out nuclear power by 2034," *Swissinfo.ch*, May 25, 2011; Philippe Clavel, "Switzerland Nuclear Power Phaseout Approved by Lawmakers," *Huffington Post*, June 8, 2011.

¹⁹ "Opposition to Nuclear Energy Grows: Global Poll," *BBC World Service*, Nov. 25, 2011.

²⁰ "Japan left with one nuclear reactor after shutdown," *BBC News Asia*, March 26, 2011; Wieland Wagner, "What Future Does Nuclear Power Have in Japan," *Spiegel Online*, March 1, 2012.

for economic reasons, the technology is expected to remain part of Japan's energy mix for some time to come.

The case of the United States, which pioneered both the development of nuclear power and the formation of a vocal anti-nuclear protest movement,²¹ highlights the multilayered interplay of political and economic factors in the nuclear energy field.²² Two decades of rapid expansion culminated in renewed enthusiasm for the technology in the wake of the 1973 oil crisis, which put an end to decades of cheap energy. Once hailed as an energy source too cheap to meter, nuclear energy now signified independence from an energy market that saw oil prices quadruple in the course of just a few months. The global recession that followed the OPEC oil embargo, however, led to cuts in the predicted growth of electricity demand, thus discouraging investment in the capital-intensive technology. The nuclear core meltdown at the Three Mile Island nuclear plant in Pennsylvania in 1979 then caused the U.S. Nuclear Regulatory Commission (NRC) to tighten its oversight. Resultant changes in the nuclear industry enhanced plant safety but also increased lead times and construction costs, thus all but eliminating nuclear energy's profitability expectations. By the time of the Chernobyl accident in 1986, the industry was in decline mostly for economic reasons. In fact, all of the 104 reactors currently in operation in the United States were ordered prior to 1974, and less than half of the reactors on order in 1974 were ever completed.²³

The U.S. nuclear sector regained momentum at the beginning of the new millennium, when Republican President George W. Bush took up nuclear power as a clean alternative to

²¹ Joachim Radkau, "Eine kurze Geschichte der deutschen Atomkraftbewegung," in: *Aus Politik und Zeitgeschichte*, No. 46, 2011, Thema: Ende des Atomzeitalters; ed. Bundeszentrale für Politische Bildung, Bonn 14.11.2011.

²² Lucas W. Davis, "Prospects for Nuclear Power," NBER Working Paper Series 17674, Dec. 2011; Jason Koebler, "Expert: Nuclear Power Is On Its Deathbed," *U.S.News.com*, March 30, 2012.

²³ Davis.

global warming. Having rejected the ratification of the Kyoto Protocol in 2001, the Bush administration expedited the renewal process for existing nuclear plants and provided loan guarantees as well as tax incentives for the nuclear power industry. Licensing applications increased to a total of 28 by the first quarter of 2011,²⁴ but this temporary spike in orders fizzled in the wake of the late-2000s global financial crisis. Imploding gas prices and the failure of Congress to pass a federal carbon tax also played a role in diminishing the nuclear industry's growth potential.

In the absence of significant new construction, the U.S. nuclear fleet is likely to gradually age out of existence. Out of a total of 104 reactors originally designed to last for forty years, more than half had their licenses extended by two decades. Another 18 are under Nuclear Regulatory Commission review. In February 2012, the NRC granted a license to build and operate two reactors at the Vogtle Nuclear Power Plant in Georgia. The \$14 billion project has been praised as a crucial threshold for an industry that has not had a new construction start in more than three decades. Most utilities remain apprehensive of the delays and cost overruns that accompanied the last waves of U.S. reactor building in the 1970s and 1980s.²⁵ Skepticism is especially high in federal states with open energy markets, for their utilities cannot simply transfer costs to the consumer.²⁶ Legal challenges from anti-nuclear groups, as well as the evolution of both natural gas prices and federal emission rules, will also affect the prospects of nuclear energy in competition-driven liberalized market economies such as the United States.

²⁴ Here and in the following, see World Nuclear Industry Status Report 2010-2011: 53; Margaret Ryan, "New Reactors Mean New Life for Nuclear," *AOL Energy*, Dec. 1, 2011.

²⁵ According to some estimates, a single nuclear power plant costs almost twice as much as a coal-fired power plant and almost four times as much as a gas fired one. "Undeterred by Fukushima: Nuclear Lobby Pushes Ahead with New Reactors," *Spiegel Online*, March 8, 2012. John Rowe, CEO of Exelon, the largest U.S. nuclear utility, reportedly estimated that a carbon price of \$100 per ton would be needed to make new nuclear energy break even. World Nuclear Industry Status Report 2010-2011: 32.

²⁶ Cf. World Nuclear Industry Status Report 2010-2011: 29.

In France, which has the highest per-capita investment in nuclear energy in the world, the general political climate became more critical of the technology in the wake of Fukushima.²⁷ According to a poll by the French Institute of Public Opinion published in June 2011, 62% of French people wanted a progressive halt to the country's nuclear power program in the next twenty-five to thirty years.²⁸ A survey conducted by the French Institute for Radioprotection and Nuclear Safety in Fall 2011 indicated that 55% of the population rated the risks from nuclear power plants high, and only 24 percent trusted the authorities to protect the public against this danger.²⁹ It is questionable, however, whether France will significantly reduce its investment in nuclear power. After all, the government-owned utility EDF (*Electricité de France SA*) produces most of its electricity from nuclear power. The state-owned nuclear conglomerate Areva, on the other hand, is a key driver of jobs and exports, with revenues of \$12.3 billion and 48,000 employees in 2011.³⁰

As the French struggle with the question of whether to maintain their nuclear investment or re-channel resources into (the search for) renewable alternatives, Areva is looking for new markets abroad. Growth potential is seen in Eastern Europe, the Middle and Far East, South Africa, India, and especially in China, which alone accounted for more than half of the new construction starts in 2010.³¹ Having initialized its commercial nuclear program only in 1985, China had 15 reactors in operation and 26 under construction in 2011, with 51 more planned and 120 proposed. The government's objective is to have 43 GW of reactors in operation by the end

²⁷ Here and in the following: John C. K. Daly, "French Nuclear Anxieties Soar After Fukushima," *The Huffington Post*, Feb. 16, 2012.

²⁸ "French nuke industry struggles to boost public image," *Homeland Security News Wire*, Sept. 22, 2011.

²⁹ Daly, "French Nuclear Anxieties."

³⁰ Website of the Center for Climate and Energy Solutions (accessed February 20, 2012).

³¹ Nathan Myhrvold, "After Fukushima: Now, More Than Ever," *The New York Times*, Dec. 2, 2011; World Nuclear Industry Status Report 2010-2011: 54.

of 2015 and 80 GW by 2020.³² This would amount to the second largest installed nuclear capacity behind the United States.³³ Since the Chinese government ties domestic market access to technology transfers, nuclear exports from France, Canada, the United States, and Russia are preparing the ground for the country to become a large-scale exporter of nuclear technology in the future. Popular opposition against siting new plants near population centers is growing in China, however, and new safety regulations drafted by the government in response to the nuclear accident at Daiichi have yet to be revealed.³⁴

It appears, then, that the Fukushima accident has had an uneven effect if considered on the global scale. While some industrialized nations reduced or halted their nuclear programs, countries with fast-growing economies and rapidly-rising electricity demand continue to press for nuclear fleets of their own. The anticipated migration of nuclear construction further “south” to low-income and low-middle income economies such as Bangladesh and Vietnam has raised the specter of a global divide over the safety of nuclear energy, separating the world’s wealthiest and poorest nations. Driven by aggressive marketing competition between the mostly Western exporters of nuclear technology, this development could result in a nuclear market at two speeds: a high-tech, high-safety mode for developed countries and a lower-safety mode for emerging countries.³⁵ In addition, the overlap of the new markets for nuclear power with political hot spots in the Middle and Far East has increased concerns over the danger of nuclear weapons proliferation. The international tension sparked by Iran’s nuclear power program is a point in case. Rather than deciding the controversy over the industry’s global future, the Fukushima

³² Shifra Mincer, “Is Nuclear Power Being Phased-Out,” *Aol Energy*, Dec. 8, 2011.

³³ World Nuclear Industry Status Report 2010-2011: 55, 10.

³⁴ Leslie Hook, “China nuclear protest picks up steam,” *Financial Times*, Feb. 29, 2012, p. 5.

³⁵ Cf. Jim Hoagland, “Nuclear energy after Fukushima,” *The Washington Post*, Oct. 6, 2011; Henry Sokolski, “Nuclear Power Goes Rogue: Post-Fukushima, the market for nuclear power is changing latitudes,” *The Daily Beast*, Nov. 28, 2011.

accident thus stirred up and complicated the nuclear energy debate. To understand Germany's decision to abandon the technology, it is necessary to identify the determining factors of the individual case.

II. A Clean Template for the World?

Germany is a highly developed and densely populated country in the center of Europe. Shaped by the historical legacies of two world wars and the Holocaust, the population has become acutely attuned to the international context to which it is bound. After the collapse of the Nazi Third Reich in 1945, the defeated nation was divided along the major fault lines of the cold war. The German Democratic Republic (GDR) became tied to the Warsaw Pact and the Council for Mutual Economic Assistance (COMECON), and boasted the highest per-capita production output in the Eastern bloc. The Federal Republic of Germany (FRG) integrated into the European Community and the North Atlantic Treaty Organization (NATO) and became one of the most developed economies in the world. The wealthier and more democratic West Germany dominated the unification process in the wake of the fall of the Berlin Wall in November 1989. Although the GDR legacy retains a strong influence in the country's east, it is fair to say that the unified nation stands in the (legal) tradition of the Federal Republic.

Germany's post-unification economy is export-driven and supports a high standard of living. Being able to take their physical safety and economic security for granted, large segments of the population place a high price on post-materialist values such as personal freedom and environmental concerns. The prosperous nation is poor in raw materials, however, and derives most of its considerable energy supply from imported sources. In fact, Germany is one of the

world's major consumers of energy and the largest electricity market in Europe. In 2010, more than half of the gross electric power generation of 621 billion kWh was based on lignite (23.7%), hard coal (18.7%), and natural gas (13.6%). Nuclear energy had a share of 22.6%. Renewables (wind, water, bio-mass, photo voltaic) accounted for 16.5 %.³⁶ While this distribution reflects a heavy reliance on fossil-fuel-fired power generation, the cost-competitiveness of coal and natural gas is expected to decline with increasing carbon pricing through the European Union's greenhouse gas emission allowance trading scheme.³⁷ Germany's existing nuclear power plants, on the other hand, are lucrative because the investment expenses of most reactors have been amortized and the fuel is not subject to carbon-based energy taxes. According to some estimates, a large plant with a capacity of 1,300 megawatts generates a profit of at least one million euros (1.3226 million U.S. dollars), and smaller 800 MW about half that much every day.³⁸

The German nuclear phase out goes far beyond the profit interests of a particular energy sector, however, as the accelerated energy switch is bound to have profound implications for the entire society.³⁹ Germans will have to dramatically increase the energy efficiency of their buildings and machinery. They will have to develop energy storage technologies and build massive high-voltage power lines to support a smart grid. Large wind farms and transmission lines will cause dramatic transformations of the environment, thus raising questions about the compatibility of the energy revolution with the green ideas that inspired it in the first place. Last but not least, the energy transition will be expensive. According to the *World Nuclear News*,

³⁶ Website of the European Nuclear Society, <http://www.euronuclear.org/info/encyclopedia/p/pow-gener.htm> (accessed: March 2, 2012).

³⁷ See the summary of EU legislation on the greenhouse gas emissions allowance trading scheme at: http://europa.eu/legislation_summaries/energy/european_energy_policy/l28012_en.htm.

³⁸ Ulrike Fokken, "Back to basic economics," *The German Times for Europe*, Nov. 2007.

³⁹ Interview with Stephan Kohler, Chief Executive of the German Energy Agency (dena). "The energy revolution in Germany can be a model for others," *The German Times for Europe*, June 2011.

Germany will have to invest about €25 billion (\$33 billion) per year until 2020 to achieve its post-Fukushima energy targets.⁴⁰

A second cluster of concerns revolves around the uncertain consequences of the nuclear exit for the price and supply of electricity. Critics of the nuclear phase out argue that the accelerated transition to renewables is neither practical nor economically feasible. The major question is whether the new technologies can deliver the steady flow of cheap energy provided by traditional base-load powers such coal-fired and nuclear plants. Germany's "big four" electricity producers, which are the major shareholders of the country's nuclear power stations, are projecting a heightened probability of power outages especially in winter when high demand meets a reduced supply of wind and solar power.⁴¹ Large manufacturers are warning that the nuclear exit will increase pollution and electricity prices, making German production less competitive on the global market and undermining the country's leading role on climate policy. The chief executive of the German energy giant RWE, which distributes electricity to more than 20 million customers, described the anticipated transition to renewable sources as a "Herculean task."⁴² The *Financial Times* labeled Germany's energy transformation "one of the biggest gambles ever made by an advanced industrial country on renewable energy."⁴³

Faced with the vocal criticism of a business community that usually counts amongst its staunchest supporters, the Merkel administration has been steadfast in noting that the people

⁴⁰ "Big money needed for German energy transition," *World Nuclear News*, Sept. 22, 2011.

⁴¹ Jennifer Morgan, "In Germany's Nuclear Phase-Out, Renewable Energy Plans are Clear," Website of the World Resources Institute, June 7, 2011 (accessed Dec. 12, 2011).

⁴² Gerrit Wiesmann, "Germany faces 'Herculean' task with move to renewables," *Financial Times*, Dec. 5, 2011.

⁴³ Sylvia Pfeiffer and Gerrit Wiesmann, "Nuclear fears spur Berlin to bet big on renewables," *Financial Times*, June 9, 2011.

want the transition to renewable energy and are prepared to pay for it.⁴⁴ In addition to invoking its democratic mandate, the center-right government seeks to focus the debate on the added economic value of green technologies. According to Environment Minister Norbert Röttgen of the Christian Democratic Union, investment into renewable sources of energy makes sense because it will create the high-tech employment opportunities of the future. The German Ministry of the Environment (BMU) reported in July 2011 that the number of jobs connected with renewable energy more than doubled by 2010 to 367,400 from 160,500 in 2004 and could be expected to rise to over half a million jobs in 2030.⁴⁵ The ministry promoted these numbers together with a broad information campaign, invoking the future as being “made in Germany” (figure 1). Röttgen summarized the official policy line when he described the German people as trailblazers on the path to a new energy era.⁴⁶ “If we proceed successfully,” the minister asserted, “others will follow.”⁴⁷ Stephan Kohler, the chief executive of the semi-public German Energy Agency (*Deutsche Energie-Agentur*, DENA), reiterated this claim by suggesting that Germany could become a high-tech clean-energy model for the world.⁴⁸

The German desire to become pioneers on the “path into a sustainable modernity” is remarkable, considering that the country belonged to the laggards when modern environmental

⁴⁴ “German Environment Minister: ‘Our Lifestyle Has Revolved Around a Dangerous Egotism,’” *Spiegel Online*, Nov. 28, 2011.

⁴⁵ Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (BMU), *Renewably employed. Short and long-term impacts of the expansion of renewable energy on the German labour market*, July 2011.

⁴⁶ *Aufbruch in ein neues Energiezeitalter: Gemeinsam auf dem Weg in eine nachhaltige Moderne*. Public address delivered by Environment Minister Dr. Norbert Röttgen, at the Free University of Berlin, on June 7, 2011, ed. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, June 2011.

⁴⁷ “A Green Future for Europe’s Biggest Economy. What Germany Must Learn from Chernobyl and Fukushima,” An Editorial by German Environment Minister Norbert Röttgen. *Spiegel Online*, March 27, 2011.

⁴⁸ “The energy revolution in Germany can be a model for others” *The German Times for Europe*, June 2011.

policies first began to be developed in the 1960s not least in the United States.⁴⁹ As we have seen, nuclear power has since gained status as a zero emissions industry. Why does the technology appear as part of the problem and not of the solution in Germany? The country could just as well apply its widely respected engineering know-how to the improvement of nuclear energy generation. A comparison with neighboring France throws the German situation into sharp relief. Both countries are highly developed but resource-poor EU member states that need to limit carbon dependence while at the same time ensuring energy security and market efficiency. The commercial use of nuclear power for energy generation should make as much (or as little) economic sense in Germany as in France.

Notably, the energy profiles of France and Germany were quite similar around the time of the 1973 oil crisis. Revealing a heavy reliance on imported fossil fuels, the oil shock triggered an urgent search for alternatives in both countries. The French government's massive drive to increase the nation's energy security resulted in the nuclear construction boom of the following decades. The nuclear sector also expanded in Germany, albeit to a lesser extent. The divide grew more explicit in the 1980s, when France turned to nuclear power not only as a means to gain energy independence, but to also mitigate aerial pollution from coal-fired power plants. With the adoption of the 1997 Kyoto Protocol and the launching of the European Union Emission Trading Scheme in 2005, the French government pursued nuclear energy as the primary means through which to reach the country's greenhouse emissions targets. Germany faced the same challenges but progressively addressed them differently.⁵⁰ As nuclear energy moved into the very core of

⁴⁹ Cf. Helmut Weidner and Lutz Mez, "German Climate Change Policy: A Success Story With Some Flaws," *The Journal of Environment Development* 2008, Vol. 17, No 4, Dec. 2008: 356-378, here 357.

⁵⁰ Yuka Fukushima's 2011 case study of nuclear power in Germany and France, while not free of linguistic and methodological problems, includes interesting observations and ideas. "Implications of the

the French energy policy, the German nuclear energy expansion tapered off and finally stagnated at a quarter of the nation's energy supply. Electricity generation from renewable sources, on the other hand, gradually increased to reach a share of twenty percent in the first half of 2011. Figure 2 illustrates the share of nuclear energy in the total electricity of France and Germany from the early 1970s to the present. Since there is no obvious economic reason for the divergence in the French and German energy approaches,⁵¹ it is hard to understand the respective positions without reference to the political sensibilities rooted in history, politics, and culture.

Nuclear Power, Democratic Change, and the Legacies of History

It is important to note that at its introduction in the 1950s, the commercial use of nuclear power stood for technological innovation, economic growth and societal progress also in Germany.⁵² In fact, the German nuclear industry received large subsidies and tax benefits, as well as substantial R&D investments, far into the 1990s. And yet, the technology's positive appreciation was complicated by the fact that the nuclear breakthroughs of the 1940s had been driven by fears of a Nazi-built atomic bomb. Although Hitler's regime never acquired nuclear weapons capability and Germans eventually came to understand their defeat in WWII in terms of liberation, the country's legacy of military aggression required a strict separation of the technology's civilian and military uses. As France staked its claims to global leadership on its status as a fully

Determinants of Energy Policy," MMP Thesis, University of Tokyo, Graduate School of Public Policy, July 29, 2011.

⁵¹ The impact of the colonial availability of uranium needs to be evaluated from an economic points of view. For a historical perspective, see Gabriele Hecht, *Being Nuclear: Africans and the Global Uranium Trade* (Cambridge: MIT Press: 2012)

⁵² Cf. Arnulf Baring, "Geschichte eines Realitätsverlusts," *Frankfurter Allgemeine Zeitung*, July 2, 2009.

equipped nuclear weapons state,⁵³ the demilitarized and divided Germany was forbidden to make or possess such arms and later affirmed the status quo by signing the Nuclear Non-Proliferation Treaty in 1975. Granted that the unified nation has the capacity to build all things nuclear and commands U.S. nuclear warheads under NATO, German history still conveys a suspicion about the technology that its western neighbor does not share. Whereas France traces its proud involvement to Marie Currie's pioneering research on radioactivity, German nuclear science is tainted by its compliance with Nazi politics.

Wary of Germany's military-industrial potential, the occupation authorities forbade any fission research in the defeated country in 1945. The build-up of nuclear science programs in the divided nation was an effect of the gradual political and economic integration of the respective territories into the cold war systems of alliances. Signaling the country's return into the circle of the world's leading industrialized nations, West-Germany opened its first nuclear power plant in the Bavarian town of Kahl in 1960. Five years later, Communist East Germany started up the Rheinsberg Nuclear Power Station about 75 kilometer north of Berlin. The GDR eventually drew about a tenth of its electricity supply from five nuclear reactors concentrated at the Ludmin Nuclear Power Plant near Greifswald on the Baltic Coast. Most of the country's electricity stemmed from lignite-fired thermal power stations. More consequential was the East-German capacity for uranium mining in the Ore Mountains near the Czech border. Having produced a total of about 220,000 tons of uranium for the Soviet Union,⁵⁴ the mines were closed after German unification in 1990. East Germany's nuclear reactors were shut down for safety reasons. All remaining atomic power stations were built by Kraftwerk Union AG, a subsidiary of

⁵³ Gabriele Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (Cambridge: MIT Press: 1998).

⁵⁴ Peter Diehl, "Uranium Mining in Eastern Germany: The WISMUT Legacy," <http://www.wise-uranium.org/uwis.html> (last updated April 17, 2011).

Munich-based engineering conglomerate Siemens. The newest reactor unit in operation came online in 1989.⁵⁵

The expansion of the West-German commercial nuclear power sector in the 1970s and 1980s overlapped with the formation and consolidation of the post-war peace movement, which reacted to the tensions of the cold war. Until German unification in 1990, nuclear missiles were installed in West Germany by the United States and in East Germany by the Soviet Union. The fact that the divided nation was a likely battlefield in a nuclear confrontation that it could not control explains the particular national inflection of the West-German pacifist movement. Combining an intense fear of nuclear death with a decided renunciation of the country's history of military aggression and genocide, broad strata of the population rejected the rearmament of the divided nation in the 1950s.⁵⁶ The anti-military sentiment that first manifested in response to the stationing of nuclear weapons on German soil continues to resonate in the country's foreign policy today. Having marched to the battlefield twice to return to a materially and morally destroyed homeland, German public opinion no longer supports the rhetoric of honorable death for the fatherland and seeks to avoid military involvement in world affairs. In historical perspective, Germany's often lamented failure to assume a global military presence commensurate with its economic power is the result of a societal reorientation that bore first fruit in the 1950s.

The anti-nuclear pacifist protests of the immediate post-war era became more systematic in the 1960s when a new generation of students subjected the status quo to a comprehensive

⁵⁵ Siemens announced its exit from the nuclear energy business in Fall 2011. The company is expected to boost its work in the renewable energy sector. "Response to Fukushima: Siemens to Exit Nuclear Energy Business," *Spiegel Online*, Sept.19, 2011.

⁵⁶ Cf. Alice Holmes Cooper, *Paradoxes of Peace: German Peace Movements Since 1945* (Ann Arbor: University of Michigan Press, 1996).

criticism that extended from the structural crisis of the universities to the exploitation of colonialized people, women and the environment. At the core of the protests stood the radical rejection of authoritarianism, imperialism and capitalism. The generational push for fundamental social and political change that erupted in many Western countries in the 1960s derived its specific historical dynamics in Germany from the rejection of a national consensus that imagined the German people as victims rather than perpetrators of Nazi crimes.⁵⁷ Gudrun Pausewang (born in 1928), the author of the two single most important anti-nuclear youth novels in Germany,⁵⁸ draws a clear link between her writing and repressed national guilt. Remembering the disgust she felt when her elders answered questions about their Nazi involvement with silence, Pausewang explained in a post-Fukushima talk show that she joined the anti-nuclear environmentalist movement because she wanted to speak out about the dangers she saw for her own and future generations. Silence was not option; Pausewang wanted to undercut any future use of the standard post-war apology: “We didn’t know about it.”⁵⁹ There is ample evidence that this heightened sense of personal and historical responsibility was widespread among the writers and activists that came of age at the end of WWII and in the 1960s. The critical questioning of the parents’ refusal to admit to the organized murder of millions of people triggered a democratic opening of post-war German society that changed the country from the bottom up.

The West-German anti-nuclear movement came into its own in the early 1970s, when an unusual alliance of local farmers and students from nearby Freiburg University occupied a

⁵⁷ Robert Moeller, “Remembering the War in a Nation of Victims: West German Pasts in the 1950,” in: *The Miracle Years: A Cultural History of West Germany 1949-1968*, ed. Hanna Schissler (Princeton: Princeton University Press, 2001), 83-109.

⁵⁸ Gudrun Pausewang, *Die letzten Kinder von Schewenborn: oder ... sieht so unsere Zukunft aus?* (Ravensburger Buchverlag 2003/1983); Pausewang, *Die Wolke* (Ravensburger Buchverlag 2012/1987). See the 2006 movie adaptation, *Die Wolke / The Cloud*, directed by Gregor Schnitzler.

⁵⁹ Günther Jauch talk show, *Das Erste*, March 4, 2012, 21:45 PM.

nuclear construction site at Wyhl in the wine-growing south-west of Germany.⁶⁰ Media coverage of police officers dragging away peacefully demonstrating citizens turned resistance against nuclear power into a national concern. The administrative court eventually withdrew the plant's construction license and the land became a nature reserve.⁶¹ The Wyhl experience encouraged the formation of similar citizen action groups near other planned nuclear sites, but success was not guaranteed. While a fast breeder reactor at Kalkar in North Rhine-Westphalia and the Bavarian nuclear fuel reprocessing plant at Wackersdorf were aborted,⁶² other large constructions projects such as the controversial Brokdorf nuclear power plant on the North Sea coast west of Hamburg were completed and went online.

As the oil shock induced nuclear construction boom subsided in the 1980s, the anti-nuclear protest movement turned to the reprocessing and storage of nuclear fuel. The demonstrations culminated in Gorleben, a municipality of about 700 inhabitants in the far northeast of Lower Saxony. Situated on the left bank of the Elbe river in a region also known as the Wendland, the small town was to accommodate the world's largest reprocessing plant together with a deep geological repository for highly radioactive waste. Not unlike the Wyhl experience, resistance against the project forged an uneasy alliance of local citizens and the urban Left.⁶³ Whereas anti-nuclear city dwellers carried out sit-down blockades or chained themselves to roads and railways, farmers blocked access with heavy machinery or by driving flocks of sheep onto streets. They also dispersed liquid manure at the exploratory drilling site and lined up spectacular tractor parades when taking their grievances to the local capital. The protests

⁶⁰ Joachim Radkau, "Eine kurze Geschichte der deutschen Atomkraftbewegung," in: *Aus Politik und Zeitgeschichte*, No. 46, 2011.

⁶¹ *Wikipedia*, "Anti-nuclear movement in Germany" (accessed March 20, 2012)

⁶² Radkau, "Eine kurze Geschichte," in: *Aus Politik und Zeitgeschichte*, No. 46, 2011.

⁶³ Cf. Christian Joppke, *Mobilizing Against Nuclear Energy: A Comparison of Germany and the United States* (Berkeley: The University of California Press, 1995), p. 109 ff.

culminated in the founding of the “Free Republic of Wendland” at the proposed site of the final repository. When the police finally evacuated the improvised “peace village” after thirty days of existence in June 1980, the small encampment became a symbol of the collective alternative lifestyle that has since become green legend.⁶⁴

The provincial government eventually abandoned the Gorleben reprocessing plant as “not politically feasible,” but continued to pursue the exploration site for the final repository.⁶⁵ Shipments of spent fuel elements from reprocessing plants in France (La Hague) and Britain (Sellafield) to an intermediate storage facility for vitrified high-level nuclear waste kept Gorleben in the public eye. In November 2010, an unprecedented 50,000 people protested against the transport of eleven dry storage “Castor” casks containing nuclear waste from the reprocessing of German spent fuel at La Hague. It took 17,000 police to secure the transfer from France to its Gorleben destination. The colorful presence of many young people at the Castor demonstrations testified to the fact that anti-nuclear culture had crossed over to the next generation. In present-day Germany, the movement’s symbolism unites people of all ages and ranks, including entire families (figure 3).

From the Fringes to the Center: Green Ideas Go Mainstream

An important station on the anti-nuclear movement’s journey from the extra-parliamentary fringes of the 1960s into the mainstream of German society and politics was the foundation of the German Green Party (*Die Grünen*) in 1980. Confronting a political elite they

⁶⁴ Radkau in: *Aus Politik und Zeitgeschichte*, No. 46, 2011.

⁶⁵ Joppke, p.113. Cf. Michael Sailer, “Nuclear waste repository case studies: Germany,” *Bulletin of the Atomic Scientist*, August 29, 2008.

perceived as ossified and undemocratic, Green delegates entered the lower house of German parliament (*Bundestag*) in 1983. The environmentalist movement was well developed also in France at that time, but the German proportional voting system proved more favorable to the expression of minority opinions in government. Whereas the winner takes all in the French semi-presidential system, German elections hardly ever produce absolute majorities. Instead, the greater part of the vote tends to split between the conservative union (CDU/CSU) and the social democrats (SPD), with smaller parties sharing the minority vote. The number of political parties to be represented in parliament is limited by the requirement to win at least five percent of the vote. This constitutional qualification was introduced after WWII in response to the fragmentation of the Weimar political party system, which prevented the formation of stable democratic majorities in the early 1930s. The introduction of the “five-percent clause” resulted in the formation of a three-party system that featured the business-friendly Liberals (FDP) alongside the CDU/CSU and SPD. Since grand coalitions between the two larger parties were the exception rather than the norm, the FDP assumed the role of the king maker party.

The arrival of the Greens on the national parliamentary stage added a new dimension to the political system of alliances, although the practical implications manifested only gradually. Initially, there was little love lost between the self-declared “green” outsiders and the “black” (conservatives), “red” (social democrats) and “yellow” (liberal) *Bundestag* establishment. The tensions were less stringent in the regions, where political coalitions were more praxis-oriented and less ideological. As Green party members started to enter the provincial governments, a second characteristic of the German political system came into play. Unlike unitary France, the German federal republic divides authority between the political center and sixteen states or *Bundesländer*. While the latter act in part as implementation agencies of federal law, they also

have considerable competencies of their own. This is especially relevant in the areas of policing, education, and taxation.⁶⁶ Federal legislation that impacts regional interests requires the approval of the federal council (*Bundesrat*), which represents the provincial governments at the national level. Dissenting majorities in the upper and lower houses of parliament can have profound effects on national policy making.

Germany's federal structure plays an important role in the regulation and administration of the country's nuclear energy power program. The regional governments are the responsible licensing authorities for nuclear power plants and repositories. The Federal Office for Radiation Protection (BfS) is the licensing authority for interim storage sites and transport and the operator of a final repository.⁶⁷ The Federal Ministry for the Environment (BMU) supervises the BfS and states, and has power to issue guidelines and directives in cooperation with other responsible agencies at the national and regional level.

The legal basis for the construction and operation of Germany's nuclear plants is the Atomic Energy Act (AtG).⁶⁸ Designed in the late 1950s to regulate the industry's expansion, the AtG was amended in 2002 and 2011 to write Germany's nuclear exit into law. In its most recent formulation, the act's purpose is "to phase out the use of nuclear energy for the commercial generation of electricity in a structured manner, and to ensure on-going operation up until the

⁶⁶ *Facts about Germany*, <http://www.tatsachen-ueber-deutschland.de/en/political-system/main-content-04/the-federal-structure.html> (accessed March 28, 2012).

⁶⁷ C.Greipl (BMU), "Public Communication Challenges in a Federal Nuclear Regulatory System," in: *Nuclear Regulation; Building, Measuring and Improving Public Confidence in the Nuclear Regulator*, Workshop Proceedings, Ottawa, Canada, 18-20 May, 2004; OECD 2006: 51 ff.

⁶⁸ Here and in the following, see: *Nuclear Legislation in OECD Countries: Regulatory and Institutional Framework for Nuclear Activities, Germany*; OECD 2011.

date of discontinuation.”⁶⁹ For the duration of the nuclear phase-out, the continued operation of Germany’s nuclear power stations remains a shared responsibility of the federation and states.

The characteristic interlocking of federal and regional competencies in the regulation and administration of nuclear power had profound consequences for the ascent of the anti-nuclear movement into government.⁷⁰ Although the Greens lacked a potential coalition partner at the national level, their participation in provincial governments provided them with both regional administrative power and legislative seats in the federal council. The gradual promotion of Green party members, such as Joschka Fischer or Petra Kelly, into positions of political prominence and administrative responsibility rendered German political culture more open and flexible. At the same time, the Greens’ adaptation to the political system brought its delegates into conflict with the radical groups and ideas that had founded the party. This problem was especially pressing when provincial green ministers oversaw the operation of nuclear plants rather than closing them, or mobilized the police against violent anti-nuclear protesters.

The loss of political support at the radical fringes was offset by gains amongst the new middle classes. As the 1968ers entered the professions and took charge of the bureaucratic institutions they had previously criticized if not rejected, their distrust of the state and capitalism gave way to a participatory spirit that created jobs and paid taxes. Serving as an integrative ideological bond, the nuclear exit remained non-negotiable for the Greens. As no other political party supported this position on principle, the Greens remained isolated at the federal level.

⁶⁹ “Gesetz über die friedliche Verwendung der Kernenergie und den Schutz gegen ihre Gefahren,” Website of the Federal Ministry of Justice, <http://www.gesetze-im-internet.de/atg/index.html> (accessed March 27, 2012). A bilingual German-English version is available at http://www.bfs.de/de/bfs/recht/rsh/volltext/A1_Englisch/A1_11_11_AtG.pdf.

⁷⁰ “Nuclear power regulation becomes political minefield,” *Deutsche Welle*, July 13, 2009.

The situation changed when Germans confronted nuclear fallout from radioactive clouds released by the Chernobyl nuclear disaster on April 26, 1986. Concerns about the contamination of the environment and especially of foodstuff deepened the anti-nuclear opposition and at the same time broadened the environmental capacity of the German state. Indeed, it is no coincidence that the Federal Environment Ministry (BMU) was founded on June 6, 1986 in the direct aftermath of the Chernobyl accident. The institutional concentration of environmental capacities at the highest government level reacted to the perceived severity of the crisis as well as to the delayed and disorganized nature of the federal response.⁷¹ As the center struggled to determine safety levels for meat, milk, and vegetables, the state of Hesse issued recommendations that were significantly lower and more frequent than in any other state.⁷² Hesse's openly deviationist course originated with a provincial government that had given the environment ministry to the Green party. The founding of the BMU was to both strengthen the center's position vis-à-vis green pressures from the regions and improve the national disaster response. In turn, the concentration of responsibilities at the federal level was instrumental in elevating (regionalized) environmental policy into a concern that had to be addressed at the highest level of German politics.

Notably, the new cabinet post originated with a center-right government that supported nuclear power despite sustained domestic protest against the industry's further expansion. Helmut Kohl, who served as Germany's chancellor between 1982 and 1998, oversaw the opening of several nuclear power stations and upheld his cabinet's pro-nuclear course after Chernobyl.⁷³

⁷¹ "From fringe issue to the heart of politics - 25 years of German environmental policy." Editorial by Environment Minister Norbert Röttgen, *BMU Website*, June 2011.

⁷² Radkau in: *Aus Politik und Zeitgeschichte*, No. 46, 2011.

⁷³ Cf. Gerard Braunthal, "Opposition in the Kohl Era: The SPD and the Left," *The Kohl Chancellorship*, ed. Clay Clemens and William E. Paterson (Portland: Frank Cass, 1998), pp. 143-162, here 149.

As in other industrialized nations including France and the United States, energy security provided a key argument in support of the technology. A second increasingly important justification revolved around the global mitigation of climate change. Indeed, much of the Kohl administration's efforts to reduce CO₂ emissions went into nuclear energy. Still, the research and development of alternative energy sources such as wind and solar also received increased funding, as well as infrastructural support.⁷⁴ Germany's pioneering electricity feed-in law, for instance, came into force during Helmut Kohl's third term in 1991. It required electricity utilities operating the public grid to ensure grid access and pay fixed prices (feed-in tariffs) for electricity generated from hydropower, wind energy, solar energy, landfill gas, sewage gas or biomass. The economic burden imposed by the law was borne by electricity suppliers and their customers. Public budget funds were not involved.

A comparative perspective highlights the particularities of the German energy path that started to manifest in the 1980s. As indicated in the global survey section of this article, the G.W. Bush administration also employed the energy security argument in support of the industry's expansion. In the United States, however, public concern with climate change mitigation was too weak to rationalize substantial investment into nuclear and/or renewable alternatives to fossil-fueled power generation. It was a combination of slacking electricity demand, increased regulatory oversight, rising nuclear construction costs, and decreasing natural gas prices that determined the industry's fate in the United States.

⁷⁴ Loren R. Cass, "Measuring the Domestic Salience of International Environmental Norms: Climate Change Norms in American, German, and British Climate Change Debates," *The Social Construction of Climate Change: Power, Knowledge, Norms, Discourse*, ed. Mary E. Pettenger (Aldershot: Ashgate, 2007): 36-40.

In Europe, climate change mitigation became a deep political concern both domestically and at the highest levels of EU policy making. The relatively high public acceptance of nuclear power in France allowed for the state-driven expansion of the industry in the 1980s. The relative strength of the anti-nuclear opposition prevented a similar outcome in Germany. Having claimed global leadership in the climate change arena, however, the Kohl administration could not easily abandon the task to reduce greenhouse gas emissions. Responding to the high public concern for green issues it had helped to create, the center-right government continued to push for climate change solutions at home and abroad. The successful completion of the Kyoto Protocol in 1997, for instance, has been credited in part to the preparatory work of Angela Merkel (CDU), then Minister of Environment, at the 1995 Conference of the Parties (COP1) conference in Berlin.⁷⁵ The German energy revolution, then, is not simply a creation of the political Left. One trajectory can be traced to a conservative coalition that saw nuclear power as part of a low carbon energy mix and found the policy path blocked by the anti-nuclear movement. The pursuit of climate change mitigation in the absence of a strong nuclear option generated policy support for renewable alternatives also in conservative circles.

Another historical trajectory leading from the 1980s to the post-Fukushima energy switch surfaced with the social democrats' renunciation of nuclear power in the aftermath of the Chernobyl accident. This was a serious change in direction for a party that had supported the technology unequivocally for more than three decades. Helmut Schmidt, Germany's Social Democratic Chancellor between 1974 and 1982, had pushed the program's expansion against both strong grassroots resistance and increasing disagreement within his own party. By the 1980s, however, the competition for green votes had all but eroded the social democrats' pro-

⁷⁵ Weidner and Mez, "German Climate Change Policy: 357.

nuclear stance. The internal opposition carried the day in August 1986, when the party congress at Nuremberg passed a resolution to abandon nuclear power within ten years.⁷⁶

The SPD's programmatic reversal on the issue of nuclear power prepared the ground for a coalition with the Greens by removing a major ideological obstacle. Twelve years later, the closely fought 1998 federal elections produced a parliament with a viable red-green majority. Gerhard Schröder, the Social Democratic governor of Lower Saxony, replaced long-serving Helmut Kohl in the Chancellery. Joschka Fischer, completing his life journey from archetypical 1960s street activist to respectable political party leader, accepted the posts of vice-chancellor and foreign minister.⁷⁷ Anti-nuclear politics had finally arrived at the heart of German politics.

Although the election had been dominated by high unemployment and the need to reform the German social security system, the nuclear question remained high on the new coalition's agenda. Embarking on a drawn-out process of consensus finding with the country's big-four energy utilities, the Greens gave up their immediate exit strategy and accepted a gradual phase out. Two years into its first term, the Schröder government announced a pragmatic compromise that limited reactor lifespans to thirty-two years while securing the operation of the existing plants. No further licenses for the construction and operation of new nuclear power plants would be issued. The agreement included a ban on the delivery of spent fuel elements for reprocessing and obliged nuclear power plant operators to set up intermediate onsite storage facilities for spent

⁷⁶ Nuclear Power in Germany; <http://www.world-nuclear.org/info/inf43.html> (updated Feb. 2012).

⁷⁷ Cf. Paul Hockenos, *Joschka Fischer and the Making of the Berlin Republic: An Alternative History of Postwar Germany* (Oxford University Press, 2008).

fuel. The German parliament approved the amendment to the 1959 Atomic Energy Act on December 14, 2001, and it was passed by the federal council on February 1st, 2002.⁷⁸

Complementing the nuclear phase-out, the Schröder administration expanded the feed-in law first introduced a decade earlier under Helmut Kohl into the more comprehensive Renewable Energy Source Act (*Erneuerbare Energien Gesetz*) in 2000.⁷⁹ The law has been designed to provide renewable energy generators with a reasonable return on their investment, and is reviewed on a regular basis. Similar tariff regulations have been introduced in more than fifty countries at the national or provincial level, including Australia, India and the United States.

Schröder's red-green coalition won a second term in 2002, but political support was faltering over the government's tough labor and welfare reforms. Early elections in 2005 produced a "grand" coalition between the SPD and CDU/CSU. Angela Merkel became the first female chancellor of Germany. Her administration's position on the nuclear issue was split. The Social Democrats, now in the position of the smaller government partner, continued to support the phase out it had written into law. The Christian Democrats wanted to reopen negotiations with the industry, but found themselves bound to a coalition agreement that guaranteed the 2002 legislative amendments. It was only when the conservative union was in the position to form a governing coalition with the business-friendly Liberals after the 2009 federal elections that the nuclear exit stood on the agenda again. And yet, the political turn-around was cautious and came with a heavy price tag. A law written for the approval solely of the Bundestag extended the maximum operation time for Germany's seventeen reactors by an average of twelve years, thus stretching the nuclear exit from 2021 to 2036. In return, the utilities agreed to a nuclear fuel tax

⁷⁸ Axel Vorwerk, "The 2002 Amendment to the German Atomic Energy Act Concerning the Phase-out of Nuclear Power," <http://www.oecd-neo.org/law/nlb/nlb-69/nlb69-vorwerk.pdf>.

⁷⁹ English translation at: http://www.bmu.de/english/renewable_energy/doc/3242.php.

to be used to subsidize the move away from nuclear energy and fossil fuels to renewable energy. Chancellor Angela Merkel took great pains to emphasize that the phase out would continue, albeit at a slower speed. Nuclear power was to “bridge” Germany’s transition into a nuclear free and low carbon energy future.

The anti-nuclear opposition did not accept the official rationale, but rather aimed to revitalize a protest movement that had calmed down since the 2002 compromise with the nuclear industry. On September 18, 2010, tens of thousands of Germans surrounded Chancellor Merkel's office in demonstrations that organizers described as the biggest of their kind since the 1986 Chernobyl disaster.⁸⁰ But although the extension of reactor life spans was unpopular, the Merkel administration seems to have trusted its ability to control the negative political fallout. It is fair to assume that the government expected the anti-nuclear protests to die down, with a majority being willing to accept a prolonged exit as the pre-condition for the widely desired clean energy transition. The position of Federal Environment Minister Röttgen is a case in point. Having first strongly rejected the lifespan extension, the minister later reworked Chancellor Merkel’s nuclear extension into a “great success” on the road into the era of renewable energy.⁸¹

The Fukushima accident half a year later prevented a return to compromise conditions, tipping the political scales towards the anti-nuclear opposition. Faced with crucial provincial elections in Baden Wuerttemberg and Rhineland-Palatinate on March 27, 2011 Chancellor Merkel almost immediately imposed a three-month moratorium on her cabinet’s extension of reactor lifespans. Nuclear power stations that had started operation in 1980 or earlier were shut

⁸⁰ Dave Graham, “Thousands surround Merkel office in nuclear protest,” *Reuters*, Sept. 18, 2010.

⁸¹ “Reversing the Atomic Phase-Out: German Minister Sparks Government Row Over Nuclear Power,” *Spiegel Online*, Feb. 8, 2010. “14 Years Longer Online: Merkel's Government Extends Nuclear Plant Lifespans,” *Spiegel Online*, Sept. 6, 2010.

down. The new legislation to be worked out in the following months effectively returned to the nuclear exit strategy put in place by the Schröder government a decade earlier. This time, however, the anti-nuclear consensus included the conservative party, which makes the decision difficult to reverse.

The conservative party's struggle to regain the political initiative in the aftermath of the Fukushima nuclear disaster did not succeed in the short run. Riding on a wave of public support, the Greens surged in noted state elections at the expense of all other political parties. In the Rhineland-Palatinate, the ruling social democrats suffered large losses and were forced to form a coalition government with the Green party. In Baden Württemberg, which is a traditional conservative stronghold and one of Germany's economic power houses, the Greens doubled their voter share and won their first-ever state governorship. The party's success in the first post-Fukushima elections marks an end as well as a new beginning for the Greens, who have lost a defining political issue and need to remake their political identity.⁸² At the same time, the resolution of the nuclear question has turned the environmentalist party into an attractive potential coalition partner for Chancellor Merkel's conservative union. As the conservatives become more environmentalist and the Greens more business oriented, their political coalition at the federal level would be congruent with the broad societal consensus against nuclear energy and in support of a renewable energy future.

⁸² See Arne Jungjohann's article in this volume.

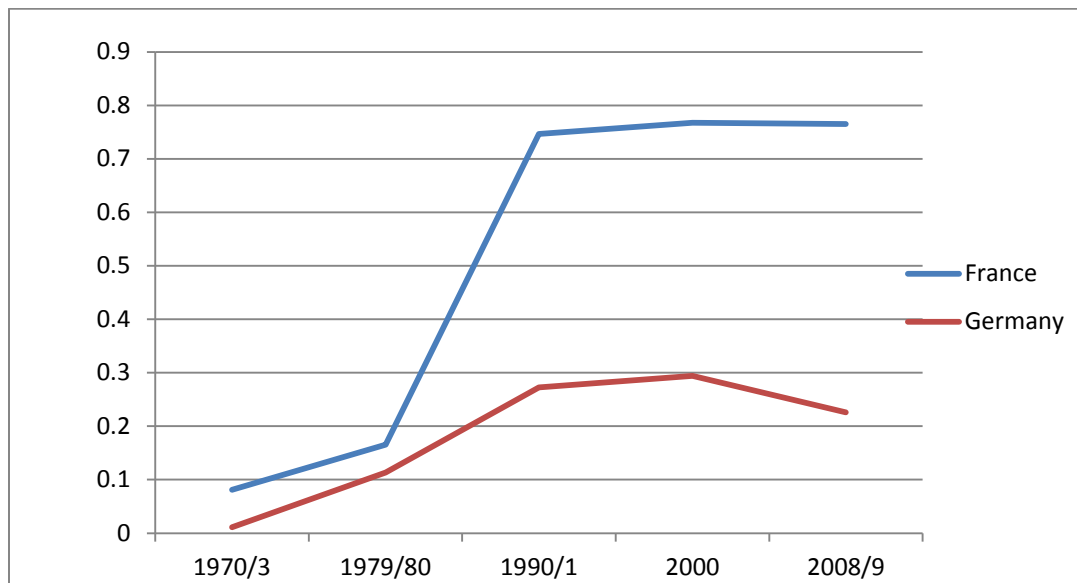
Figure 1: The Future – “Made in Germany”



Source: BMU website; <http://www.bmu.de/energiewende/doc/48073.php?bild=2>

Figure 2: Share of Nuclear Energy in Total Electricity Production

France vs. Germany from 1970-2009



Source: Country Nuclear Power Profiles, IAEA, Vienna, 2011.

Note: The data for 1970 and 1980 focus on West Germany only.

Figure 3: Generational Alliance against Nuclear Power



“Fukushima admonishes: shut down all nuclear power stations!”

Source: indymedia.org.au



Nuclear power? No thank you!

Source: (cc) flickr user dieter_titz