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Subsidizing Advanced Nuclear Energy

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SUBSIDIZING ADVANCED NUCLEAR ENERGY

After Congress enacted the Energy Policy Act of 2005,[1] the Nuclear Regulatory Commission experienced a flood of applicants seeking construction and operating licenses to build modern nuclear power plants. The legislative purpose of the Act is to promote the development of cleaner forms of energy. By the time the act became effective, it had been over thirty years since the last application was filed. The Act provides, *inter alia*, a federal subsidy in the form of a production tax credit for "advanced nuclear facilities."[2] At first, it appeared the credit could be extremely valuable; however, built-in limitations and complex requirements reduced the value of the credit for each new applicant. Unfortunately, the credit does not apply to applicants filing after 2008. Since then, only one new application for a Construction and Operating License has been filed, and the industry's interest in advanced nuclear energy continues to remain substantially diminished. For nuclear tax subsidies to be effective, they must have the power to reduce or remove the high-risk barriers precluding investment in modern nuclear power plants. The legislative goals of the Energy Policy Act of 2005 cannot be given effect if the subsidies it provides progressively decrease to a nominal value.

The first part of this paper reviews the historical development of nuclear energy and compares nuclear energy to the other alternative sources of energy production. Part II discusses the process of planning, building, and operating a nuclear facility and the tax consequences of each stage. Part III reviews and critiques the production tax credit for advanced nuclear facili-

[1] Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594.
[2] *Id*. § 1306.

ties. Finally, Part IV considers alternative tax-based solutions to promote nuclear energy through changes to corporate tax brackets and amendments to the credit system.

I. Historical Development of Nuclear Energy; Alternative Sources of Production

A. Overview of Current Electricity Paradigm

Innovations in modern technology occur every day, making electronic devices increasingly accessible to the general public. The effects of cell phones, laptop computers, televisions, and automated home electronics permeate all levels of our society.[3] The modern technological age continues to expand the process of globalization, from connecting individuals a world apart, to improving healthcare in rural areas. None of these advancements would be possible without electricity.

For the fifteen-year period beginning from 1997 to 2012, electricity usage in the U.S. increased 17.5%.[4] The need for electricity will continue to grow as our population increases in size, and innovations in modern technology change the way we live our lives. As demand for electricity increases, so too must our ability to generate power. There are significant environmental implications related to the method by which power companies meet new demands. Modern power plants must reduce carbon emissions and decrease the energy industry's adverse impact on the environment. This would entail a significant departure from our current energy arrangement, which relies heavily on coal and natural gas. The question becomes how to achieve

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[3] In extreme cases, countries have taken defensive military action based on inaccurate representations of borderlines on Google Maps. Jenny Schlesinger, *Google Nearly Starts a War. Seriously*, ABC NEWS (Nov. 11, 2010, 12:43 p.m.), http://abcnews.go.com/blogs/politics/2010/11/google-nearly-starts-a-war-seriously/. Users of Facebook, an online networking website, planned and effectuated the overthrow of a dictatorial government. Wilson Rothman, *How the Internet Brought Down a Dictator*, NBCNEWS.COM TECHNOLOGY, http://www.nbcnews.com/technology/technolog/how-internet-brought-down-dictator-125222 (last visited Dec. 20, 2012). Even relationships end due to arguments between couples over the amount of time spent on the internet. *Jennifer Aniston Ended Relationship with John Mayer Because of His Twitter 'Obsession'*, TELEGRAPH, Mar. 23, 2009, http://www.telegraph.co.uk/ technology/twitter/5038203/Jennifer-Aniston-ended-relationship-with-John-Mayer-because-of-his-Twitter-obsession.html (last visited Dec. 20, 2012).

[4] U.S. ENERGY INFO. ADMIN., MONTHLY ENERGY REVIEW tbl. 7.2a, at 95 (Dec. 2012) (Electricity Net Generation: Total (All Sectors)), *available at* http://www.eia.gov/totalenergy/data/monthly/pdf/sec7_5.pdf.

these environmental goals, while meeting the production level requisite to satisfy growing demand. Yet, the industry is slow to respond to environmentally friendly alternatives. A market for cleaner alternative sources will emerge when the demand for electricity exceeds our national generating capacity, and proper federal subsidies are in place. Under those circumstances, nuclear power may become the new leader in production for modern electricity. [5]

Nuclear power is a safe, clean, and efficient form of energy.[6] It is capable of satisfying the increasing demand for electricity as well as significantly reducing carbon emissions compared to coal and natural gas powered facilities.[7] Today, there are 104 nuclear reactors "operating in the U.S., [which] are among . . . [the] safest . . . industrial facilities" in the nation.[8] The carbon footprint of nuclear power is comparable to that of renewable generation sources.[9] The operating life of a nuclear power plant is around forty years. In some cases, new operating licenses allow existing plants to extend their operating life by another twenty years.[10] Additionally, the average nuclear power plant has the ability to operate at 90% of its deemed "nameplate capacity."[11]

Unfortunately, many barriers prevent investors from pursuing modern nuclear development. The cost of preparing and filing an application with the Nuclear Regulatory Commission

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[5] *But cf.* Denis Binder, *NEPA, NIMBYs and New Technology*, 25 LAND & WATER L. REV. 11, 40 (1990) ("There has always been a substantial body of opposition to nuclear power.").
[6] *See* Arnold W. Reitze, Jr., *Electric Power in a Carbon Constrained World*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 821, 883 (2010) (noting that nuclear energy plants produce no conventional air pollutants or emissions).
[7] *See* Katarina O. Savino, *The Case for Nuclear Power Tax Incentives*, 123 TAX NOTES 329 (2009), *available at* 2009 TNT 74-8 (LEXIS).
[8], *Financial Stimulus to Nuclear Energy Industry Will Promote Job Creation, Industry Official Testifies*, TAX NOTES TODAY (Nov. 10, 2009), *available at* 2009 TNT 216-38 (LEXIS) (testimony of Carol L. Berrigan to the U.S. Senate Finance Committee). None of these facilities are eligible for the production tax credit created by the EPA-2005, since all were placed in service before 1993.
[9] *Id.*
[10] Joseph P. Tomain, *Nuclear Futures*, 15 DUKE ENVTL. L. & POL'Y F. 221, 231 (2005).
[11] Gary L. Hunt & George Given, *America's Resource Mix*, PUB. UTIL. FORT., 9-10 (July 2006), http://www.fortnightly.com/fortnightly/2006/07/americas-resource-mix/page/0/1 (discussing historic output for nuclear power plants in the early 2000s). "The 'nameplate capacity' of a reactor is its maximum rated output, which may be expressed in GW per hour, and is usually indicated on a nameplate physically attached to the reactor." Alan S. Lederman, *How Powerful Is the Nuclear Reactor Income Tax Credit?*, 114 J. TAX. 100 (2011).

(NRC) for a Construction and Operating License (COL) is expensive and time-consuming. Where the application for a COL is successful, investors will then face the daunting task of building the facility. Although unexpected costs incurred during the construction phase of nuclear facilities are expected to decrease as reactor designs are streamlined,[12] the facility's construction may be riddled with unexpected costs, design failures, lengthy inspections, and economic downturn that may result in the loss of financing.[13] Without congressional policies that control or reduce the significant investment risks associated with the construction of modern nuclear power plants, development will continue at a turtle's pace.[14] Thus, the nuclear industry is not likely to expand without significant federal support.[15]

B. History and Development of Nuclear Energy

1. Historical Overview

The history of atomic energy dates back to World War II and the Manhattan Project.[16] After World War II, the future of atomic power was somewhat uncertain. Some scientists saw a new opportunity to use atomic power as a commercial energy source.[17] However, the Atomic Energy Act of 1946[18] prohibited private development of atomic energy.[19] The Act's prohibition

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[12] Robert Zuppert, *Nuclear Power Standardization*, STRATEGIC STANDARDS EDUC., 11, http://www. strategicstandards.com/files/NuclearEnergy.pdf(last visited Dec. 20, 2012).

[13] *Duke Raises Cost Estimate for Lee Plant*, WORLD NUCLEAR NEWS (Nov. 7, 2008), http://www.world-nuclear-news.org/NN-Duke_raises_cost_estimate_for_Lee_plant-0711084.html (reporting that Duke Energy incurred $70 million in pre-construction costs in 2007 and estimating an additional $160 million in pre-construction costs for the two-year period beginning in 2008).

[14] Joseph P. Tomain & Constance Dowd Burton, *Nuclear Transition: From Three Mile Island to Chernobyl*, 28 WM. & MARY L. REV. 363, 364 (1987).

[15] The U.S. government began taking steps to reduce the financial and administrative burdens that preclude or inhibit nuclear power plant development. Some help came with the enactment of the Energy Policy Act of 2005. Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594. The Act confirmed Congress' plan to provide the needed support to encourage the revitalization of nuclear energy.

[16] Arthur W. Murphy & D. Bruce La Pierre, *Nuclear "Moratorium" Legislation in the States and the Supremacy Clause: A Case of Express Preemption*, 76 COLUM. L. REV. 392, 394-95 (1976).

[17] *See* Sonny Swazo, Casenote, *The Future of High-Level Nuclear Waste Disposal, State Sovereignty and the Tenth Amendment:* Nevada v. Watkins, 36 NAT. RESOURCES J. 127, 129 (1996) ("To better serve the national interest, Congress enacted the Atomic Energy Act (AEA) of 1954 to further private sector nuclear energy development for peaceful purposes . . . ."

[18] Atomic Energy Act of 1946, Pub. L. No. 79-585, 60 Stat. 755.

on private development stemmed from well-founded apprehensions related to the perceived destructive power of radioactive materials and the fear that commercial development could affect the environment as well as public health.[20] Within a few years, the industry's successful lobbying efforts led to the passage of the Atomic Energy Act of 1954.[21] The Act enabled the private sector to invest in and develop commercial uses for atomic energy.[22]

2. Commercialization of Atomic Energy

The Atomic Energy Act of 1954 provided the federal support needed to facilitate the private development of commercial nuclear power.[23] However, the liabilities associated with private development were too risky for the industry to bear without government support; investors were understandably reluctant to "proceed with a cloud of bankruptcy hanging over [their] head[s]."[24] In response to these concerns, Congress passed the Price-Anderson Act of 1957.[25] The Act largely limited the liability of utility providers upon the occurrence of a major accident.[26] As a result, entrepreneurs and major utility companies began the widespread construction of commercialized nuclear power plants from 1957 through the mid-1960s.[27] This period was known as the "Great Band Wagon Market" for nuclear energy.[28]

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[19] Tomain, *supra* note 10, at 227.
[20] Allen R. Ferguson, Jr., Comment, *Federal Supremacy Versus Legitimate State Interests in Nuclear Regulation:* Pacific Gas & Electric *and* Silkwood, 33 CATH. U. L. REV. 899, 899-900 (1984).
[21] Atomic Energy Act of 1954, Pub. L. No. 83-703, 68 Stat. 919.
[22] Joel Yellin, *High Technology and the Courts: Nuclear Power and the Need for Institutional Reform*, 94 HARV. L. REV. 489, 508 (1981); *see also* Tomain, *supra* note 10, at 227 (stating that the 1954 Act is the backdrop for our current regulatory scheme).
[23] Pac. Gas & Elec. Co. v. State Energy Res. Conservation & Dev. Comm'n, 461 U.S. 190, 194 (1983).
[24] *See* Tomain, *supra* note 10, at 228 (citing U.S. DEP'T OF ENERGY, U.S. COMMERCIAL NUCLEAR POWER: HISTORICAL PERSPECTIVE, CURRENT STATUES, AND OUTLOOK 6 (DOE/EIA-0315, Mar. 1982).
[25] Price-Anderson Act of 1957, Pub. L. No. 85-256, 71 Stat. 576.
[26] Diane Carter Maleson, *The Historical Roots of the Legal System's Response to Nuclear Power*, 55 S. CAL. L. REV. 597, 602 (1982).
[27] *See* Tomain, *supra* note 10, at 228 (citing U.S. DEP'T OF ENERGY, *supra* 24).
[28] *Id*.

Despite an initially promising inception, the Great Band Wagon Market slowed and eventually froze by the mid-1970s.[29] From 1978 to 2008, no new Construction and Operating Licenses (COLs) were approved.[30] Reasons for the thirty-year lull in development include: (1) unexpected and excessive capital costs in designing, building, and operating nuclear facilities;[31] (2) public safety concerns soaring after the partial-meltdown of Pennsylvania's Three-Mile Island plant in March of 1979 and the disastrous meltdown of Chernobyl in the former Soviet Union in April of 1986[32]; and (3) innovative development of competing sources of energy such as natural gas and renewable sources.

In 2005, the passage of the Energy Policy Act (EPA-2005) revived interest in nuclear energy, and ushered in what some have dubbed the "Nuclear Renaissance."[33] The EPA-2005 provides incentives for the development of advanced nuclear power plants such as production tax credits, "a loan guarantee program, and regulatory risk insurance."[34] By the end of 2008, sixteen new applications—proposing twenty-four nuclear reactors—were filed with the Nuclear Regulatory Commission.[35] Unfortunately, the EPA-2005 only sparked interest in advanced nuclear power for a short period of time.[36]

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[29] *See* Maleson, *supra* note 26, at 618 (noting the rapid rate of applications and construction for new nuclear facilities, followed by a sudden marked decline in the 1970s).

[30] The last construction permit for a nuclear power plant was issued in 1978 and the last operating license was issued in 1996. On February 9, 2012, the NRC approved its first COL in thirty years. *Nuclear Regulatory Commission Approves Construction of First Nuclear Units in 30 Years*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (Mar. 5, 2012), http://205.254.135.7/todayinenergy/detail.cfm?id=5250.

[31] *See* Melissa Powers, *The Cost of Coal: Climate Change and the End of Coal as a Source of Cheap Electricity*, 12 U. PA. J. BUS. L. 407, 409 (2010) (noting that construction costs for nuclear reactors skyrocketed in the 1970s).

[32] *See* T.L. Fahring, Note, *Nuclear Uncertainty: A Look at the Uncertainties of A U.S. Nuclear Renaissance*, 41 TEX. ENVTL. L.J. 279, 288 (2011) ("Actual nuclear accidents in the 1970s and 1980s, particularly those at Browns Ferry, Three Mile Island, and Chernobyl, did little to reassure the public.")

[33] Roland M. Frye, Jr., *The Current "Nuclear Renaissance" in the United States, Its Underlying Reasons, and Its Potential Pitfalls*, 29 Energy L.J. 279, 281 (2008).

[34] Sony Ben-Moshe et al., *Financing the Nuclear Renaissance: The Benefits and Potential Pitfalls of Federal & State Government Subsidies and the Future of Nuclear Power in California*, 30 ENERGY L.J. 497, 514 (2009).

[35] *See* U.S. Nuclear Regulatory Comm'n, Expected New Nuclear Power Plant Applications (Oct. 6, 2011) [hereinafter *Expected New Nuclear Power Plant Applications*], *available at* http://www.nrc.gov/reactors/new-reactors/new-licensing-files/expected-new-rx-applications.pdf.

[36] *Id*. Since 2008, only one new application for two new reactors was submitted and six reactors were suspended. *Id*.

3. How Nuclear Power Works

The commercial generation of electricity is largely based on Michael Faraday's principle of electromagnetic induction.[37] Electromagnetic induction converts mechanical energy into electricity by using an external force to rotate a conductor, such as copper wire, in a magnetic field.[38] Modern generators accomplish the same task but on a much larger scale. In lieu of Faraday's hand-crank, most modern generators consist of a turbine connected to a large magnet surrounded by coiled wires.[39] For decades, scientists continued to develop different ways to produce the mechanical energy needed to continuously rotate these turbines. Coal, natural gas, atomic energy, petroleum, solar, and hydro-power are among the methods in use today.[40]

Atomic energy harnesses the immense power of nuclear fission to create heat.[41] The heat generated from a nuclear reactor is used to produce steam from water. The steam then provides the mechanical energy needed to rotate the turbine of a generator. The fission process originates in the core of the nuclear reactor, where rods containing uranium pellets interact with neutrons that force the uranium atoms to split, resulting in a significant release of energy in the form of

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[37] Joshua J. Houser, Note, *Supplying the Light at the End of the Tunnel: Using State-Level Experience to Develop Federal-Level Renewable Energy Policy*, 19 SOUTHEASTERN ENVTL. L.J. 153, 157 (2010).

[38] Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 60 EMORY L.J. 877, 885 (2011).

[39] *See* Houser, *supra* note 37 (explaining how modern commercial generators work).

[40] William K. Jones, *An Example of a Regulatory Alternative to Antitrust: New York Utilities in the Early Seventies*, 73 COLUM. L. REV. 462, 520-25 (1973).

[41] *See* Marshall Brain & Robert Lamb, *How Nuclear Power Works*, HOWSTUFFWORKS.COM, http://science.howstuffworks.com/nuclear-power2.htm(last visited Dec. 20, 2012).

heat.[42] "To prevent overheating, control rods" may be inserted into the core, to regulate the rate of the reaction.[43]

"In some nuclear power plants," a secondary water system carries out the remainder of the process.[44] The first system circulates water around the core of the reactor, where the water converts to steam, reaching a temperature of 550 degrees Fahrenheit.[45] The steam generator contains a separate enclosed water-system.[46] The water from the core heats up the water in the generator, converting it to steam.[47] The steam passes through a system of pipes and collides with the blades of the turbine, forcing it to rotate. A shaft connects the turbine to the generator, converting the mechanical force of the turbine's rotation into an electrical current. Cooling water, supplied from nearby lakes or other natural sources, condenses the steam back to water.

4. U.S. Nuclear Amperage

The United States is home to 104 nuclear reactors.[48] Based off of production capacity, nuclear power accounts for 10% of the total nameplate capacity of U.S. based power generators.[49] Those 104 reactors historically average 90% net utilization of their nameplate capacity,

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[42] *See* N. States Power Co. v. United States, 151 F.3d 876, 878 (8th Cir. 1998) (outlining a brief description of the nuclear fission process). Uranium is a naturally occurring element and must be mined from the ground and enriched through a series of refining processes. The enrichment phase increases the concentration of U235 isotope needed to maintain the reaction. *Id.* The fission reaction begins when a neutron enters the nucleus of an U235 atom forcing it to split into smaller nuclei and release more neutrons, causing a chain reaction. *See* Brain & Lamb, *supra* note 41..
[43] Brain & Lamb, *supra* note 41.
[44] *Id.*
[45] Ben Casselman & Rebecca Smith, *How Nuclear Reactors Work . . . And the Dangers When They Don't*, WALL ST. J., Mar. 14, 2011, http://online.wsj.com/article/SB10001424052748704893604576200982857244_782.html.
[46] *See* Brain & Lamb, *supra* note 41.
[47] *Id.*
[48] *See Resources and Stats: U.S. Nuclear Power Plants*, NUCLEAR ENERGY INST., http://www.nei.org/resourcesandstats/nuclear_statistics/usnuclearpowerplants/ (last visited Dec. 20, 2012). One megawatt is equivalent to 1000 kilowatts or one million watts of electricity. *See Glossary*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/tools/glossary/index.cfm?id=M (last visited Dec. 20, 2012) (defining "megawatt" as one million watts of electricity or one-thousand kilowatts).
[49] *Total Energy: Annual Energy Review*, U.S. ENERGY INFO. ADMIN. (Sept. 27, 2012), http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0811a.

making them much more efficient and reliable than competing sources.[50] Although nuclear energy commands only 10% of the nation's nameplate capacity, it accounts for 20% of electricity actually produced. Comparatively, coal-powered facilities and natural gas powered plants account for 30% and 41%, respectively, of the overall nameplate capacity.[51] However, these statistics are based on production *capability*, not *actual* output.[52] According to the data for actual output, coal is the largest producer, accounting for 45% of total production.[53] Natural gas comes in second at 23% of total production.[54] The ability to operate at 90% of its nameplate capacity, well above competing sources, makes nuclear power a reliable source of carbon-free energy production.

C. Competing Sources

1. Natural Gas and Conventional Coal

Many factors affect the development of alternate sources of energy in the United States. The economics of energy production are but one important consideration. Recent developments in innovative drilling techniques for natural gas caused its market price to drop considerably, thereby making it a competitive source for energy.[55] Price fluctuations due to seasonal demand contribute some uncertainty to natural gas' economic competiveness, as compared to other

[50] *Compare Resources and Stats: U.S. Nuclear Power Plants*, *supra* note 48 (nuclear facilities operate around 90%) *with Total Energy: Annual Energy Review*, *supra* note 49 (natural gas production capability at 30% and coal production capability at 41%).
[51] *Total Energy: Annual Energy Review*, *supra* note 49.
[52] *See* Jennifer W. Fletcher et al., *Constructing Power: The Near Term Outlook for Construction of Power Generation Projects in the 21st Century*, J. AM C. CONSTRUCTION LAW., July 2011, at 4 (vol. 5, no. 2) (using net output statistics).
[53] *Id.*
[54] *Id.*
[55] *See* Hannah Wiseman, *Untested Waters: The Rise of Hydraulic Fracturing in Oil and Gas Production and the Need to Revisit Regulation*, 20 FORDHAM ENVTL. L. REV. 115, 118 (2009) (stating that innovations in horizontal and hydraulic fracturing and drilling techniques enabled natural gas developers to drastically increase their production capabilities); Fletcher et al., *supra* note 52.

sources.[56] Conventional coal remains the most economically inexpensive source of electricity production in the U.S.[57] However, the output rates for coal and natural gas are substantially lower than that of nuclear power. In 2010, production from natural gas and coal reflected 34% and 64%, respectively, of their overall nameplate capacities.[58]

Given these disparities, the environmental consequences of energy production should also be taken into account when deciding which course to pursue. The price advantages of natural gas and conventional coal over nuclear energy dissipate after taking into account their harmful impact to the environment; as one commentator noted, "The true cost of coal is not expressed in its market price or the levelized cost of generation. Coal destroys the environment and harms public health at every stage of production."[59] The same can be said for natural gas, though it does produce 60% less carbon emissions than conventional coal.[60]

2. Wind and Solar Energy

In 2010, wind and photovoltaic sources of energy accounted for only 2.9% of electricity produced, due to a lack of productivity.[61] Wind energy operates at only 27% of its nameplate capacity and solar energy averages only 14% of its nameplate capacity.[62] Although wind and solar produce a fraction of their nameplate capacities, they continue to receive significant federal

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[56] *See* John Shelton, Comment, *Who, What, How, & Wind: The Texas Energy Market's Future Relationship with Wind Energy and Whether It Will Be Enough to Meet the State's Needs*, 11 TEX. TECH ADMIN. L.J. 401, 405 (2010) (discussing fluctuations in natural gas prices in Texas).

[57] Seth P. Cox, *The Nuclear Option: Promotion of Advanced Nuclear Generation as a Matter of Public Policy*, 5 APPALACHIAN NAT. RESOURCES L.J. 25, 30 (2011).

[58] *Resources and Stats: U.S. Nuclear Power Plants*, *supra* note 48 (combining variables from Energy Information Administration data). Formula: Step One: (aggregate nameplate capacity for specific source) x (24 hours/day) x (365 days/year) = Estimated yearly output for nameplate capacity. Step Two: (Actual output for given year) / (Estimated yearly output) = True Production Capability.

[59] Cox, *supra* note 57, at 31.

[60] Josh Lute, *LNG Terminals: Future or Folly?*, 43 WILLAMETTE L. REV. 621, 627 (2007).

[61] *Table 1.1.A. Net Generation by Other Renewables: Total (All Sectors, 2002-October 2012*, U.S. ENERGY INFO. ADMIN.: ELECTRIC POWER MONTHLY (Dec. 21, 2012), http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1_a [hereinafter *Net Generation by Other Renewables*].

[62] Wind turbines combined for a total nameplate capacity of 39,516 megawatts, yet operated at only 27% of that amount. Similarly, solar (photovoltaic) energy totaled 8646 megawatts of nameplate capacity but produced only 14% of that amount. Combine variables from EIA data. *See Total Energy: Annual Energy Review*, *supra* note 49; *see also Net Generation by Other Renewables*, *supra* note 61.

subsidies.[63] As a result, wind and solar energy have significantly expanded over the past twenty years.[64] Renewable sources no longer stand as negligible alternatives to conventional methods of producing electricity, though they are far from capable of handling current and future electricity demands.[65] In addition, there are ecological concerns that befuddle renewable energy development.[66] These environmental setbacks present a challenging obstacle but by no means indicate that renewable energy is an incompatible solution to the growing demand for electricity. Until production capabilities in renewable energy significantly improve, we must choose to develop new coal, natural gas, or nuclear plants to meet the growing demand for electricity.

The revitalization of nuclear energy as an alternative energy source is the best solution to our future electricity needs, because of its ability to increase the national production capacity and

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[63] *See* Fletcher et al., *supra* note 52 (stating that wind receives $23.37 in federal subsidies and support and solar receives $24.34 per megawatt-hour).

[64] Solar-power production increased 340% from a net yearly output of 357 GWh in 1990 to 1212 GWh in 2010. Likewise, wind energy increased by 3393% in actual output from 2789 GWh in 1990 to 94,652 GWh in 2010. *See Net Generation by Other Renewables*, *supra* note 61.

[65] Some proponents of renewable alternatives believe sustainable production lies in the near future. *See* Christoph H. Stefes, *The German Solution: Feed-in Tariffs*, N.Y. TIMES (Sept. 21, 2011),http://www.nytimes.com/roomfordebate/2011/09/20/why-isnt-the-us-a-leader-in-green-technology/us-should-emulate-germanys-renewable-energy-model. But the twenty-five-year outlook for renewable energy may not be so optimistic. The long-term outlook supports the proposition that renewable alternatives will improve overall but continue to fall short of supplanting conventional methods such as coal, natural gas, or nuclear energy. *See generally* Fletcher et al., *supra* note 52. The International Energy Agency in its 2010 Annual World Energy Outlook, reported that the global electricity demand will increase 2.5% per year, making it the world's fastest growing energy source. Charles K. Ebinger & John P. Banks, *The Geopolitics of Electricity*, GLOBAL POST (Jan. 25, 2010, 08:23),http://www.globalpost.com/dispatch/worldview/100114/electricity-developing-world. Also, the U.S. Energy Information Administration anticipates that renewable resource production capacity will increase from 13% in 2011 to 16% in 2040. *Today in Energy: EIA Projections Show U.S. Energy Production Growing Faster Than Consumption Through 2040*, U.S. ENERGY INFO. ADMIN. (Dec. 5, 2012), http://www.eia.gov/todayinenergy/detail.cfm?id=9070. However, the Energy Information Administration report on peak loads from all grids shows an average of 1.28% increase in demand over an eleven-year period from 1999 to 2010. *Electric Power Annual 2010 Data Table 4.1.A*, U.S. ENERGY INFO. ADMIN. (Nov. 9, 2011), http://www.eia.gov/electricity/annual/html/table4.1a.cfm. Although renewable energy will continue to thrive as sources of energy, they are incapable of replacing natural gas or coal methods of production anytime in the near future.

[66] Wind and solar projects generally require much more land in order to generate electricity compared to that of other conventional sources. Wind turbines create turbulence that may "significantly reduce the efficiency of a wind-farm" and adversely affect the growth of nearby crops, causing "the land surface to become much warmer and drier." *Answers to Huge Wind-Farm Problems Are Blowin' in the Wind*, SCIENCE DAILY (Dec. 17, 2008), http://www.sciencedaily.com-/releases/2008/12/081216104307.htm. Likewise, the best geographic locations for commercialized solar-powered cells are deserts and large open fields that may have sensitive and vibrant species of plants and animals. Fletcher et al., *supra* note 52. It may be necessary to clear large sections of vegetation to maximize photovoltaic exposure to the sun's rays, forcing animals and wildlife to migrate to other less favorable regions. *See id.*

simultaneously reduce carbon emissions. However, the burden of bearing the investment risks in nuclear energy cannot rest solely on the shoulders of the private sector.[67] Expansion will not occur without effective government policies that reduce the financial risks of building and operating a nuclear power plant.

II. The Current Tax Regime

A. Tax Consequences for Nuclear Power Plants

Tax subsidies promote economic development and encourage certain actions of existing taxpayers. Subsidies frequently facilitate the creation of new businesses and the expansion of existing businesses.[68] The same is true for commercial utility services. In order to better understand the long-term value of a tax-subsidy, it is important to analyze general tax consequences for corporate utilities. Without beneficial tax subsidies, a modern nuclear facility will be too costly to build.[69] The lack of investment in nuclear power detrimentally affects our government and society in four ways: (1) the government loses the long-term potential tax revenues; (2) Americans go without the much needed employment opportunity; (3) less overall electricity is produced from carbon-free energy; and (4) the environment suffers the continued detrimental impacts of coal and natural gas production of electricity. In *Southern Pacific Transportation Company v. Commissioner*, the court noted that, "without such instigation by governmental bodies and absent any governmental subsidies it would appear highly unlikely, especially during some of the financially troubled periods here involved, that these facilities would have been constructed."[70] Therefore, a tax subsidy is tantamount to an investment, and the government must

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[67] *See* Tomain, *supra* note 10, at 228.
[68] *See* S. Pac. Transp. Co. v. Comm'r of Internal Revenue, 75 T.C. 497, 761 (1980) *supplemented,* 82 T.C. 122 (1984). *See generally* Dan T. Coenen, *Business Subsidies and the Dormant Commerce Clause*, 107 YALE L.J. 965, 977 (1998).
[69] *See* Savino, *supra* note 7, at n.28.
[70] *S. Pac. Transp. Co.*, 75 T.C. at 761.

carefully provide, allocate, and limit those subsidies so as to achieve the goal of economic expansion while increasing long-term tax revenues. To better understand *why* a tax-subsidy for nuclear power plants would be effective, this section focuses on the tax consequences associated with planning, building, and operating a hypothetical nuclear facility.[71]

1. Hypothetical Nuclear Power Plant

Every investor must determine the risks associated with pursuing a particular investment, and then weigh those risks against the likelihood that the investment will return income in excess of costs. In terms of planning the construction of a nuclear power plant, investors must first ask how much debt they need to incur to build a plant, how long it will take before operations commence, and how much it will cost to stay in business. This determination can be illustrated by analyzing the tax consequences of a hypothetical nuclear power plant.[72]

Assume these basic facts for a simplified hypothetical nuclear power plant: On July 31, 2006, investors purchased a plot of land encompassing 1550 acres for $30 million, to be the future site of an advanced power plant, named "*Nuclear*." On July 31, 2008, *Nuclear's* investors filed an application for a COL with the NRC for a new Westinghouse AP1000 reactor capable of outputting at least 1000 megawatts of electricity.[73] The NRC approved the application on Feb-

[71] The numbers, costs, and time-frames provided in the example are estimates based on public information. They are intended to be as close to reality and as accurate as they can be. However, cost-overruns are unpredictable, inflation will affect the values on long-term estimations, and the tax code may change. *See* Chris Dubay, *Taxmageddon: Massive Tax Increases Coming in 2013*, HERITAGE FOUND. (Apr. 4, 2012), http://www.heritage.org/research/reports/2012/04/taxmageddon-massive-tax-increase-coming-in-2013.

[72] Unfortunately, the cost of building a nuclear reactor is difficult to estimate due to unpredictable cost-overruns, construction scheduling delays, and financing issues.

[73] The Westinghouse AP1000 reactor design is capable of outputting an average of at least 1000 megawatts of electricity. The AP1000 has many improvements compared to previous reactor designs, including passive safety mechanisms which utilize gravity, natural circulation, and condensation and evaporation. The AP1000 reactor was designed to operate for sixty years ensuring a 50% longer economic life from previous designs. *See generally* U.S. NUCLEAR REGULATORY COMM'N, FINAL SAFETY EVALUATION REPORT RELATED TO CERTIFICATION OF THE AP1000 STANDARD DESIGN at 4-24 (NUREG-1793, Supp. 2), *available at* http://pbadupws.nrc.gov/docs/ML1120/ML112061231.pdf (discussing the design, output, and safety features of the Westinghouse AP1000 nuclear reactor).

ruary 12, 2012. By January 1, 2013, construction of the facility began. At the peak of construction, *Nuclear* employed more than 2000 workers.[74]

The total cost of construction will be $8 billion, of which 65% is attributable to construction costs and the remainder is attributable to financing costs.[75] The capital costs include acquisitions such as nuclear fuel rods, the construction of an on-site spent nuclear fuel storage facility, plant operations buildings, construction of a cooling lake, the reactor and containment building and all associated transmission equipment, equipment necessary to transfer coolant to the plant, an administration building ($30 million), and various parking lots and roads ($40 million). Assume the average loan repayment period from all forms of debt-related financing over the life of the project is fifteen years, with an average interest rate of 6% per annum.

The facility will commence operations by July 31, 2020, with a nameplate capacity of 1000 megawatts and operate at an average of 93% of its capacity. At least 400 permanent employees will be required to safely operate *Nuclear* throughout the year.[76] *Nuclear* will charge an average of 14.37 cents/kWh to its customers. At the end of *Nuclear's* economic life, the decommissioning expenses will total $525 million, about 10% of the capital cost to build the plant.

2. Levelized Cost of Energy for Hypothetical Plant

In order to determine whether *Nuclear* will be a profitable facility, its projected revenues must exceed its projected costs. The Levelized Cost of Energy (LCOE) is a formula used to es-

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[74] Southern Company projects that "at the peak of construction" of Plant Vogtle Units 3 and 4, "more than 3,500 workers will be needed." JOBS AT PLANT VOGTLE (n.d.) (Southern Co. promotional brochure), *available at* http://www.southerncompany.com/nuclearenergy/pdf/Vogtle_Jobs_Brochure.pdf (last visited Dec. 20, 2012).

[75] Southern Company's Plant Vogtle two nuclear reactors are projected to cost around $14 billion dollars and provide around 2200 megawatts of electricity. Steve Hargreaves, *First New Reactors OK'd in Over 30 Years*, CNN MONEY (Feb. 9, 2012), http://money.cnn.com/2012/02/09/news/economy/nuclear_reactors/index.htm. Although the costs of building the plants are exceptionally high, Southern Co. secured a federal loan guarantee of $8.3 billion. *Id*. Thus Georgia Power—one of the utility companies forming the consortium building Plant Vogtle—is liable for around $6 billion of the cost of building the two reactors of which 75% are construction costs and the remainder financing costs. Kristi E. Swartz, *Vogtle Construction Cost Rise; Project Remains Under Budget*, ATLANTA J.-CONST., Nov. 21, 2011, http://www.ajc.com/business/vogtle-construction-costs-rise-1236442.html.

[76] Southern Company will employ "more than 800 permanent employees to operate" Units 3 and 4 at its Plant Vogtle site. *See* JOBS AT PLANT VOGTLE, *supra* note 74.

timate the projected costs of the nuclear facility on a kilowatt-hour basis. The LCOE estimates the economic competitiveness of various alternative fuel sources by reducing numerous cost-variables into a single value, the price per kWh that would be required to recover all the costs associated with each plant over its economic life.[77] The LCOE reflects the average minimum price at which a utility would need to sell its electricity, in order to recover the costs of planning, constructing, and operating the plant.[78] Unfortunately, historic cost overruns during the construction phase of nuclear power plants have led investors to doubt that advanced nuclear facilities will achieve a competitive price-point in the consumer market.[79] Nuclear facilities completed in the 1980s and 1990s showed that actual costs were significantly higher than anticipated, and construction took much longer to complete due to long and unforeseen delays.[80] The Nuclear Energy Institute estimates the cost of modern nuclear reactors to be as high as $8 billion.[81] Because the costs of building and operating a modern plant are uncertain, the LCOE should not be exclusively relied upon in determining the point at which cost overruns will limit or preclude a feasible return in a competitive market.[82] Even though the regulatory and political environments accommodate the inception of modern nuclear power plants, investors must be certain that pursu-

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[77] *See* U.S. Energy Info. Admin., Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011 (n.d.), *available at* http://www.eia.gov/oiaf/aeo/pdf/2016levelized_costs_aeo2011.pdf.

[78] The LCOE takes into account overnight capital cost, fuel cost, fixed and variable operating and maintenance costs, financing costs, and an assumed utilization rate for each source of energy. *See generally* Marcial T. Ocampo, *How to Calculate the Levelized Cost of Energy – A Simplified Approach*, ENERGY TECH. EXPERT (Apr. 28, 2009), http://energytechnologyexpert.com/cost-of-power-generation/how-to-calculate-the-levelized-cost-of-power-or-energy/. The purpose of the formula used to derive the LCOE for energy resources was to simplify the process in assessing the competitive risk for investors. Beware—this "simplified" approach utilizes a complicated formula. *Id.*

[79] *See* JOHN M DEUTCH ET AL., UPDATE OF THE MIT 2003 FUTURE OF NUCLEAR POWER 8 (MIT Energy Initiative 2009), *available at* http://web.mit.edu/nuclearpower/pdf/nuclearpower-update2009.pdf.

[80] *Id.*

[81] *Nuclear Energy Institute Summarizes Nuclear Energy Legislation*, TAX NOTES TODAY, Oct. 21, 2009, at n.3, 2009 TNT 206-40 (LEXIS).

[82] One possible reason for uncertainty in "overnight costs" is lack of data. Almost sixteen years have passed since the most recent nuclear reactor commenced operations—the Watts Bar 1 in Tennessee began operations in 1996. *See Frequently Asked Questions: How Old Are U.S. Nuclear Power Plants and When Was the Last One Built?*, U.S. ENERGY INFO. ADMIN., http://205.254.135.7/tools/faqs/faq.cfm?id=228&t=21 (last visited Dec. 20, 2012). Likewise, the last submitted application for a COL was over thirty years ago. *See* Frye, *supra* note 33, at 283.

ing the extraordinary expense associated with building a new reactor will be a profitable enterprise.[83]

The Massachusetts Institute of Technology initiated a study to help understand the financial implications of building a modern nuclear power plant. Its researchers estimated the LCOE for nuclear energy in 2002. Based on an 85% net utilization rate and a forty-year economic life, the study projected the LCOE for nuclear power at 6.7 cents/kWh compared to coal at 4.2 cents/kWh and natural gas at 3.8 cents/kWh.[84] Researchers updated their findings in 2007, when construction costs of nuclear facilities were expected to double previous estimates. The new LCOE values yielded 8.4 cent/kWh for nuclear, 6.2 cents/kWh for coal, and 6.5 cents/kWh for natural gas.[85] The study further noted that nuclear power would become competitive if a carbon tax was imposed on coal and natural gas powered plants.[86]

With respect to *Nuclear*, the financing period and capital costs will be important factors in determining the minimum cost of energy.[87] *Nuclear's* reactor will require around seventy-five tonnes of low-enriched uranium to operate its core.[88] In March of 2011, the total estimated cost

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[83] The LCOE analysis will benefit these investors by providing the required cost per/kWh of energy in a certain year necessary to cover the costs of building and operating a nuclear facility over an assumed economic life.

[84] STEPHEN ANSOLABEHERE ET AL., THE FUTURE OF NUCLEAR POWER 7 (MIT Energy Initiative, 2003), *available at* http://web.mit.edu/nuclearpower/pdf/nuclearpower-full.pdf.

[85] DEUTCH ET AL., *supra* note 79, at 6 tbl. 1.

[86] *Id.* at 7.

[87] For *Nuclear*'s first year of operations, it must pay $531,629,802 in debt repayment expenses of which $308,942,267 is attributable to interest payments and $222,687,535 is attributable to principal. Computed using a loan repayment calculator. Principal = $5.25 billion. Interest = 6%/year. Repayment Period = 15 years. In addition, refueling costs must be taken into account. A typical reactor will operate the nuclear core by utilizing a cycling method for its nuclear fuel. *See The Nuclear Fuel Cycle*, WORLD NUCLEAR ASS'N, http://www.world-nuclear.org/education/nfc.htm (last visited Dec. 20, 2012) (noting that a 1000 megawatt reactor will require approximately 75 tonnes of low enriched uranium). About every ten to sixteen months, one-third of the fuel rods need to be replaced. *See* N. States Power Co. v. United States, 151 F.3d 876, 877 (8th Cir. 1998).

[88] One "tonne" is a metric ton, equal to 1000 kilograms or 2,204.62 lbs. Our hypothetical nuclear power plant would require approximately 75,000 kilograms or 165,346.5 lbs. of low-enriched uranium to operate. *See The Nuclear Fuel Cycle*, *supra* note 87 (noting that a 1,000 megawatt reactor will require approximately 75 tonnes of low enriched uranium).

of a nuclear fuel rod was $2,770 per kilogram.[89] Approximately $208 million of *Nuclear*'s capital costs come from the expense of nuclear fuel rods. Furthermore, *Nuclear's* first refueling cycle will total approximately $69,250,000 or an average of 0.85 cents/kWh each year.[90] The average cost in terms of kilowatt hours for these expenses will be approximately 7.37 cents/kWh. Based on these variables, an LCOE of 8.4 cents/kWh might be an appropriate estimate. To be conservative, assume *Nuclear* incurs costs of 10 cents/kWh to produce electricity throughout the year. With these background facts in mind, it is possible to understand the tax treatment of *Nuclear's* operations.

3. Gross Revenue

It is necessary to compute *Nuclear's* gross revenues for its first year of operations to understand the extent of any deductions that may affect its tax liability. Given that *Nuclear* has a nameplate capacity of 1000 megawatts, operates at 93% of its nameplate capacity, and charges its customers 14.37 cents/kWh for electricity, *Nuclear's* gross revenues will total over $1.17 billion by the end of its first year of operations.[91]

B. Expenses, Capital Expenditures, and Depreciation

Most expenses associated with the production of income may be deducted, relieving the taxpayer of liability for amounts equivalent to the reimbursement value.[92] Because the government taxes net income, gain, and profits, deductions from gross income ultimately decrease an

[89] *See The Economics of Nuclear Power*, WORLD NUCLEAR ASS'N, http://world-nuclear.org/info/inf02.html (last updated Dec. 2012).

[90] Computed as follows: ($2,770 average cost/kg of fuel rod) x (75,0000 kg) / [(1,000 megawatts) x (1,000 kilowatts) x (24 hours) x (365 days) x (93% operating capacity)] = 0.85 cents/kWh. In 2011, the average cost of refueling a reactor was around $40 million for each cycle (one-third of the core) or 0.68 cents/kWh of electricity produced. *See Resources and Stats: Costs: Fuel, Operation and Waste Disposal*, NUCLEAR ENERGY INST., http://www.nei.org/resourcesandstats/nuclear_statistics/costs/ (last visited Dec. 14, 2012).

[91] Computed as follows: (1,000 megawatt nameplate capacity) x (1,000 kilowatts/megawatt) x (24 hours/day) x (365 days/year) x (93% output average) x (14.37 cents/kWh produced and sold) = $1,170,695,160.

[92] *See* 26 U.S.C.A. § 162 (West 2012).

entity's taxable income resulting in less tax paid to the government.[93] Yet, deductions are more than just a legislative grace, as compared to tax credits or direct federal subsidies.[94] While tax credits and direct federal subsidies are limited in scope and duration, deductions are permitted routinely for every qualifying year, allowing for an equitable adjustment to the taxpayer's income and preventing unnecessary taxation of expenditures related to routine economic activity.[95]

1. Start-up Expenditures

The formation of a business usually requires investors to expend start-up expenditures, such as the costs of incorporating a business or training employees before business operations commence. Under § 195 of the Code, these amounts may be deducted from income.[96] For a large company, start-up expenditures must be capitalized—not deducted entirely from gross receipts—and taken as a ratable deduction for the fifteen-year period beginning from the month in which the active trade or business begins.[97] The practical effect of § 195 is that no deductions will be taken until the nuclear power plant commences operations by producing electricity.

Modern nuclear facilities that incur large costs during the start-up phase suffer from the capitalization requirement for two reasons. First, because the ratable deduction must be taken over a fifteen-year period, they suffer the detrimental loss in the time-value of money as com-

[93] A reduction in gross receipts will lead to an overall reduction of tax liability.
[94] *But cf.* INDOPCO, Inc. v. C.I.R., 503 U.S. 79, 80 (1992) (noting that deductions are grants of legislative grace).
[95] *See generally* 26 U.S.C.A. §§ 161-199 (West 2012) (code provisions pertaining to itemized deductions for individuals and corporations).
[96] 26 U.S.C.A. § 195(b)(1) (West 2012).
[97] 26 U.S.C.A. § 195(b)(1)(B) (West 2012). The deduction, however, is not to exceed $10,000 and begins to phase out once start-up expenditures exceed $70,000—reducing the deduction to $0. *Id.*§ 195(b)(3). The policy supporting § 195 is similar to the Court's holding in *INDOPCO, Inc. v. C.I.R.* that expenditures incurred in the successful creation of a new business are non-deductible capital expenditures. *See Costs of Starting a New Business,* 34 AM. JUR. 2D *Federal Taxation* ¶ 16291; *see also INDOPCO, Inc.*, 503 U.S. at 90 (holding that expenses incurred in a friendly takeover do not qualify as ordinary and necessary under § 162 of the Code). Hence the puny $10,000 deduction and the residual 15-year capitalization period. More fundamentally, start-up expenditures mirror those of business-expense deductions, which cannot be taken until the enterprise is up and running.

pared to a shorter period of capitalization.[98] Second, the deduction is *ratable* in a manner akin to straight-line depreciation, rather than double-declining or 150%-declining methods under normal ACRS rules.[99] Straight-line depreciation may be computed by taking the total value of the capital expense and dividing by the number of years to be depreciated. For start-up expenditures, the taxpayer will take a deduction from income in the amount of one-fifteenth of the total cost of starting the business, as the capitalization period is fifteen years. Normally for property purchases that have a class life of fifteen years, the taxpayer may take advantage of accelerated depreciation deductions under § 168, using the "150 percent declining balance method," to yield a larger deduction. For *Nuclear*, the start-up expenditures incurred would result from employee training costs and salaries prior to commencing operations. If the average training cost per employee for a one-year period is $10,000 and the average salary per employee is $55,000, then start-up expenditures will constitute approximately $26 million. Assuming other miscellaneous start-up expenditures total $10 million, the aggregate start-up expenditures amount to $36 million. Based on this figure, the yearly deduction for *Nuclear's* start-up expenditures would be $2.4 million dollars for the first fifteen years.[100]

2. Ordinary and Necessary Business Expenses

Current operating expenses are deducted under § 162 of the Code. However, the acquisition costs of any asset with a useful life of more than one year are not deductible.[101] For this rea-

[98] This is because a shorter capitalization period would result in a more valuable yearly deduction for the facility given the inflation and opportunity costs associated with the time deprivation of using the money presently versus using it in the future.
[99] 26 U.S.C.A. § 168(b)(1)(A), (b)(2)(A) (West 2012). The 150% declining balance method may be computed in year one by taking the value of the asset divided by the number of years the asset is to be depreciated (fifteen years) then multiplying by 150%. To compute for year two, subtract the deduction taken in year one from the value of the asset, then divide by fifteen and multiply by 150%. Continue for each subsequent year until the year in which the straight-line method would result in a greater deduction. In that year, switch to the straight-line method and continue for the remaining years.
[100] Computed as follows: ($36 million) / (15 years) = $2.4 million per year.
[101] *See* 26 U.S.C.A. § 167 (West 2012).

son, *Nuclear* cannot deduct the cost of the buildings, reactor, fuel rods, or fixtures. Section 162 of the Code permits a deduction for "ordinary and necessary expenses" in carrying on any trade or business.[102] Under § 162 of the Code, business expenses may be deducted where the benefit of the payment is realized within the current taxable year.[103] To qualify as a business expense, the outlay must be "ordinary and necessary."[104] Whether an expense is "ordinary" depends on the duration of the benefit. If the taxpayer realizes the benefit within the year the expenditure is made, it is very likely to be a deductible expense pursuant to § 162. The typical example is employee salary. Conversely, if the benefit is realized over more than a year, the expenditure must be capitalized, i.e., not deducted, pursuant to § 263. It is important to understand the difference between an expenditure that qualifies as a deductible expense and one that must be capitalized.[105] The significance between deductible and capital expenditures is that an ordinary and necessary business expense may be *deducted* entirely for the year it is incurred, while capital expenditures are *depreciated* annually based on the useful life of the asset purchased. The result is that capital expenditures are not fully deductible in the year the expense occurs, forcing a loss in the time-value of money over the depreciation period.

The facts and circumstances of the transaction have an important role in distinguishing the often fine-line between business expenses and capital expenditures. For nuclear facilities, the most valuable deductible expenses include reactor maintenance expenses and employee salaries.[106] In fact, the deductibility of maintenance expenses associated with removing a component

[102] *Id*. § 162(a).
[103] *See* Stevens v. C.I.R., 388 F.2d 298 (6th Cir. 1968) (holding that the taxpayer may deduct "recurring expenditures where the benefit derived from the payment is realized and exhausted within the taxable year").
[104] 26 U.S.C.A. § 162(a).
[105] In the case of capital expenditures related to depreciable assets, the full value of a capital expense must be incrementally deducted to its salvage value. *Id*. § 168(b)(4). Under favorable depreciation rules the salvage value is $0, according to the rules set forth in §§ 167 and 168 of the Code (depreciation sections).
[106] Another valuable deduction may be taken for research and development costs under § 174. *See id*. § 174 (permitting a deduction for research and experimentation associated with a trade or business).

of the reactor to maintain the status quo of the reactor's production can be quite complicated. Generally, expenses incurred in the removal of a depreciable asset in connection with the installation of a replacement asset are deductible.[107] For instance, when nuclear fuel rods must be replaced, the expenses associated with removing the old rods may be deducted rather than capitalized into the cost of the new rods. There remains a slight, yet notable distinction when removing the *component* of a depreciable asset. In the example above, the nuclear fuel rods constituted depreciable assets rather than a component of a depreciable asset, because they had a useful life of more than one year. The deducibility or capitalization of expenses incurred in removing and replacing a component of a depreciable asset will depend on whether the replacement constitutes a repair or improvement to the depreciable asset.[108] If replacement is a repair, the expenses may be deducted; conversely, if the replacement amounts to an improvement, the expenses must be capitalized and depreciated.

Nuclear is capable of operating at an average of 93% of its 1000 megawatt nameplate capacity. The average yearly expenses are computed from the LCOE estimated above, less the costs of the nuclear fuel rods. This is because the LCOE takes into account the refueling costs associated with operating the plant, and other costs characterized as capital expenditures and associated interest expenses.[109] Next, subtract the amount attributable to future decommissioning

[107] Rev. Rul. 2000-7, 2000-1 C.B. 712.

[108] *See Permanent Plant Closure Not Required for Decommissioning Costs*, TAX NOTES TODAY (Aug. 3, 2009), 2009 TNT 146-20 (LEXIS) (IRS memorandum of March 11, 2009, on nuclear decommissioning costs) (concluding that "the costs of removing a component of a depreciable asset are either deductible or capitalizable based on whether replacement of the component constitutes a repair or an improvement").

[109] It will not be necessary at this time to subtract the $5 million associated with the purchase of the land because it was a capital expenditure included in the loan repayment costs. However, the value of the land must be removed in determining the depreciation value of the plant.

expenses.[110] The deductible business expenses for *Nuclear's* first year of operations would be approximately $123.6 million.[111]

3. Interest Expenses

Section 163 of the Code[112] allows a deduction of the interest expenses paid in a trade or business on indebtedness.[113] Due to the similarity between interest payments and § 162 business expenses, business-related interest expenses would be deductible even if § 163 did not exist. Financing a nuclear energy plant often requires a multifaceted credit plan.[114] The interest accrued during the construction period of the facility must be capitalized into the overall expense of building the nuclear facility.[115] Once construction is complete and production begins, the taxpayer may deduct from gross revenue an amount equal to the interest expense incurred in paying its liabilities. For *Nuclear*, the interest expenses associated with the $5.25 billion loan would amount to $309 million in *Nuclear's* first year of operations.[116]

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[110] Decommissioning expenses will be discussed below. For purposes of this example, the applicable amount of future decommissioning expenses will total $8.75 million/year.

[111] Computed as follows: First, determine costs by subtracting fuel costs from LCOE (8 cents) – (.85 cents/kWh refueling costs) = 8.15 cents/kWh. Next determine nameplate hourly output at (1,000 megawatts) x (1,000 kilowatts) = (1 million average kilowatt output per hour). Then determine total yearly output (1 million kilowatts) x (24 hours/day) x (365 days/year) x (93% average hourly output) = 8.1468 billion kWh's produced in a year. Then determine total yearly cost at (8.1468 billion kWh's) x (8.15 cents/kWh) = $663,964,200. Then subtract the total costs of the loan payments and decommissioning expenses, ($663,964,200) – ($531,629,802 loan payments) – ($8.75 million future decommissioning expenses) = $123,584,398 of ordinary and necessary expenditures.

[112] 26 U.S.C.A. § 163 (West 2012).

[113] Revenue Ruling 69-188 explains the principle of interest as follows:

> [F]or tax purposes, interest has been defined by the Supreme Court of the United States as the amount one has contracted to pay for the use of borrowed money and as the compensation paid for the use or forbearance of money . . . . The payment or accrual of interest . . . must be incidental to an unconditional and legally enforceable obligation . . . .

Rev. Rul. 69-188, 1969-1 C.B. 54.

[114] Ben-Moshe et al., *supra* note 34, at 505-06.

[115] 26 U.S.C.A. § 263A(a)(2)(B) (West 2012). *See* Encyclopedia Britannica v. United States, 685 F.2d 212, 214 (7th Cir. 1982) (holding that the payments for acquisition of an asset which would yield income over a period of years must be capitalized into the basis of the asset).

[116] Computed using a loan repayment calculator. Note that the amount of the principal paid in the first year would equal $222,687,535 and the total interest would be $308,942,267.

4. Decommissioning Expenses

When a nuclear facility is no longer in service, it must go through the two-step process of "decommissioning." First, the facility must remove any equipment or materials contaminated with radiation, and place spent nuclear fuel rods in dry storage until final disposal. Second, the plant will be disassembled, which may take years to complete.[117] Nuclear decommissioning costs are defined broadly to include expenses incurred before, during, and after the actual decommissioning process.[118] More specifically, nuclear decommissioning costs encompass "all otherwise deductible expenses to be incurred in connection with the entombment, decontamination, dismantlement, removal, and disposal of the structures, systems and components of a nuclear power plant" that has permanently ceased the production of electric energy.[119] Section 468A(a) permits a current deduction for the future costs of decommissioning a nuclear power plant if the owners of the facility deposit contributions into a Nuclear Decommissioning Reserve Fund.[120] This broadly-reaching tax incentive provides a substantial benefit to nuclear facilities facing decommissioning costs as high as $400 million.[121]

Section 468A limits the amount of the deduction to the "ruling amount," which is the amount approved by the Secretary to ensure that the costs of decommissioning are covered but that no excess deductions are made over the economic useful life of the nuclear power plant.[122] Although costs associated with the decommissioning of a nuclear power plant may generally be

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[117] *See generally Nuclear Waste Disposal: Decommissioning of Nuclear Power Plants*, NUCLEAR ENERGY INST. (Oct. 2010), http://www.nei.org/resourcesandstats/documentlibrary/nuclearwastedisposal/factsheet/ decommissioningnuclearpowerplants/?page=1. The second step may be accomplished by choosing one of three options: (1) "Decon" (decontamination) disassemble and remove any contaminated parts then ship "to a low-level waste disposal site"; (2) "Safstor" (safe storage) safely store any contaminated materials on-site, wait 50 years for radioactive decay, then continue with disassembly; or (3) "Entomb" encase the radioactive structures in concrete and appropriately maintain the site until radioactive decay is at safe level. *Id.*
[118] *See* Private Letter Ruling 9638001, 1996 PLR LEXIS 1149.
[119] 26 C.F.R. § 1.468A-1(b)(6) (West 2012).
[120] 26 U.S.C.A. § 468A(a) (West 2012).
[121] *See Nuclear Waste Disposal: Decommissioning of Nuclear Power Plants*, *supra* note 117.
[122] 26 U.S.C.A. § 468A(d)(2).

deducted, the rules for capitalization remain unaltered.[123] Some costs associated with decommissioning the plant may qualify as "nuclear decommissioning costs," but must still be capitalized.[124]

For *Nuclear*, the decommissioning costs will be approximately 10% of the capital costs or $525 million, assuming that *Nuclear* plans to decommission in sixty years and receives approval by the Secretary to make even yearly contributions to a Nuclear Decommissioning Reserve Fund in accordance with § 468A(a). Therefore, *Nuclear* will contribute approximately $8.75 million to the Decommissioning Fund each year and will be permitted a deduction for the same amount.

5. Depreciation

The government taxes net income, leaving the costs incurred in the production of income untouched. To further this goal, Congress created a cost-recovery system known as "depreciation" which permits a yearly deduction for the exhaustion, wear and tear, and obsolescence of certain depreciable assets.[125] The cost recovery of capital expenditures used to purchase depreciable property occurs over a certain number of years. This period is known as the "recovery period," and is based on the asset's value, class life, and the depreciation method used.[126]

It is necessary to determine the amount of *Nuclear's* deduction for each depreciable asset, including the power plant itself and the nuclear fuel assemblies, in order to determine its total depreciation deduction. According to IRS Publication No. 946, an electric utility nuclear pro-

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[123] *See* Private Letter Ruling 9638001, *supra* note 118.
[124] *Id.* For instance, expenses incurred in the construction of an independent spent fuel storage building during the decommissioning of a nuclear facility must be capitalized even though such expenditures are properly characterized as nuclear decommissioning expenses.
[125] Limited to property used in the trade or business, or property held for the production of income. 26 U.S.C.A. § 167(a) (West 2012).
[126] The taxpayer must determine the depreciable asset's "recovery period," which is determined from its "class life." The class life is essentially the midpoint of the Asset Depreciation Range. *Id.* § 168(e)(1). *See generally* Rev. Proc. 87-56, 1987-2 C.B. 674.

duction plant has a class life of twenty years. However, the IRS grants a beneficial recovery period of fifteen years under the Modified Accelerated Cost Recovery System.[127] Because the nuclear power plant is classified as twenty-year property, it must utilize the 150% declining balance method under § 168.[128] When *Nuclear* commences operations on July 31, 2020, the applicable convention will be the half-year convention under § 168(d), which treats the property as though it were placed in service at the mid-point of the taxable year.[129] For *Nuclear's* first year of operation, the depreciation deduction allocable to the power plant would be 5% of its cost or approximately $157 million.[130]

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[127] IRS Publication 946, provides that an Electric Utility Nuclear Production Plant has a twenty-year class life and fifteen-year recovery period. The depreciable property "includes assets used in the nuclear power production and electricity for sale and related land improvements." However, it "[d]oes not include nuclear fuel assemblies." *See* IRS, U.S. DEP'T OF THE TREASURY, HOW TO DEPRECIATE PROPERTY tbl. B-2, asset class 49.12, at 112 (Publ'n 946, 2012) [hereinafter HOW TO DEPRECIATE PROPERTY], *available at*: http://www.irs.gov/pub/irs-pdf/p946.pdf ("Electric Utility Nuclear Production Plant"). The Modified Accelerated Cost Recovery System (MACRS) is the current depreciation system added to the Code in 1986. The MACRS is applicable to *tangible* property placed in service after December 31, 1986. 26 C.F.R. § 1.168(a)-1(a) (West 2012).

[128] 26 U.S.C.A. § 168(b)(2)(A) (West 2012).

[129] *Id*. § 168(d)(1), (d)(4)(A). Under § 168(d)(1) the general rule is to presume the half-year convention on all property unless that section of the Code provides otherwise. Property is considered to be placed in service when it is "placed in a condition or state of readiness and availability for a specifically assigned function." 26 C.F.R. § 1.46-3(d)(1)(ii) (West 2012).

[130] *See* Rev. Proc. 87-57, tbl. 1, 1987-2 C.B. 687 (depreciation deduction table). Depreciation deductions must be calculated from the aggregate cost of the applicable property that may be properly classified as "Electric Utility Nuclear Production Plant." For instance, the total capital costs included the construction of an administrative building unrelated to the production of electricity cost $30 million. Likewise, the storage building for spent nuclear fuel totaled $40 million. The costs associated with the purchase of nuclear fuel rods amounted to $207,750,000. Also, the startup expenditures of $36 million and the construction of various parking lots and roads totaled $40 million. The remaining capital costs might also include an operations fund, employee salaries fund, various expense funds, maintenance and repair funds, and marketing and advertising campaign funds. Therefore, for the sake of this example, it is necessary to make a presumption on the value of the power plant's depreciable property. To do so, assume the cost of the nuclear reactor and applicable property totals 60% of the capital costs or $3.15 billion. Compute the depreciation deduction as follows: ($3.15 billion) x (5% year one depreciation with half-year convention) = $157,500,000. In the second year, the amount of depreciation will increase significantly to account for a full taxable year.

The same analysis is required for each asset listed in the hypothetical. In the case of the administration building, the depreciation deduction would be $738,000.[131] For the spent nuclear fuel storage building, *Nuclear* may take a depreciation deduction of $984,400.[132] The allocable deduction for the initial fuel rods would be $41.5 million.[133] If, during the first year of operations, *Nuclear* purchases more fuel rods in anticipation of the refueling cycle that will take place in its second year of operations, then the fuel assemblies will be deemed "placed in service" in the year that *Nuclear* acquires them.[134] *Nuclear* would properly claim a depreciation deduction of $13.9 million.[135] The depreciation deduction for the various roads and parking lots would be $2 million.[136] Therefore, the total depreciation deduction *Nuclear* could claim for its first year of operations would amount to $214.6 million.[137]

[131] Under 26 U.S.C. § 168(c), nonresidential real property has a recovery period of thirty-nine years. The applicable depreciation method is straight-line depreciation under 26 U.S.C.A. § 168(b)(3)(A) (West 2012). *Nuclear* must use the mid-month convention to depreciate the administration building under *id*. § 168(d)(2)(A). The instructions to IRS Form 4562 provide the depreciation table for thirty-nine-year nonresidential real property placed in service at the mid-point of July. IRS, DEP'T OF THE TREASURY, INSTRUCTIONS FOR IRS FORM 4562 (2013), *available at* http://www.irs.gov/pub/irs-pdf/i4562.pdf. The applicable depreciation percentage is 2.461% for year one. Compute the depreciation deduction as follows: ($30 million admin. Building) x (2.461% depreciation deduction) = $738,300 deduction.

[132] Compute the depreciation deduction as follows: ($40 million storage facility) x (2.461% depreciation deduction) = $984,400 deduction.

[133] *See generally* FLP Group, Inc. & Subsidiaries v. C.I.R., 90 T.C.M. (CCH) 202 (T.C. 2005) (finding that nuclear fuel assemblies have a class life of five years, and referencing Rev. Rul. 87-56, 1987-2 C.B. 674 for the same proposition). *See also* Rev. Rul. 72-507, 1972-2 C.B. 198 (finding that whether nuclear fuel assembly has a useful life of 3-5 years is a question of fact). *But see* HOW TO DEPRECIATE PROPERTY, *supra* note 127 (specifically providing that nuclear fuel assemblies have a class life of five years and a recovery period of five years). Under 26 U.S.C. § 168(c), five-year property has a recovery period of five years. Under 26 U.S.C. § 168(b)(1), the 200% declining balance method is used and the applicable convention is the half-year convention under 26 U.S.C. § 168(d)(1). The depreciation deduction percentage is 20% for Nuclear's first year of operation. Rev. Proc. 87-57, 1987-2 C.B. 687, tbl. 1. Compute depreciation deduction as follows: ($207.75 million fuel assembly cost) x (20% depreciation deduction percentage) = $41,550,000.

[134] N. States Power Co. v. United States, 151 F.3d 876, 880-81 (8th Cir. 1998).

[135] Compute the depreciation deduction as follows: ($207.75 million) x (33% of the fuel assemblies to be replaced after year one) x (20% depreciation percentage) = $13,850,000 depreciation deduction.

[136] The roads and parking lot qualify as land improvements with a twenty-year class life and a fifteen-year recovery period. HOW TO DEPRECIATE PROPERTY, *supra* note 127, tbl. B-1, asset class 00.3, at 104 ("Land Improvements").

[137] Add each computed depreciation deduction for an aggregate deduction of $213,723,900.

C. Hypothetical Nuclear Power Plant Pre-Credit Tax Liability

Lastly, it is necessary to determine *Nuclear's* tax liability based on the corporate tax brackets enumerated in the Code. *Nuclear's* gross revenues total over $1.17 billion.[138] Once all the deductions are taken into account, *Nuclear's* taxable income will be approximately $512.4 million. At a 35% corporate income tax rate, its pre-credit tax liability will be $179.3 million.[139] The following table summarizes the first-year tax liability for *Nuclear*:

Hypothetical Nuclear Power Plant Deductions:		
	Deductions Claimed:	**Amount:**
1	Start-up Expenditures:	$2,400,000.00
2	Ordinary and Necessary Business Expenses:	$123,584,398.00
3	Interest Expenses:	$308,942,267.00
4	Decommissioning Expenses:	$8,750,000.00
5	Depreciation Expenses:	
	a. Nuclear Reactor and Related Equipment	$157,500,000.00
	b. Administration Building	$738,300.00
	c. Spent Nuclear Fuel Storage Facility	$984,400.00
	d. Initial Fuel Rods	$41,550,000.00
	e. Re-Fueling: Cycle 1	$13,850,000.00
	Total Deduction:	$658,299,365.00
	Gross Revenues:	$1,170,695,160.00
	Taxable Income:	$512,395,795.00
	Pre-Credit Tax Liability (at 35% rate):	$179,338,528.25

III. Current Nuclear-Specific Tax Incentives

A. Energy Policy Act of 2005- Tax Incentives

Congress enacted the EPA-2005 with the intent to encourage the future development of and investment in alternative production sources of electricity in the United States.[140] Nuclear energy provides a compelling option in fulfilling this goal. Of significant benefit, is nuclear

[138] Computed as follows: (1000 megawatt nameplate capacity) x (1000 kilowatts/megawatt) x (24 hours/day) x (365 days/year) x (93% output average) x (14.37 cents/kWh produced and sold) = $1,170,695,160.
[139] $513,294,595 taxable revenues and $179,653,108.30 total pre-credit tax liability.
[140] *See Nuclear Energy Institute Submits Comments on Nuclear Power Production Credit*, TAX NOTES TODAY (Mar. 30, 2006), 2006 TNT 61-19 (LEXIS) (letter from Richard J. Myers to John Parcell, dated January 18, 2006).

power's potential to help meet growing energy needs while "emit[ting] no environmentally detrimental fumes" traditionally associated with coal and natural gas.[141] The production costs for nuclear power have continued to decline, dropping to an average of 1.76 cents per kWh in 2007,[142] while the costs associated with licensing, financing, building, and operating modern nuclear facilities have continued to rise, and pose a formidable impediment to the expansion of nuclear power.[143] Although it was once believed that nuclear power would be "too cheap to meter,"[144] the capital costs of building a *modern* nuclear plant are much higher than those for coal or natural gas.[145]

B. Production Tax Credit for Advanced Nuclear Power Facilities

The EPA-2005 provided much needed help for investors, by authorizing a production tax credit for advanced nuclear facilities for their first eight years of operation.[146] On August 8, 2005, the EPA-2005 added § 45J, the Credit for Production from Advanced Nuclear Power Facilities, to the Internal Revenue Code. The credit was designed to facilitate commercial interest in building advanced nuclear power plants before the year 2021. The section provides modern nuclear energy plants with a production credit of up to 1.8 cents per kWh, for electricity produced by the taxpayer and sold to an unrelated party[147] during the first eight years of the facility's operation.[148] To qualify as an "advanced nuclear facility," the NRC must approve the reactor design after December 31, 1993.[149] In addition, the facility must also be owned by the tax-

[141] *See* Savino, *supra* note 7.
[142] *Id*.
[143] *See* ANSOLABEHERE ET AL., *supra* note 84, at 38.
[144] JOSEPH P. TOMAIN, NUCLEAR POWER TRANSFORMATION 8 (1987).
[145] *See* Savino, *supra* note 7.
[146] Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594.
[147] 26 U.S.C.A. § 45J(a)(2)(B) (West 2012).
[148] *Id*. § 45J(a)(2)(A).
[149] *Id*. § 45J(d)(2).

payer, utilize nuclear energy to produce electricity, and be placed in service after August 8, 2005, but before January 1, 2021.[150]

The amount of the credit is limited to $125 million per 1000 megawatt capacity. There is also a "national limitation" allocated on a *pro rata* basis after determining each reactor's portion of the 6000 megawatt national nameplate capacity.[151] The value of the credit will therefore not exceed $750 million per year with a maximum net value not exceeding $6 billion dollars over eight years.[152] Although the credit appears enticing, Congress has substantially limited its potential scope and value in five ways: (1) an application cutoff date for qualification; (2) the "national limitation;" (3) an annual credit amount; (4) a phaseout limitation; and (5) no adjustment for inflation for the value of the credit.[153] Each limitation will be discussed in turn.

C. Limitations

1. COL Application Cutoff Date for Qualified Facilities

The taxpayer must submit an application for a construction and operating license (COL) with the NRC no later than December 31, 2008, to qualify for the tax credit.[154] Construction of the facility must begin before January 1, 2014.[155] Construction "begins" for purposes of the credit when the taxpayer "initiates the pouring of safety-related concrete for the reactor building."[156] With December 31, 2008, as the cutoff date, no new applications qualify for the § 45J credit. By the end of 2008, the NRC had received sixteen applications proposing a total of twen-

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[150] *Id.* § 45J(d)(1)(A), (B).
[151] *Id.* § 45J(b). The credit will be reduced further by each facility's proportion of the aggregate nameplate capacity of all qualifying facilities. That percentage is used to reduce the 6000 megawatt limitation to each facility. *Id.*
[152] Computed as follows: First, ($125 million x 6) = $750 million. Second, ($750 million x 8) = $6 billion.
[153] *See* 26 U.S.C.A. § 45J(a)(1), (b), (c)(1), (c)(2), (d)(1)(B).
[154] Although IRS Notice 2006-40 provides a cutoff date of December 31, 2007, the Service later determined the final date to be December 31, 2008. I.R.S. Notice 2006-1 C.B. 855, § 3.01(1). *See* Savino, *supra* note 7, at n. 46 ("According to Tax Notes, although the notice as released specifies a December 31, 2007, deadline for filing a COL application, '[a]ccording to the IRS, the correct date . . . is December 31, 2008'") (citing *IRS Issues Interim Guidance for Nuclear Power Production Credit*, TAX NOTES DAILY (Apr. 12, 2006), 2006 TNT 70-6 (LEXIS)).
[155] *Credit for Production from Advanced Nuclear Facilities*, I.R.S. Notice 2006-40, 2006-1 C.B. 855, § 3.01(2) [hereinafter I.R.S. Notice 2006-40], *available at* 2006 WL 924985.
[156] *Id.*

ty-four nuclear units.[157] Since January 1, 2009, only one application was submitted and accepted by the NRC.[158] Three more are expected in 2012; however, none of these post-2008 applicants will qualify for the credit.[159] It is apparent that interest in building new reactors dropped significantly after the December 31, 2008, cutoff date. That only one new application has been filed since 2008 lends support to the proposition that investors will generally refuse to go forward with construction unless a credit is available. If Congress were to remove the cutoff date, it would allow new applicants to qualify for the credit, and increase interest in building new reactors.

2. The National Limitation

Section 45J imposes a "national limitation" of 6000 megawatts, as determined from the aggregate nameplate capacities of all qualifying facilities.[160] The national limitation restricts the maximum amount of kilowatt-hours from which the 1.8 cent credit shall be computed.[161] The limitation determines each facility's proportion of the aggregate nameplate capacity[162] that bears the same ratio to 6000 megawatts.[163] The Service determined that if the sum of the "nameplate capacity[ies] of all qualifying facilities . . . does not exceed the national megawatt capacity limitation, [then] each of those facilities will be allocated" its actual nameplate capacity.[164] If a total of six (6) qualifying facilities have an aggregate nameplate capacity of 6000 megawatts (1000 actual megawatts for each separate facility), then each facility would be allocated its actual nameplate capacity of 1000 megawatts. However, if their aggregate nameplate capacity exceeds

[157] *See Expected New Nuclear Power Plant Applications, supra* note 35.
[158] *Id*.
[159] *Id*.
[160] 26 U.S.C.A. § 45J(b)(2) (West 2012).
[161] *Id*. § 45J(b).
[162] The sum of all other qualifying facilities' nameplate capacities.
[163] The Secretary determines the manner in which to allocate the national megawatt capacity limitation among qualifying facilities. *See* 26 U.S.C.A. § 45J(b).
[164] I.R.S. Notice 2006-40, *supra* note 155, § 3.03(1).

the national limit, IRS Notice 2006-40 provides that the 6000 megawatt capacity will be allocated in proportion to each facility's nameplate capacity.[165]

The following example illustrates the national limitation's application. If a total of twenty-six nuclear facilities combined for an aggregate nameplate capacity of 26,000 megawatts, with each facility having an actual nameplate capacity of 1000 megawatts, then each facility's allocated capacity under § 45J(b)(2) would be approximately 230.769 megawatts.[166] The practical effect is that a facility capable of operating at a maximum output of 1000 megawatts per hour can only take advantage of the production tax credit as if it were operating at 230 megawatts/hour, resulting in a significant reduction of the credit's potential value for that facility. If *Nuclear* was among those twenty-six facilities, it too would be treated as having an adjusted nameplate capacity of just 230.769 megawatts.

3. Annual Limitation of Credit Amount

The annual credit limitation reduces the net value of the credit to each taxpayer. It is perhaps the most confusing limitation of § 45J, because the statute itself cannot be given effect without the use of the Secretary's formulated allocation-regulations, found in IRS Notice 2006-40. The statute provides that the annual limit of the credit shall not exceed the "amount which bears the same ratio to $125 [million] as . . . [the allocated] capacity limitation . . . bears to 1,000."[167] It is instructive to look at the Secretary's formulated approach to determine how to compute the annual limitation.[168] First, compute the "tentative credit" by multiplying 1.8 cents

[165] *Id*. § 3.03(2).
[166] The formula for allocated capacity is [(reactor nameplate capacity) / (aggregate nameplate capacity)] x (6,000 megawatts). In the example, the allocated nameplate capacity would be computed as follows: [(1,500 megawatt actual nameplate capacity of individual facility) / (39,000 megawatt aggregate nameplate capacity)] x (6,000 megawatt national limitation).
[167] 26 U.S.C.A. § 45J(c)(1), (2).
[168] *See* I.R.S. Notice 2006-40, *supra* note 155, § 2.04(1)-(3).

“by the kilowatt hours of qualified electricity produced” and sold to an unrelated person.[169] Second, compute the “credit percentage” of the facility by dividing the allocated capacity of the facility by that facility’s actual nameplate capacity.[170] If the aggregate nameplate capacity of all facilities is less than or equal to the national limitation, then that facility’s credit percentage will be 100%.[171] Finally, the credit allowed will be the lesser of (1) the tentative credit multiplied by the credit percentage; or (2) $125 million per 1000 megawatts allocated to the facility. This approach can ultimately be distilled into two formulas: (1) the Maximum Annual Credit Limitation, computed as follows: an amount not more than, ($125 million) x [(individual facility’s allocated megawatt capacity limitation) / (1,000)]; (2) *Credit Allocation*, computed as follows: a combination of the credit percentage and the tentative credit provisions of Notice 2006-40, [(6,000 megawatt national limitation) / (aggregate nameplate capacity of all facilities)] x 1.8 cents per kWh.

Continuing with the prior example, the twenty-six facilities each operate at a nameplate capacity of 1000 megawatts and receive a 230.769 megawatt capacity allocation.[172] Each facility in the example would be permitted a 0.41538 cent credit for every kWh hour produced and sold to an unrelated person, not to exceed $28.5 million per year for their first eight years of operation.[173] This amount is significantly lower than the value of the credit without such limitations.[174] *Nuclear* would take a credit of .41538 cents/kWh of electricity produced and sold, not

[169] *Id*. § 2.04(1).
[170] *Id*. § 2.04(2).
[171] *See id*. § 2.04(2), 3.03(1).
[172] Computed from the National Megawatt Limitation formula.
[173] Each facility’s annual credit allocation is determined as follows: [(6,000 national limitation) / (39,000 aggregate nameplate capacities)] x 1.8 cents per kWh, or 0.2769 cents per kWh. The maximum annual credit amount is computed as follows: ($125 million) x [(230.769 individual allocated capacity) / (1,000)], or $28.85 million.
[174] Had the limitations not applied, the facility would receive a credit in the amount of 1.8 cents per kWh produced and sold, up to $187.5 million per year ($125 million x 1.5).

to exceed a maximum of $28.5 million per year. As a result, *Nuclear's* credit for its first year of operations would be limited to a maximum of $28.5 million, despite totaling $33.8 million.[175]

4. Phaseout Limitation

Section 45J provides a reference price phaseout of the credit that effectively reduces the amount of the credit by the excess of the actual price at which the electricity is sold over the reference price determined by the Code. The phaseout limitation can be computed as a reduction of the credit by one-third of the excess that the "reference price" exceeds eight (8) cents, adjusted for inflation.[176] The "reference price" is defined as "the annual average contract price per kilowatt hour of electricity generated . . . and sold."[177] As of 2010, the eight-cent threshold price was indexed at 1.4342, or 11.474 cents.[178] The § 45J phaseout limitation initially appears to pose little risk of reducing the amount of the credit because the threshold price as inflated for 2010 exceeds the average cost of nuclear energy.[179] The 2010 average retail price for electricity was 9.83 cents per kWh, about 1.6 cents below the indexed threshold amount.[180]

While these figures are favorable, it bears emphasizing that not one of the 104 nuclear facilities currently operating in the U.S. qualifies for the § 45J production tax credit because each

[175] Computed as follows: (8.1468 billion kilowatts produced in year 1) x (.41538 cents/kWh) = $33,840,553.85 total credit for year 1.
[176] 26 U.S.C.A. § 45J(c)(2) (West 2012).
[177] *Id.* § 45(e)(2)(C).
[178] FEDERAL TAX COORDINATOR 2D, FTC ¶ L-17762 (RIA 2012), *available at* 1997 WL 554216 ("The Gross Domestic Product (GDP) Inflation Adjustment Factor for the Electricity Production Credit Rate and Threshold Price"); *see also Credit for Renewable Electricity Production, Refined Coal Production, and Indian Coal Production, and Publication of Inflation Adjustment Factors and Reference Prices for Calendar Year 2010*, I.R.S. Notice 2010-37, 2010-18 I.R.B. 654, *available at* 2010 WL 1738863 (providing the inflation adjustment for 2010 at 1.4342 factor). Indexed Reference Price computed as follows: (1.4342) x ($0.08) = 11.474 cents.
[179] According to the Nuclear Energy Institute, "the average production cost of" nuclear energy was 2.19 cents per kWh in 2010. *Affordable Energy to Support Economic Growth*, NUCLEAR ENERGY INST., http://nei.org/keyissues/reliableandaffordableenergy/economicgrowth/ (last visited Dec. 20, 2012). Similarly, the Energy Information Administration reveals the 2010 average cost of nuclear energy was about 2.398 cents per kWh. Comparatively, this is about 33% cheaper than coal and 50% cheaper than gas. *Electric Power Annual 2010 Data Table 8.2*, U.S. ENERGY INFO. ADMIN. (Nov. 2011), *available at* http://205.254.135.7/electricity/annual/pdf/table8.2.pdf.
[180] *Electric Power Annual 2010 Data Table 7.4*, U.S. ENERGY INFO. ADMIN. (Nov. 2011), *available at* http://205.254.135.7/electricity/annual/pdf/table7.4.pdf.

was placed in service before the earliest period allowed by the EPA-2005.[181] It is futile to use operating costs and sales from non-qualifying nuclear facilities currently producing electricity to analyze the potential pitfalls of the phaseout limitation because the costs and revenues of the first qualifying facility will likely be substantially higher. Instead, it is necessary to predict the inflation factor based on when the first new facility is likely to begin operations. The most conservative date for the inflation estimate would be January 1, 2021.[182] In 2021, the inflation factor can be approximated by increasing the 2011 inflation factor by the preceding ten-year average increase, resulting in an inflation factor of 1.7959. This will increase the eight-cent threshold amount to 14.37 cents per kWh,[183] which may preclude a new nuclear facility from taking full advantage of the production tax credit for that year, depending on projected costs and revenues.[184] If the indexed threshold price will be less than the projected average price per kWh, there is an increased likelihood that § 45J(c)(2) would reduce or phase out the credit.[185] For *Nuclear*, this consideration would not be an issue, since it will charge 14.37 cents/kWh to its customers.

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[181] *See* 26 U.S.C.A. § 45J(d)(2) (West 2012) (requiring that a qualified nuclear facility must use a reactor design "approved after December 31, 1993" by the Nuclear Regulatory Commission); *see also id*. § 45J(d)(1)(B) (requiring the facility to be placed in service after August 8, 2005, but before January 1, 2021).
[182] *See id*. § 45J(d)(1)(B) (requiring the facility to be placed in service before January 1, 2021).
[183] From 2001 to 2011 the inflation factor increased approximately 24.21% from a factor of 1.1641 to 1.4459. FEDERAL TAX COORDINATOR 2D, *supra* note 178, FTC ¶ L-17762.
[184] Investors should first estimate the indexed threshold amount for the year in which they plan to begin operations; then estimate their projected operating costs of the facility in that year; finally, estimate the projected average price per kWh adjusted for inflation and future demand.
[185] Similarly, if the indexed threshold amount is greater than the estimated average price per kWh, which in turn is greater than the estimated operating costs per kWh, then the phaseout limitation is less likely to reduce or preclude the amount of the credit.

5. No Adjustment of Credit Amount for Inflation

Unlike other energy credits, the amount of 1.8 cent per kWh credit for advanced nuclear facilities cannot be adjusted for inflation.[186] Its value will ultimately reduce for each subsequent year. If a modern facility were to complete construction and commence operations by the year 2021, it must take the value of the credit in 2005 year dollars. The kWh production credit will be worth much less than it would have been if the amount were adjusted for inflation to mirror its value in 2021 dollars.[187]

Nuclear would generate a production tax credit in its first year of operations totaling $28.5 million, and thereby reduce its tax liability to $150.8 million.[188] Now compare the same facts adjusted for inflation. Had the credit amount and limitations been adjusted by the inflation factor the values would have been much larger. Using the estimated inflation factor for 2021 of 1.7959 above, the credit should be 3.23 cents/kWh (instead of 1.8 cents/kWh), with a maximum credit limitation of $224,487,500 per 1000 megawatts of nameplate capacity. Under those circumstances, *Nuclear* would earn the credit at .74538 cents/kWh[189] with a maximum credit allocation of $51.8 million.[190] *Nuclear* would generate a total credit of $60.7 million,[191] limited to the adjusted $51.8 million maximum credit allocation for its first year of operations. *Nuclear's* tax liability would be reduced to $127.5 million, lower than its tax liability of $150.8 million

[186] Although § 45J lacks any provision to increase the rate of the credit by the inflation factor for the given taxable year, a similar credit for electricity produced from certain renewable resources found in § 45 is adjusted for inflation. *See* 26 U.S.C.A. § 45(b)(2) (allowing for inflation adjustment on limitation amount of credit for electricity produced from certain renewable sources).

[187] Considering the high cost of building the plant, a modern facility must charge a sufficient amount to its customers in order to cover its liabilities and expenses, and yet, turn a profit. The cost of electricity to consumers will logically increase over the years alongside inflation, resulting in larger revenues to utility providers.

[188] Computed as follows: ($179,338,528.25 pre-credit tax liability) – ($28.5 million production tax credit) = $150,838,528.25 in total tax liability.

[189] Computed as follows: [(6,000 megawatt national limitation)/(26,000 megawatt aggregate nameplate capacity)] x (3.23 cents/kWh adjusted for inflation) = .74538 cents/kWh.

[190] Computed as follows: ($224,487,500 adjusted credit allocation) x [(230.769 allocated nameplate capacity) / (1,000 megawatts)] = $51,804,755.89 adjusted maximum credit allocation.

[191] Computed as follows: (8.1468 billion kilowatts produced in year 1) x (.74538 cents/kWh adjusted for inflation) = $60,724,617.84 total credit generated for year 1.

when the credit is not adjusted for inflation.[192] With each subsequent year after 2005,[193] the potential value of the credit ultimately decreases because it is not adjusted for inflation.

D. Coordination of § 45J with the General Business Credit

The built-in limitations of § 45J, illustrated above, are not the only hurdles the taxpayer must clear in claiming the production tax credit for advanced nuclear facilities. After determining the amount of the § 45J tax credit, companies exercising the option must claim the credit pursuant to the provisions of the General Business Credit under I.R.C. § 38,[194] which further limits the extent of the § 45J credit.[195]

Congress permits business and profit-seeking taxpayers to utilize various credits as an incentive to encourage national economic expansion and development.[196] The taxpayer must claim certain credits within the limits of § 38 of the Internal Revenue Code.[197] Section 38 permits application of a "general business credit" for the current taxable year.[198] The amount of the general business credit includes, *inter alia*, "the advanced nuclear power facility production credit determined under § 45J(a)."[199] Section 38 limits the aggregate allowance of the general business credit to the excess "of the taxpayers' 'net tax liability' for the year, less the greater of the 'tentative minimum tax' or 25 percent of 'net regular tax liability' in excess of $25,000."[200] The

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[192] Computed as follows: ($179,338,528.25 pre-credit tax liability) – ($51,804,755.89 adjusted maximum credit allocation) = $127,533,772.36 in tax liability.

[193] The year Congress added § 45J to the code. *See* Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594.

[194] 26 U.S.C.A. § 38 (West 2012) (General Business Credit).

[195] *See infra* note 201.

[196] See World Airways, Inc. v. C.I.R., 564 F.2d 886 (9th Cir. 1977) (discussing the investment credit used to modernize and expand nation's production capabilities).

[197] 26 U.S.C.A. § 38.

[198] *Id.* § 38(a).

[199] *Id.* § 38(b)(21).

[200] BORIS I. BITTKER & LAWRENCE LOKKEN, FEDERAL TAXATION OF INCOME, ESTATES, AND GIFTS ¶ 27.1.2 (2011) ("Business Credits-In General"). For a better understanding of the General Business Credit and how it works to prevent excessive reduction of income for tax reporting purposes, see generally *Id.* ¶ 27.1. The exact details of interpreting and applying the business credit allowance limitation are exceedingly complex and beyond the scope of this paper.

taxpayer should be aware that § 38 may create latent problems related to the amount of the § 45J credit claimed.[201]

Section 45J allocates a production tax credit based on the energy output of a modern nuclear facility. It follows that the value of the credit increases as the facility produces more electricity. At the same time, more electricity produced and sold to customers results in larger revenues; as those revenues increase, so too will the taxpayer's overall tax liability. Since the effect of the § 45J credit is a dollar-for-dollar reduction of the taxpayer's tax liability, the credit will be claimed against a portion of the taxpayer's net taxes owed to the government for that year. Second, note that the limitations imposed by § 38(c), the general business credit, are essentially based on *percentages* relating to taxable income—the "tentative minimum tax" and the "net regular tax liability."[202] Though a nuclear facility may produce enough electricity to reap the benefit of a large production tax credit, the percentage-based limitation of the general business credit may result in disallowance of a portion of that credit for any eligible § 45J-year.[203] However, under current law this may not be the case.

There are sixteen completed § 45J-eligible applications for COLs proposing the construction of twenty-four modern nuclear facilities by 2021. If all applicants successfully complete

[201] The general business credit's limitation of allowance references the "tentative minimum tax." *Id.* § 38(c). The tentative minimum tax is 20% of the alternative minimum taxable income "as exceeds the exemption amount" of $40,000. 26 U.S.C.A. § 55(b)(1)(B)(i) (West 2012). This provision prevents the § 45J credit from offsetting any amount calculated for the tentative minimum tax in the event that the taxpayers actual tax liability falls so low that the taxpayer is forced to pay the Alternative Minimum Tax (AMT). Likewise, commentators note that if the tentative minimum tax for the company owning the nuclear facility is zero, then the maximum amount of the general business credit is limited to "the first $25,000 of tax liability [plus] 75 percent of any remaining tax liability." BITTKER & LOKKEN, *supra* note 200, ¶ 27.1.2. This is a tough break for new nuclear facilities capable of consistently operating around 90% of their nameplate capacity, even in the first year of operations.

[202] *See* 26 U.S.C.A. § 38(c)(1); *see also* 26 U.S.C.A. § 55 (West 2012) (stating that the tentative minimum tax is 20% of the alternative minimum taxable income "as exceeds the exemption amount" of $40,000).

[203] Because the limitations of the general business credit reserves a minimum percentage of the net tax liability to go untouched by the § 45J credit, § 38 may leave the taxpayer with a significant tax liability that would have otherwise been reduced by the unused excess of the general business credit for that year. This potential problem is latent in that there is no real way to determine if the limitation will apply until the taxpayer begins operations. For instance, the tax liability could be large enough that the amount of the § 45J credit claimed fails to exceed the § 38 limitation. In that instance, the full value of the § 45J credit will be claimed against the net tax liability.

each project, the § 45J credit will be significantly limited for each facility. It is therefore not likely that the amount of the § 45J credit included in the computation of the general business credit will exceed the § 38 limitation. Should Congress decide to amend § 45J, the chances of § 38 limiting the allowance of the credit will increase.

The credit is refundable under § 39 of the Code.[204] A taxpayer may recapture the amount of the credit that exceeds the credit allowance permitted under § 38. The excess is carried back to the preceding taxable year and carried forward twenty years, subject to the same limitations under § 38(c) for each taxable year.[205] In calculating the general business credit for subsequent years, the amount of the carryforward from the preceding year, if any, is applied first. Then the amount of the credit for the current taxable year is determined and applied against the remaining tax liability subject to the allowance limitations for "qualified business credits."[206]

Generally, at the end of the twenty year carryforward period any unused portion of the excess from the first year the general business credit to which the excess applies was calculated in regard to the twenty year carryforward period will apply as a deduction—not a credit—in the next taxable year to the extent that the unused excess consists of "qualified business credits" under § 196.[207] However, current law does not classify § 45J as a "qualified business credit" for this purpose.[208] Thus, nuclear facilities that qualify for the nuclear production tax credit have the opportunity to benefit from the full amount of the credit by applying the excess to subsequent years for twenty years; however, they lose the benefit of a deduction of any expired amount at the conclusion of that period.

E. Efficacy of § 45J

[204] 26 U.S.C.A. § 39(a).
[205] *Id*.
[206] 26 U.S.C.A. § 196(a) (West 2012).
[207] *Id*.
[208] *Id*. § 196(c).

The production tax credit will be too small of an incentive to have any real effect in persuading investors to spend significant sums of money to build modern nuclear reactors. Section 45J is severely limited on paper as well as in practice. New facilities are likely to experience their highest costs and liabilities in the first few years of operation. The benefits of the production tax credit will neither be significant enough to quell the industry's concern of a looming cloud of bankruptcy, nor substantial enough to assist in the payment of liabilities.

IV. Congress Should Change the Tax Structure to More Effectively Promote the Development of Modern Nuclear Power

Since 2009, there has been one application to build a new nuclear power plant.[209] Congress could change this and more appropriately give effect to the legislative purpose of the EPA-2005 by providing tax incentives to expand and develop modern nuclear energy. Section 45J significantly benefits first-movers of modern nuclear energy but is fatally flawed by its limitations.[210] Congress and the President legislatively endorsed the clean energy movement by enacting legislation subsidizing production from nuclear—and renewable—sources. These subsidies should be designed with that goal in mind. Renewable energy sources are far from capable of leading the clean air revolution, though not necessarily incapable. Nuclear energy can help significantly reduce carbon and greenhouse gas emissions in the near future, by creating an effective reduction in carbon-emissions from electricity production during the renewable energy expansion period.[211] A better approach, using different tax incentives, can spark the chain reaction necessary to expand nuclear development.

A. Congress Should Amend § 45J

[209] *See Expected New Nuclear Power Plant Applications*, *supra* note 35.
[210] From 2007-2008, every new application for a nuclear reactor decreased the value of the credit pursuant to the national megawatt limitation. *See infra* Part III.C.2.
[211] Discussed *infra* Part I.

The industry cannot shoulder the potential burdens and risks associated with building, operating, and dismantling a modern nuclear power plant. Historically, construction costs exceed their projected figures.[212] Section 45J started off as an extremely valuable tax incentive but because of its built-in limitations, every investor suffered as more interest in new plants grew. These limitations inherently pit industry leaders against one another and deter future investment by limiting the value of the credit for every new COL application received. The credit is unpredictable and limited to first-mover participation. Congress should amend § 45J to allow each new investor to take advantage of the full value of the credit.

B. Remove the Application Cutoff Date

Although, investors do not want to continue "with a cloud of bankruptcy hanging over [their] head,"[213] the bulk of federal support needed to go forward is no longer available to new applicants. Current applicants face a Hobson's choice of either continuing with construction knowing the value of the credit is a fraction of what it could have been, or ceasing all efforts and losing the potential business opportunity. Therefore, Congress should remove the cutoff date for eligibility under § 45J. This would allow new investors to enter the market and take advantage of the production tax credit. Likewise, removing the cutoff date would fulfill the legislative purpose of clean energy tax credits, by increasing the amount of modern nuclear energy facilities, and reducing the creation of new coal and natural gas operated facilities. This would ultimately decrease the overall environmental impact of energy production. If Congress refuses to amend the cutoff date, there will likely be no significant development of nuclear energy because future applicants will not be eligible for the credit's much needed subsidy.

C. Amend the National Megawatt Limitation

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[212] *See* DEUTCH ET AL., *supra* note 79, at 8.
[213] Tomain, *supra* note 10.

Removing the cutoff date would be the first step of many to make the credit a favorable tax subsidy to future investors. However, under current law, if Congress were to permit new applicants to become eligible for the credit, the applicant pool would increase, causing the credit allocation to decrease for all other applicants.[214] It would also be necessary to contemporaneously alter the national megawatt limitation to prevent a significant reduction of the credit available to other applicants.

When Congress added § 45J to the Code, it intended to spend a maximum of $6 billion and wanted to ensure that no matter how many applicants filed for COL, the credit would never exceed this predetermined amount.[215] Recall that each qualifying facility may only claim the credit for the first eight (8) years of operations.[216] Congress should remove the national megawatt limitation and instead reduce the credit based on each separate facility. This could be accomplished by providing that each facility will be permitted a maximum credit of $100 million per year adjusted by the ratio which the reactor's nameplate capacity bears to 1500 megawatts for its first eight years of operations. A nuclear power plant with a 1000 megawatt nameplate capacity is eligible for a maximum yearly credit of $66.7 million and a 1500 megawatt reactor would qualify for the full $100 million credit. This approach benefits investors by allowing them to know the amount of the credit before commencing operations. Similarly, investors could be sure that, as new applicants enter the market, the credit will not gradually lose its value.

D. Adjust the Credit Amount for Inflation

Congress added the production tax credit for advanced nuclear facilities to the Code in 2005. The amount of the credit contemplated at that time was subject to the value of the dollar in

[214] The National Megawatt Limitation under § 45J reduces the credit allocation based on the aggregate nameplate capacity of all other applicants. 26 U.S.C.A. § 45J(b) (West 2012).
[215] *See* Overview of § 45J, *supra* Part III.B.
[216] *See id*.

2005. However, no adjustment for inflation is permitted for the 1.8 cent credit amount or maximum credit allowance. It can take years for a nuclear facility to complete the application, construction, and inspection phases before commencing operations. In fact, Congress anticipated this delay by requiring that the nuclear power plant begin construction before January 1, 2014.[217] If a modern nuclear facility commences operations before January 1, 2021, over fourteen years after § 45J was added to the Code, it will take the value of the credit without the benefit of any adjustment for inflation or, more fundamentally, it will take the value of the credit subject to the value of the dollar in 2005. Congress should permit inflation adjustments to the credit amount and maximum credit allowance to ensure an equitable value of the credit each year a taxpayer claims it. Doing so allows investors to make an inflation adjustment to the eight-cent value of the credit for every eligible year, thereby reducing any inherent loss in the time-value of the credit.

E. Offer Non-Credit Tax Incentives

One beneficial tax incentive to modern nuclear power plants is the ability to deduct the future costs of decommissioning the plant under § 468A.[218] Congress should consider offering other non-credit tax incentives such as a reduction of the tax rate for income from operations for a limited number of years after the nuclear power plant is placed in service. Most large electrical utility companies will generate revenues in excess of $10 million, the minimum threshold for imposition of the 35% tax rate on corporations.[219] Congress could reduce the tax rate for ad-

[217] I.R.S. Notice 2006-40, *supra* note 155. Note that the nuclear power plant must also be placed in service after August 8, 2005, but before January 1, 2021. 26 U.S.C.A. § 45J(d)(1)(B).
[218] 26 U.S.C.A. § 468A (West 2012).
[219] 26 U.S.C.A. § 11(b)(1)(D) (West 2012).

vanced nuclear power plants to the next lower threshold of 34%[220] for the duration of time the facility qualifies to take the production tax credit.

Conversely, Congress could elect to replace the § 45J credit altogether, and instead reduce the corporate tax rate for a limited period of time to each qualifying facility. For instance, for the first eight years of operations, an advanced nuclear power plant would be taxed at a 25% rate. The benefit to investors would be the existence of a simple method of computing their tax liability by applying the reduced percentage in lieu of making the complex calculations of the § 45J credit amount. More significantly, a reduced tax rate would not pit the IRS and nuclear power plants against each other. This is because a credit reduces the amount of tax the IRS receives based on the amount of electricity produced. As a result, the more revenue a nuclear plant earns, the less tax it will pay under the credit systems approach. In contrast, a reduced tax rate places the business interests of the nuclear power plant in line with the tax-revenue interests of the IRS. Thus, as a nuclear power plant produces more revenue, its tax liability continues to increase, which ultimately confers a benefit on both the IRS and the nuclear power plant because each will earn more income based on the performance of the plant. Since the reduced tax rate would be limited in duration to eight years, normal corporate rates will eventually apply.

V. Conclusion

The increasing demand for electricity in the U.S. will require the construction of new energy plants. Because of their price competitiveness, coal and natural gas power plants are more likely to be built unless Congress creates effective incentives for investors to build nuclear power plants. As new coal and natural gas plants are built, the environment suffers an increase in carbon emissions released into the atmosphere, and more non-renewable natural resources are depleted. Nuclear energy is a safe, clean, and effective alternative. Renewable resource production

[220] *Id*. § 11(b)(1)(C).

of electricity is far from capable of matching the output of coal and natural gas anytime in the near future. Nuclear energy can help to displace these more damaging alternatives in the near future while renewable energy continues to develop. The EPA-2005 provides a significant step in the right direction and evidences Congress' willingness to subsidize nuclear energy. Unfortunately, the tax incentives created by the EPA-2005 are nominal and ineffective. Congress should amend § 45J to provide a realistic tax subsidy for nuclear energy or amend its approach altogether. With the right incentives, nuclear energy can develop and expand enough to significantly reduce carbon and greenhouse gas emissions while meeting the growing demand for electricity. Without such subsidies, nuclear power cannot survive.