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HOW MUCH PRECAUTION IS TOO MUCH? EVALUATING GERMANY'S NUCLEAR PHASEOUT DECISION IN LIGHT OF THE EVENTS AT FUKUSHIMA

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ABSTRACT

Through the lens of the precautionary principle, this essay evaluates Germany's decision to prematurely phase-out nuclear power in light of the Fukushima Daiichi crisis in March 2011. Leading up to the crisis, nuclear power, which accounts for one-quarter of Germany's electricity supply, was viewed by the German government as a low-carbon 'bridge technology' to help the country transition into a fully renewable political economy. The crisis changed this view, though, and led Germany's Ethics Commission on Safe Energy Supply to quickly dismiss nuclear power's many important benefits. After analyzing the Commission's post-Fukushima report, this essay concludes that the phase-out decision represents a misguided and potentially damaging interpretation of the precautionary principle.

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I. INTRODUCTION

On March 11, 2011, the largest earthquake in Japanese history hit the Tōhoku region in the northeastern part of the country. Part of the earthquake's damage centered on the nuclear reactors at the Fukushima Daiichi power plant, in which the initial impact knocked out the plant's electrical power. Nearly one hour later, the earthquake triggered a devastating tsunami, which washed out the plant's auxiliary generators and shut down all reactor cooling systems.[13] After failed attempts to use the service water system, the control rods in Fukushima's three operational reactors melted, spurring a build-up of hydrogen gas and subsequent explosions that damaged the outer buildings of each reactor.[14,15] The entire chain of events resulted in the world's first triple reactor meltdown and large-scale releases of radioactive steam.[16,17] Only recently, on December 16, 2011, did Japanese Prime Minister Yoshihiko Noda finally declare the damaged reactors to be in a stable, cold-shutdown state.[18]

The Fukushima crisis generated global panic about the vulnerabilities of nuclear power. Viewing the events in Japan as unique and unforeseen, most countries with nuclear plants pledged to revamp their regulatory processes and look for new ways to improve reactor resiliency. On the other hand, a small group of countries, led by Germany, took more drastic action. On March 14, 2011, just three days after the earthquake, German Chancellor Angela Merkel announced a closure of Germany's two oldest nuclear power stations. In addition, she also declared a three-month moratorium on her previous plans to extend the lifetimes of each of the country's seventeen nuclear plants.[19] During the suspension, the Ethics Commission on Safe Energy Supply reviewed Germany's future nuclear plan and recommended a dramatic policy change: immediate closure of the country's seven oldest reactors and a complete nuclear phaseout by 2021. In short order, Merkel's ruling coalition quickly adopted the commission's recommendation, enacting a new energy policy that represented a full 180-degree turn from their original plan. In only three months, the German government completely changed

[13] The Atlantic Wire. *Meltdown: What Really Happened at Fukushima?* 2011. [Online]. Available: http://www.theatlanticwire.com/global/2011/07/meltdown-what-really-happened-fukushima/39541; accessed 20 December 2011.
[14] Dr. Matthias Lang et al, "Plant Specific Safety Review of German Nuclear Power Plants In Light of the Events in Fukushima-1," *Reactor Safety Commission* (17 March 2011), 2.
[15] The New American. *No Fukushima Related Deaths—No Surprises* 2011. [Online]. Available: http://thenewamerican.com/tech-mainmenu-30/environment/9537-no-fukushima-radiation-deaths-no-surprises; accessed 20 December 2011.
[16] "*What Really Happened at Fukushima?*"
[17] Lucas W. Davis, "Prospects for U.S. Nuclear Power after Fukushima," *Energy Institute at Haas Working Paper Series* (August 2011), 1.
[18] The Electric Daily News. *Japanese Government Declared Cold Shutdown of Fukushima 1 Reactors* 2011. [Online]. Available: http://www.shimbun.denki.or.jp/en/news/20111220_01.html; accessed 20 December 2011.
[19] The Guardian. *Germany Suspends Power Station Extension Plans as Nuclear Jitters Spread* 2011. [Online]. Available: http://www.guardian.co.uk/environment/2011/mar/14/germany-japan-nuclear-industry; accessed 20 December 2011.

course in response to an unpredictable event occurring 5,500 miles away.[20] Such an extreme reaction begs the question, why?

While the initial moratorium was likely a knee-jerk, political response, the government's ultimate decision for an early phaseout represents a misguided and potentially damaging interpretation of the precautionary principle. The precautionary principle expounds upon the famous adage, "*better safe than sorry*," and regulates risk by cautioning against activities with potentially dangerous consequences. The remainder of this essay will further evaluate the principle's merits and pitfalls in order to better understand its role in important international policy decisions, such as Germany's choice on nuclear power.

II. THE PRECAUTIONARY PRINCIPLE

The current interpretation of the precautionary principle dates back to the concept of "*Vorsorgeprinzip*", which served as the basis for German environmental policy in the early 1970s. In order to avoid environmental damage, the term *Vorsorge* required careful, forward-looking planning in addition to government regulation to mitigate any risk of potentially dangerous outcomes.[21,22] Moving on from its early German roots, the precautionary principle has become a major component of international policy in fields ranging from medical research to judicial review.[23] In light of its increased prominence, the principle has been heavily debated without any clear consensus on its appropriate interpretation. Although there are many available definitions, Cass Sunstein, a Harvard legal professor who currently runs the White House Office of Information and Regulatory Affairs, proposes a precautionary principle continuum, held together at either end by a weak and strong interpretation. The weak interpretation, which suggests that a lack of decisive evidence should not prohibit regulation, is both unobjectionable and important:[24] everyday people take precautions against uncertain hazards, such as avoiding dangerous areas at night or wearing seatbelts inside the car.[25] Where the problems with the precautionary principle lie is in Sunstein's strong interpretation: that regulation is required <u>whenever</u> there is a possible risk to health, safety, or the environment.[26] Such an interpretation can be damaging in many ways. For one, critics find the principle vague, incoherent,

[20] Ibid.
[21] David Kreibel et al, "The Precautionary Principle in Environmental Science," *Environmental Health Perspectives* (September 2011), 4.
[22] Mike Feintuck, "Precautionary Maybe, but What's the Principle? The Precautionary Principle, the Regulation of Risk, and the Public Domain," *Journal of Law and Society* (September 2005), 374.
[23] Anton Petrenko and Dan McArthur, "High-Stakes Gambling with Unknown Outcomes: Justifying the Precautionary Principle," *Journal of Social Philosophy* (Winter 2011), 346.
[24] Cass R. Sunstein, "The Paralyzing Principle," *Regulation* (Winter 2002-2003), 33.
[25] Ibid.
[26] Ibid.

and inadequate in determining just how much to regulate. Sunstein, however, highlights an even more serious problem: interpreted in its strong version, the precautionary principle becomes a paralyzing principle.

The ultimate goal of the principle is to regulate risk; however, risks are an inherent part of all policy choices. For example, one of the most familiar cases of regulation running afoul of the precautionary principle is the 'drug lag'. When governments choose highly stringent regulatory processes for introducing new medicine, they create a time lapse that prevents people from receiving a drug's potential benefits.[27] Because risks are ubiquitous, the precautionary principle forbids all courses of action: regulation, non-regulation, and everything in between.[28] Sunstein's argument then follows that if the principle is paralyzing, the only way it can guide policy occurs when policy makers wear blinders and focus on some aspects of regulatory situations while disregarding others.[29]

Three prominent mechanisms can lead to policy blinders: loss aversion, the availability heuristic, and probability neglect. People tend to dislike losses from the status quo more than corresponding gains. This both results in a concentrated focus on the losses related to an activity and a neglect of potential gains. Next, according to the availability heuristic, people often focus on some risks simply because the risks are well-known. For example, issues related to air travel generate significant public attention, while the hazards associated with heat waves often go unnoticed.[30] Finally, people are sometimes so focused on the bad outcome of a situation that they forget to consider the actual risk associated with that bad outcome. This line of thinking can lead to overly stringent regulation on low-probability risks.[31] These blinder mechanisms underscore the overarching problem associated with Germany's nuclear phaseout decision: the precautionary principle makes certain outcomes so salient that policy makers lock their focus solely onto averting catastrophe, regardless of the associated economic costs and risks. In such cases, the principle takes on a political form that impedes smart decision making.

[27] Cass R. Sunstein, "Beyond the Precautionary Principle," *University of Pennsylvania Law Review* (January 2003), 1023.
[28] Cass R. Sunstein, "The Precautionary Principle as a Basis for Decision Making," *The Economists' Voice* (2005), 5.
[29] Sunstein, "Beyond the Precautionary Principle," 1035.
[30] Ibid, 1009.
[31] Ibid, 1009-1010.

III. THE IDEAL VERSUS POLITICAL FORM OF THE PRECAUTIONARY PRINCIPLE

In spite of the problems related to the precautionary principle, the principle has several salutary aspects that should not be lost in policy analysis. In general, the principle is founded on strong moral goals. It reminds policy makers not to require proof in all situations, otherwise some environmental or health problems may be addressed too late. In addition, the principle often focuses on obligations to future generations, especially with regards to environmental issues such as global warming. Present-minded policy makers use the principle as well, and those with good intentions often concentrate on protecting the most vulnerable people in society from severe health and safety risks.[32] Without question, these types of goals should be incorporated into policy decisions; any form of rational risk regulation should take precautions into account.[33] The ideal use of the principle incorporates risk into some form of Risk Tradeoff Analysis or Cost Benefit Analysis, each of which look at policy decisions through a wider screen and acknowledge a variety of adverse affects that can result from both inaction and regulation.[34,35]

When salient risks spur a more political form of the precautionary principle, policy makers unfortunately lose sight of its ideal usage and salutary aspects. In his article titled, "Paradoxical Perils of the Precautionary Principle," Frank B. Cross, a professor at the University of Texas at Austin, notes that the principle favors whatever issue happens to be at the top of the current political agenda.[36] "In practice, the precautionary principle suffers from tunnel vision," writes Professor Cross, "The debate unfortunately dwells on the merits of the particular problem under consideration, without any attention to opportunity costs."[37] The reality of politically charged issues is that they can skew prioritization of government efforts to reduce risk. As a result, the principle's application in politics is prone to systematic distortions, especially when precautionary measures are used to regulate tiny risks.[38] The nuclear power situation in Germany highlights this very limitation and shows clearly how the precautionary principle can misguide important policy changes.

[32] Ibid, 1035.
[33] Sunstein, "The Paralyzing Principle," 37.
[34] Frank B. Cross, "Paradoxical Perils of the Precautionary Principle," *Washington & Lee Law Review* (1996), 23.
[35] Sunstein, "Beyond the Precautionary Principle," 1056.
[36] Cross, "Paradoxical Perils," 19.
[37] Ibid.
[38] Ibid, 4.

IV. GERMANY'S DECISION TO PHASEOUT NUCLEAR POWER

Nuclear power has been unpopular in Germany ever since radioactivity drifted into the country during the 1986 Chernobyl disaster.[39] In 2000, even though Germany is the fourth largest producer of nuclear power in the world, the lack of social acceptance for nuclear lead former Chancellor Gerhard Schröder to enact legislation to phaseout nuclear power by 2021.[40,41] However, in September 2010, just months before the Fukushima crisis, Chancellor Merkel spent significant political capital to reverse Schröder's decision, thereby extending the lifespan of all seventeen of Germany's reactors by an average of twelve years.[42] The reversal was the most important policy change of Merkel's second term in office and represented her firm commitment to making nuclear power a key component of Germany's future energy plans.[43]

Nuclear power is crucially important as a 'bridge technology' in Germany. As concern over global warming continues to grow, nuclear power, which is nearly emission-free regarding CO_2,[44] can help transform the German energy supply into low-carbon, renewable sources.[45] "Nuclear energy is no future technology," notes former German environment minister, Klaus Toepfer, "It's an energy that needs to lead to a time in which renewable energy can determine the energy supply alone."[46] Since gaining power in the fall of 2005, Merkel's Christian Democratic Union has made dealing with climate change a top priority. In fact, at the 2007 German Energy Summit, Merkel, who is a former environment minister herself, declared climate protection to be the biggest challenge of the 21st century.[47] Leading up to the 2009 UN Climate Conference in Copenhagen, Germany decided to raise its 2020 CO_2 reduction target from thirty to forty percent in an effort to rally additional supporters.[48] They then maintained their ambitious target when the conference failed to produce a binding

[39] CBC News. *Germany Weaning Itself from Nuclear Power* 2011. [Online]. Available: http://www.cbc.ca/news/technology/story/2011/03/23/tech-germany-nuclear.html; accessed 25 December 2011.
[40] BBC News. *Germany to Phase Out Nuclear Energy—Schroeder* 1998. [Online]. Available: http://news.bbc.co.uk/2/hi/world/monitoring/211911.stm; accessed 25 November 2011.
[41] Smart Energy Portal. *Germany's Nuclear Decisions—Maybe Not the Optimal Timing?* 2011. [Online]. Available: http://smartenergyportal.net/article/germany%E2%80%99s-nuclear-decisions-%E2%80%93-maybe-not-optimal-timing; accessed 25 December 2011.
[42] "*Germany Suspends Power Station Extension Plans.*"
[43] Commentary. *Panic as Policy* 2011. [Online]. Available: http://www.commentarymagazine.com/2011/03/16/panic-as-policy; accessed 26 December 2011.
[44] World Nuclear Association. *The Nuclear Debate* 2011. [Online]. Available: http://world-nuclear.org/info/inf50.html; accessed 26 December 2011.
[45] The Wall Street Journal. *Nuclear Energy Remains "Bridge Technology" for Germany* 2011. [Online]. Available: http://online.wsj.com/article/BT-CO-20110428-712604.html; accessed 26 December 2011.
[46] Ibid.
[47] Helmut Weidner and Lutz Mez, "German Climate Change Policy," *The Journal of Environment and Development* (December 2008), 364.
[48] Reuters. *Germany Sticking with Ambitious CO2 Target* 2010. [Online]. Available: http://www.reuters.com/article/2010/01/11/us-climate-germany-idUSTRE60A4D020100111; accessed 14 December 2011.

international agreement.[49] Beyond the 2020 timeframe, Germany currently plans to further reduce emissions by fifty-five percent in 2030 and eighty percent in 2050, with each target being compared to 1990 CO_2 levels.[50] Keeping these goals in mind, Merkel fought through months of heated debates in order to extend nuclear power because she understood its role in the broader energy strategy. The Fukushima crisis, however, changed everything. In just three days, all that Merkel's government had worked for regarding nuclear power was called into question.

The German government's initial reaction to Fukushima, to close the two oldest reactors and enact a three-month moratorium on nuclear extension plans, was likely a political response. In the two weeks following the crisis, Merkel's conservative party faced three important state elections, including the election in Baden-Wuerttemberg where the Christian Democratic Union had held power since 1953.[51] In a country with pre-existing caution towards nuclear energy, Fukushima clearly shifted power to the anti-nuclear Green Party: for example, 100,000 demonstrators from four hundred towns and cities across Germany flooded the streets in nuclear protest immediately after the crisis.[52] For the sake of her party, Merkel needed to show voters that she would at least reconsider her extension plans.

In addition to the moratorium, Merkel also established the Ethics Commission on Safe Energy Supply to analyze Germany's nuclear strategy in light of Fukushima. While the moratorium itself was merely a campaign tactic, the Ethics Commission's ultimate recommendation is much more interesting. An in-depth look into the Commission's final deliverable shows evidence of the precautionary principle's political application—the issue of nuclear power became so salient in Germany that early reactor closure was essentially the only available option.

On May 30, 2011, two and a half months after the crisis, the Ethics Commission, comprised of seventeen representatives from industry, research, and politics, recommended permanently shutting down the country's seven oldest reactors and returning to Chancellor Schröder's 2021 nuclear phaseout timeframe.[53] "The phaseout is necessary," reads the Commission's final report, "And is recommended in order to rule out risks posed by nuclear power in Germany in the future."[54] On the surface, the Commission's goal to prevent future catastrophe is laudable; however, their

[49] Business Green. *Germany Stands by Carbon Target, US Insists Copenhagen Delivered Progress* 2010. [Online]. Available: http://www.businessgreen.com/bg/news/1803852/germany-stands-carbon-target-us-insists-copenhagen-delivered-progress; accessed 14 December 2011.
[50] Spiegel Online. *Merkel Wants to Extend Nuclear Power Plant Lifespans* 2010. [Online]. Available: http://www.spiegel.de/international/germany/0,1518,714580,00.html; accessed 14 December 2011.
[51] Spiegel Online. *Merkel Sets Three-Month 'Moratorium' on Extension of Lifespans* 2011. [Online]. Available: http://www.spiegel.de/international/world/0,1518,750916,00.html; accessed 14 December 2011.
[52] Spiegel Online. *Germany Cripples Itself with Nuclear Angst* 2011. [Online]. Available: http://www.spiegel.de/international/germany/0,1518,751135,00.html; accessed 14 December 2011.
[53] Science. *Ethics Commission Recommends Swift German Nuclear Phaseout* 2011. [Online]. Available: http://news.sciencemag.org/scienceinsider/2011/05/ethics-commission-recommends-swi.html; accessed 31 December 2011.
[54] Dr. Klaus Töpfer et al, "Germany's Energy Transition: A Collective Endeavor for the Future," *Ethics Commission for a Safe Energy Supply* (30 May 2011), 1.

recommendation is misguided by the precautionary principle in three key ways. First, the report focuses heavily on the direct comparison between Germany and Japan. Japan, like Germany, is a highly organized and technologically advanced country. The fact that a nuclear crisis can occur in a place like Japan, follows the report, highlights the limitations of human precaution and potentially leaves Germany vulnerable to a similar situation.[55] What the report fails to recognize is that while the countries may be similar in some respects, the actual damaging event is not applicable to Germany. "Germany is not in a seismic danger zone," quips journalist David Crossland, "Its earthquakes are either too small to be registered by anyone but bored geologists, or just big enough to knock over a precariously placed garden gnome."[56] Even Germany's Reactor Safety Commission, also asked to review plant safety, noted in their report: "Initiating events that may lead to such tsunamis are practically excluded for Germany according to current knowledge."[57] A country comparison to justify policy reversal is simply not appropriate in this situation. Blinded by the saliency of Fukushima, the Ethics Commission locked their focus on nuclear crisis without stepping away to consider the bigger picture.

In addition to the Japanese comparison, the report also fails to appropriately evaluate the risks and consequences associated with nuclear power. In 2010, Merkel was adamant that extending nuclear timelines was unproblematic given the safety of Germany's reactors, which are among the safest in the world.[58] In fact, after reviewing safety precautions at all seventeen of Germany's reactors in light of Fukushima's electricity and flooding problems, the Reactor Safety Commission concluded that a "higher level of precaution can be ascertained for German plants."[59] In their final report, the Ethics Commission disregards all aspects of German nuclear safety and instead presumes that the costs associated with a nuclear catastrophe are simply incalculable.[60] As a result, no action other than quickly phasing out nuclear power is deemed acceptable. There will always be risks associated with nuclear power, but there are also important benefits as well. By establishing the costs as incalculable, especially in a country with proven safety standards, the Ethics Commission turned a blind eye to corresponding benefits and did not properly assess the consequences of their recommendation. This further example of inherent tunnel vision leads to the final pitfall of the Commission's report: failure to offer clear projections about the viability of renewable alternatives.

Nuclear power currently accounts for twenty-two percent of electricity generation in Germany. In addition, power generated from the reactors allows Germany to enjoy a power supply safety buffer,

[55] Ibid, 9.
[56] "*Germany Cripples Itself with Nuclear Angst.*"
[57] Lang, "Plant Specific Safety Review," 4.
[58] Spiegel Online. *Merkel Cabinet Colleague Spills the Atomic Beans* 2011. [Online]. Available: http://www.spiegel.de/international/germany/0,1518,752943,00.html; accessed 14 December 2011.
[59] Lang, "Plant Specific Safety Review," 13.
[60] Töpfer, "Germany's Energy Transition," 9.

which prevents power fluctuations and helps maintain steady industrial production processes.[61] By phasing out nuclear power, Germany will not only have to recoup almost a quarter of its power supply, they will also lose the majority of their safety buffer. The question then becomes, how will the country make up for such a dramatic loss? In order to maintain their climate protection targets, the ultimate goal is to move aggressively towards renewables. However, the Ethics Commission admits that "considerable additional resources need to be created in the field of renewables over the coming years."[62] In addition, the report recognizes wind as one of Germany's prominent renewable alternatives but concedes that the development of wind energy, especially offshore wind farms and replacements for old turbines, is well behind expectations.[63] If Germany fails to make progress on their renewables, they will become more dependent on fossil-fuelled power stations as well as oil, gas, and uranium imports. At a time when carbon emissions are actually increasing in Germany after the 2008 global economic crisis, improving energy productivity should be the government's primary focus.[64] Instead, the Ethics Commission's recommendation assumes a damaging interpretation of the precautionary principle. Although the German phaseout reduces the chance of a future nuclear crisis, a lack of suitable alternatives will put the country at risk of energy instability, while neglecting their ambitious climate protection goals.

V. CONCLUSION

In his 2005 article, "The Precautionary Principle as a Basis for Decision Making," Cass Sunstein warns that because the precautionary principle can lead to dramatic changes in policy, "serious thought needs to be given to the strengths and weakness of adopting this principle before using it to help make difficult decisions."[65] Sunstein's warning is particularly apt in the case of Germany's decision to phaseout nuclear power. The events in Japan showed the world that nuclear power plants, no matter how safe, are never indestructible. Risks are inherent in all situations, though, and Germany viewed Fukushima through a very narrow policy lens. For reasons of risk aversion, probability neglect, and the availability heuristic, Germany's Ethics Commission blindly focused on one salient issue, eliminating a nuclear catastrophe, and failed to consider the enormous risks associated with such a decision. The Commission's thought process and ultimate recommendation show how quickly a politically-charged, strong interpretation of the precautionary principle can misguide long-term policy. In this situation, the country that first developed the precautionary principle has unfortunately fallen victim to the principle's original, salutary intentions.

[61] Ibid, 15.
[62] Ibid, 16.
[63] Ibid, 25.
[64] Ibid, 14.
[65] Sunstein, "Basis for Decision Making," 2.

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