2015

he Quest for Sustainable Energy: Germany's Nuclear Scrutiny vs. "All of the Above"

Adam Arnold

Sustainable Development Law & Policy

Volume 15 | Issue 1 Article 5

The Quest for Sustainable Energy: Germany's Nuclear Scrutiny vs. "All of the Above"

Adam Arnold
American University Washington College of Law

The Quest for Sustainable Energy: Germany's Nuclear Scrutiny vs. "All of the Above"

*by Adam Arnold**

A widely applicable legal doctrine states that the value of an activity must outweigh the cost of that activity in terms of risk.[1] The purpose of this paper is to argue that the risks of nuclear power outweigh its benefits, even when greenhouse gas ("GHG") emissions are considered.

Fossil fuel consumption is problematic on many levels: in addition to the impact of combustion on the global climate, there is the inevitable scarcity of non-renewable resources, plus considerable environmental degradation due to extraction, transportation, storage, and consumption.[2] While increasing reliance on nuclear power helps address the problem of climate change, it carries with it many of fossil fuels' shortcomings as well as creating other significant problems for the environment and human health.[3] It is unreasonable to rely on one high-risk energy source to offset another.

Germany has recognized this issue and has built the phase-out of nuclear power and the development of renewable resources into its energy policy.[4] The United States has reintroduced support for nuclear power into its plan for energy independence.[5] Although very different geographically, the countries' similarities in terms of economic development and political structure allow for reasonable comparison of their energy policies.[6] The question addressed herein is: does new nuclear power have a place in a sustainable energy policy for developed nations? Reason, foresight, and signs of success in Germany[7] suggest the answer is "No."

Germany's move away from nuclear power began prior to 1980, when the term *Energiewende* ("Energy Transition") was coined.[8] Support for the Energy Transition grew following the Chernobyl Disaster in 1986.[9] Renewables became a focus through the 1990s, particularly following the creation of the United Nations Framework Convention on Climate Change at the 1992 Rio Summit. In 2000, Germany's coalition government under Gerhard Schröder established a timeline for removing nuclear power from Germany's power grid by 2022.[10]

The phase-out was interrupted with the election of Angela Merkel in 2005.[11] A trained physicist, Merkel believed in nuclear power as a safe, clean alternative to fossil fuels.[12] The 2011 Fukushima Disaster, however, caused Chancellor Merkel and Germany to return to the planned nuclear phase-out.[13] Since 2011, growth of renewables in Germany has been almost unparalleled.[14]

Beginning in 1991, direct taxation on German energy consumers has been used to subsidize cleaner energy.[15] These Feed-In Tariffs ("FITs") were adjusted in 2000 to further support the transition to renewable energy sources.[16] Technological advances – largely the result of FIT subsidization – have increased production and storage capacity significantly.[17] Availability of small-scale solar, wind, and other renewables have helped to localize production and lessen the need for large, centralized facilities.[18] If the goal is cleaner, safer energy and a reduction in GHG emissions, Germany's policy has been a success.[19]

In the U.S., President Obama incorporated nuclear power into his "all of the above" plan to minimize U.S. reliance on foreign fossil fuels, diversify the U.S. energy portfolio, and address climate change.[20] An anticipated renaissance of U.S. nuclear power faced some scrutiny following the Fukushima Disaster,[21] but that scrutiny has wilted under the demand for "clean" domestic energy. Subsidies[22] and liability limits[23] have resulted in the development of several new nuclear facilities in the United States.[24]

Nuclear power is touted for its reliability, efficiency, and lack of GHG emissions.[25] However, both the production and transport of Uranium generate GHGs,[26] and Uranium mining is rife with negative environmental impacts.[27] More significantly, disposal of waste from nuclear facilities remains an unsolved problem – a problem which will last for centuries.[28] Threats of natural disaster, terrorism, and catastrophic human error are of greatest concern, but the risks associated with nuclear power are not limited to potential calamity; extraction and disposal guarantee environmental harm and threats to human health. To describe nuclear power as "clean" is a gross misstatement.

Supporters argue that nuclear power is cost effective.[29] However, building and maintaining nuclear facilities is extremely expensive and requires substantial subsidies.[30] Arguments against public funding for renewables (like FITs) fall flat given the reliance on subsidies in other energy sectors.[31] The costs of extraction, disposal, security, insurance, and externalities associated with nuclear power are also considerable.[32] These costs are largely absent for renewables.

Nuclear supporters also claim that nuclear facilities require less space to produce much more energy than renewables.[33] However, land-use concerns regarding renewables generally ignore that (1) other energy sources, like nuclear, require space not only for facilities but also for continuous extraction of fuel (i.e. Uranium), which scars the landscape and creates its own environmental harms;[34] (2) large solar and wind plants can be optimally sited to take advantage of land with limited other uses;[35] (3) such plants pose far less risk to the environment than nuclear facilities, particularly when externalities are factored in;[36] and (4) land use for small-scale production is incidental.[37]

*L.L.M. Candidate 2015, American University Washington College of Law

Ultimately, the question of safety is decisive. Nuclear power carries such actual and potential risks to human health and the environment that it cannot be considered sustainable. One goal of sustainability is to minimize reliance on energy sources which pose the greatest threats to health and the environment.[38] For the reasons described, building new nuclear facilities is counter to this goal. Sustainability requires avoiding irremediable harm to the environment.

Shifting the focus of energy production away from fossil fuels is desirable given the obvious threats posed by climate change. Germany has committed itself to achieving minimal reliance on fossil fuels and nuclear power by maximizing energy production from renewables.[39] Fossil fuel facilities will continue to be used to the extent necessary, but the choice has been made to remove nuclear power from the equation, gradually but completely.[40] Such a shift has been slow to occur in United States energy policy, although President Obama's plan represents a positive move away from GHG-emitting energy sources. However, the plan fails to fully assess the risks and benefits of each energy source in the new, diverse portfolio. In the case of nuclear power, the failure to heed the warning of Fukushima may prove disastrous not only due to the hazards posed by nuclear energy, but through delay in technological improvements caused by funneling funding away from the development of truly clean energy sources.[41]

A forward-looking energy policy requires the public to use our resources wisely, not wastefully.[42] The development of efficient, reliable methods of producing, storing, and distributing clean energy benefits the consumer, the general public, and the environment.[43] A U.S. energy policy with a focus on renewables, conservation, and efficiency could foster innovation and public support, and could bring about a true renaissance in sustainable development. But to ignore the risks and unavoidable harms of nuclear power by subsidizing new facilities when so many other options – including energy conservation – have not been exhausted is a mockery of sustainability.

Endnotes: The Quest for Sustainable Energy: Germany's Nuclear Scrutiny vs. "All of the Above"

1 U.S. v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947). The calculus for negligence has been applied and adapted in various ways since Judge Learned Hand made his pronouncement.

2 GHG emissions occur throughout the lifecycle of fossil fuels. *See, e.g.*, Nuclear Energy Institute, Life-Cycle Emissions Analyses, http://www.nei.org/Issues-Policy/Protecting-the-Environment/Life-Cycle-Emissions-Analyses (last visited Nov. 26, 2014); Union of Concerned Scientists, The Hidden Cost of Fossil Fuels, http://www.ucsusa.org/clean_energy/our-energy-choices/coal-and-other-fossil-fuels/the-hidden-cost-of-fossil.html#.VGkxU0suMng (last visited Nov. 26, 2014).

3 Studies which consider mining and extraction of Uranium support the claim that, while significantly less GHG-intensive than any fossil fuel, nuclear power is no cleaner in regards to GHG emissions than renewable energy sources. *See generally* Ethan S. Warner & Garvin A. Heath, *Life Cycle Greenhouse Gas Emissions of Nuclear Electricity Generation*, 16 J. Indus. Ecology S73, S90 (2012).

4 *See* Heinrich Böll Stiftung, Energy Transition: The German Energiewende 33 (Jan. 2014), *available at* http://energytransition.de/wp-content/themes/boell/pdf/en/German-Energy-Transition_en.pdf. For the purposes of this paper, "renewable resources" principally refers to wind and solar power.

5 *See* Executive Office of the President, The President's Climate Action Plan 7 (June 2013), *available at* http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.

6 *See* CIA World Factbook: Germany, https://www.cia.gov/library/publications/the-world-factbook/geos/gm.html (last visited Nov. 26, 2014).

7 Since 1991, Germany's GHG emissions have declined while energy production from renewable sources has increased. Heinrich Böll Stiftung, Energy Transition, *supra* note 4, at 2.

8 Craig Morris, *Looking Back to the Energiewende in 1980 – 55 Percent Coal?* The Energiewende Blog (Mar. 26, 2013), http://energytransition.de/2013/03/55-percent-coal/.

9 *See* Heinrich Böll Stiftung, Energy Transition, *supra* note 4, at 54-55.

10 *See* Heinrich Böll Stiftung, Energy Transition, *supra* note 4, at 33-34.

11 *Slowing the Phase-Out: Merkel Wants to Extend Nuclear Power Plant Lifespans*, Spiegel Online, (Aug. 8, 2012), http://www.spiegel.de/international/germany/slowing-the-phase-out-merkel-wants-to-extend-nuclear-power-plant-lifespans-a-714580.html.

12 *Id.*

13 *See, e.g.,* Melissa Eddy, *Angela Merkel Defends Germany's Nuclear Deadline*, N.Y. Times, Mar. 12, 2012, *available at* http://www.nytimes.com/2012/03/13/world/europe/merkel-offers-defense-of-her-policy-on-energy.html.

14 Bernard Chabot, Updated Analysis in Electricity Production from Renewables in Germany in 2013 1(May, 2014), *available at* http://cf01.erneuerbareenergien.schluetersche.de/files/smfiledata/3/7/6/6/9/9/82REGon2013in514.pdf.

15 *See* Heinrich Böll Stiftung, Energy Transition, *supra* note 4, at 34-35.

16 *Id. See generally* Steven Ferrey et al., *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 Duke Envtl. L. & Pol'y F. 125, 169-71 (2010).

17 *See* Heinrich Böll Stiftung, Energy Transition, *supra* note 4, at 34-35.

18 *Id.* at 28-30.

19 As of 2013, energy production from renewable sources has outpaced the reduction of production from nuclear facilities, and the overall GHG output from fossil-fuel energy has slightly decreased. Germany surpassed its goals under the Kyoto Protocol four years ahead of schedule, and is on target to meet its phase-two goals. *Germany Ratifies Kyoto protocol Extension*, Argus Media, (Sept. 18, 2014), http://www.argusmedia.com/pages/NewsBody.aspx?id=929410&menu=yes; *see also* Chabot, *supra* note 14, at 1.

20 S*ee* Council of Economic Advisors, New Report: The All-of-the-Above Energy Strategy as a Path to Sustainable Economic Growth 2 (May 29, 2014), *available at* http://www.whitehouse.gov/sites/default/files/docs/aota_energy_strategy_as_a_path_to_sustainable_economic_growth.pdf; *see also* The President's Climate Action Plan, *supra* note 6 at 5.

21 *See, e.g.*, Leslie Kaufman, *Japan Crisis Could Rekindle U.S. Anti-Nuclear Movement*, N.Y. Times, March 18, 2011, http://www.nytime, s.com/2011/03/19/science/earth/19antinuke.html?_r=1.

22 T.L. Fahring, *Nuclear Uncertainty: A Look at the Uncertainties of A U.S. Nuclear Renaissance*, 41 Tex. Envtl. L.J. 279, 281-82 (2011).

23 Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 §§ 603-605 (2005). (increasing assessment amounts and liability limits for nuclear facilities within and outside the United States).

24 *See Nuclear Power in the U.S.A.,* World Nuclear Assoc., http://www.world-nuclear.org/info/Country-Profiles/Countries-T-Z/USA—Nuclear-Power/ (last updated Jan. 2015).

continued on page 59

Endnotes: The Quest for Sustainable Energy: Germany's Nuclear Scrutiny vs. "All of the Above"

continued from page 27

[25] *See, e.g., Environmental Emissions: Prevented*, Nuclear Energy Inst., http://www.nei.org/Knowledge-Center/Nuclear-Statistics/Environment-Emissions-Prevented (last visited Nov. 26, 2014).

[26] European Commission, Calculating the Environmental Cost of Uranium Mining (May 29, 2008), *available at* http://ec.europa.eu/environment/integration/research/newsalert/pdf/109na4_en.pdf.

[27] *Id.*; Benjamin K. Sovacool & Christopher Cooper, *Nuclear Nonsense: Why Nuclear Power Is No Answer to Climate Change and the World's Post-Kyoto Energy Challenges*, 33 Wm. & Mary Envtl. L. & Pol'y Rev. 1, 46 (2008).

[28] *See* John Deutch et al., The Future of Nuclear Power: an Interdisciplinary mit study, 53 (2003), *available at* http://web.mit.edu/nuclearpower/pdf/nuclearpower-full.pdf.

[29] *See Third Way: Nuclear a Highly Cost-Effective Climate Strategy*, Nuclear Energy Institute, http://www.nei.org/News-Media/News/News-Archives/Third-Way-Nuclear-a-Highly-Cost-Effective-Climate (last visited Nov. 26, 2014).

[30] *See generally* David Schlissel and Bruce Biewald, *Nuclear Power Plant Construction Costs* 2 (July, 2008), http://www.synapse-energy.com/sites/default/files/ SynapsePaper.2008-07.0.Nuclear-Plant-Construction-Costs.A0022_0.pdf (stating that nuclear plants cost billions of dollars to construct and require significant public funding, and that, both historically and foreseeably, plant costs are unpredictable and tend to greatly exceed estimates).

[31] Miguel Mendonga et al., Powering The Green Economy: The Feed-In Tariff Handbook 137-138 (2010).

[32] *See* Amy J. Wildermuth, *The Next Step: The Integration of Energy Law and Environmental Law*, 31 Utah Envtl. L. Rev. 369, 371 (2011); Justin Gundlach, *What's the Cost of A New Nuclear Power Plant? The Answer's Gonna Cost You: A Risk-Based Approach to Estimating the Cost of New Nuclear Plants*, 18 N.Y.U. Envtl. L.J. 600, 636-38 (2011).

[33] Martin Nicholson, *Nuclear Has One of the Smallest Footprints*, The Breakthrough (Sept. 20, 2013), http://thebreakthrough.org/index.php/programs/energy-and-climate/nuclear-has-one-of-the-smallest-footprints/.

[34] *See generally* European Commission, *supra* note 26; *see also* Wildermuth, *supra* note 33, at 371; Sovacool & Collins, *supra* note 27, 6-11.

[35] *See generally* U.S. Envtl. Prot. Agency, Handbook on Siting Renewable Energy Project While Addressing Environmental Issues, 3-6 (April 20, 2012), *available at* http://www.epa.gov/oswercpa/docs/handbook_siting_repowering_projects.pdf.

[36] *See* Gundlach, *supra* note 32, at 636-38; *see also* Wildermuth, *supra* note 32, at 371.

[37] *See* Heinrich Böll Stiftung, Energy Transition, *supra* note 4, at 28-29.

[38] *See, e.g.*, Irma S. Russell, *The Sustainability Principle in Sustainable Energy*, 44 Tulsa L. Rev. 121, 121 (2008).

[39] *See generally* Heinrich Böll Stiftung, Energy Transition, *supra* note 4.

[40] *Id.* at 33.

[41] *See* Bernell K. Stone, *Using Fair Return Prices to Assess the Value and Cost of Financial Guarantees for New Nuclear Power Plants*, 6 B.Y.U. Int'l L. & Mgmt. Rev. 83, 104-105 (2009); *10 Reasons Not to Invest in Nuclear Energy*, Center for American Progress (July 8, 2008), https://www.americanprogress.org/issues/green/news/2008/07/08/4735/10-reasons-not-to-invest-in-nuclear-energy/.

[42] *See, e.g.,* Hossein Haeri, *Efficiency Beyond the Low Fruit*, Pub. Util. Fort. 34, 36-37 (Oct. 1, 2012).

[43] U.S. Envtl. Prot. Agency, Assessing the Multiple Benefits of Clean Energy: A Resource for States, 5-8 (Sept. 2011), *available at* http://www.epa.gov/statelocalclimate/documents/pdf/epa_assessing_benefits.pdf; *Opportunities to Tackle Growth and Climate Challenges, Will Climate Action Cost Jobs?*, The New Climate Economy: The Global Commission on the Economy and Climate, http://newclimateeconomy.report/overview/ (last visited Nov. 26, 2014).

Endnotes: The Role of Advanced Cost Recovery in Nuclear Energy Policy

continued from page 38

US-Nuclear-Generating-Statistics. Last year nuclear reactors operated at a capacity factor of 90.1%. U.S. Energy Info. Admin., *supra* note 22, at Table 6.7B..

[26] Base load plant: "A plant, usually housing high-efficiency steam-electric units, which is normally operated to take all or part of the minimum load of a system, and which consequently produces electricity at an essentially constant rate and runs continuously. These units are operated to maximize system mechanical and thermal efficiency and minimize system operating costs." *Glossary*, *supra* note 21.

[27] *See* Robert Bryce, *supra* note 14, at 98–99.

[28] Levelized Cost Of New Generation Resources, *supra* note 18, at 6 (referencing Table 1).

[29] The largest single carrying charge for development of a nuclear power plant is interest on borrowed funds. For an in-depth discussion of the economics of nuclear power, *see The Economics of Nuclear Power,* World Nuclear Ass'n, http://www.world-nuclear.org/info/Economic-Aspects/Economics-of-Nuclear-Power/ (last updated Sept. 2014).

[30] Congressional Budget Office, Nuclear Power's Role in Generating Electricity 16 (2008), *available at* http://www.cbo.gov/sites/default/files/05-02-nuclear.pdf.

[31] V.C. Summer Nuclear Station Units 2 & 3, Quarterly Report to the South Carolina Office of Regulatory Staff Submitted by South Carolina Electric & Gas Company Pursuant to Public Service Commission Order No. 2009-104(A) 4 (2014), *available at* http://www.scana.com/NR/rdonlyres/CC6965BC-FFE3-4080-914C-1BFFE858EFE7/0/BLRA3Q2014.pdf. ("Spending through December 31, 2014, in current dollars is forecasted to be approximately $861 million less than the capital cost schedule approved in Order No. 2012-884.").

[32] "The combined attributes of passive safety, simplified design, modular construction and accelerated construction, all lead to reduced capital cost and minimized environmental risk." William J. Nuttall, Nuclear Renaissance: Technologies and Policies for the Future of Nuclear Power 128 (2005).

[33] Levelized Cost Of New Generation Resources *supra* note 18, at 6.

[34] *U.S. Natural Gas Wellhead Price*, U.S. Energy Info. Admin., http://www.eia.gov/dnav/ng/hist/n9190us3a.htm (last updated Nov. 28, 2014).

[35] Levelized Cost of New Generation Resources, *supra* note 18, at 3, 6.

[36] "Energy Sprawl" is a term for the large amounts of land necessary to certain types of energy production. *See* Robert I. McDonald et al., *Energy Sprawl or Energy Efficiency: Climate Policy Impacts on Natural Habitat for the United States of America*, 4(8) PLoS ONE (2009), http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2728545/.

[37] *Environment: Emissions Prevented*, Nuclear Energy Inst., http://www.nei.org/Knowledge-Center/Nuclear-Statistics/Environment-Emissions-Prevented (last visited Dec. 16, 2014).

[38] U.S. Energy Info. Admin., *supra* note 15, at 84, 68 (referencing Table 6.2 Coal Consumption by Sector and Figure 4.1 Natural Gas Overview).

[39] Seth P. Cox, *The Nuclear Option: Promotion of Advanced Nuclear Generation As A Matter of Public Policy*, 5 Appalachian Nat. Resources L.J. 25, 32 (2011).

[40] Nuclear Energy Institute, *supra* note 37.

[41] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 34830 (proposed June 18, 2014).

[42] *Id.*

[43] *See* Robert I. McDonald et al., *supra* note 36, at 1.

[44] *Id.*

[45] *Id.* at 4 (referencing *Figure 3, Land-Use Intensity For Energy Production/Conservation Techniques*).

[46] *See U.S. Expected To Be Largest Producer of Petroleum and Natural Gas Hydrocarbons in 2013*, U.S. Energy Info. Admin. (Oct. 4, 2013), http://www.eia.gov/todayinenergy/detail.cfm?id=13251.