



MSU Graduate Theses

Fall 2015

Nonproliferation: Rapid Retreat from the Gold Standard Negatively Impacts Future Nuclear Negotiations

Evan Tyler Beese

As with any intellectual project, the content and views expressed in this thesis may be considered objectionable by some readers. However, this student-scholar's work has been judged to have academic value by the student's thesis committee members trained in the discipline. The content and views expressed in this thesis are those of the student-scholar and are not endorsed by Missouri State University, its Graduate College, or its employees.

Follow this and additional works at: <https://bearworks.missouristate.edu/theses>



Part of the [Defense and Security Studies Commons](#)

Recommended Citation

Beese, Evan Tyler, "Nonproliferation: Rapid Retreat from the Gold Standard Negatively Impacts Future Nuclear Negotiations" (2015). *MSU Graduate Theses*. 1504.
<https://bearworks.missouristate.edu/theses/1504>

This article or document was made available through BearWorks, the institutional repository of Missouri State University. The work contained in it may be protected by copyright and require permission of the copyright holder for reuse or redistribution.

For more information, please contact bearworks@missouristate.edu.

**NONPROLIFERATION: RAPID RETREAT FROM THE “GOLD STANDARD”
NEGATIVELY IMPACTS FUTURE NUCLEAR NEGOTIATIONS**

A Masters Thesis

Presented to

The Graduate College of
Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Defense and Strategic Studies

By

Evan T. Beese

December 2015

Copyright 2015 by Evan Tyler Beese

**NONPROLIFERATION: RAPID RETREAT FROM THE “GOLD STANDARD”
NEGATIVELY IMPACTS FUTURE NUCLEAR NEGOTIATIONS**

Defense and Strategic Studies

Missouri State University, December 2015

Master of Science

Evan T. Beese

ABSTRACT

In 2009, the United States and the United Arab Emirates (U.A.E.) concluded a nuclear cooperation agreement which contained a commitment on the part of the U.A.E. not to enrich uranium through its own domestic programs. Dubbed the “Gold Standard” of nuclear nonproliferation by the Obama administration, such an accomplishment has not been repeated in nuclear agreements between 2009 and 2015. This paper examines American nuclear cooperation negotiations following the establishment of the “Gold Standard,” and argues that the rapid reversal of American negotiating policy toward enrichment and reprocessing technologies will hinder U.S. nonproliferation goals going forward.

KEYWORDS: United Arab Emirates, UAE, Vietnam, gold standard, nonproliferation

This abstract is approved as to form and content

Ambassador Robert Joseph, PhD
Chairperson, Advisory Committee
Missouri State University

**NONPROLIFERATION: RAPID RETREAT FROM THE “GOLD STANDARD”
NEGATIVELY IMPACTS FUTURE NUCLEAR NEGOTIATIONS**

By

Evan T. Beese

A Masters Thesis
Submitted to the Graduate College
Of Missouri State University
In Partial Fulfillment of the Requirements
For the Degree of Master of Science, Defense and Strategic Studies

December 2015

Approved:

Robert Joseph, PhD

David Trachtenberg

Andrei Shoumikhin, PhD

Julie Masterson, PhD: Dean, Graduate College

ACKNOWLEDGEMENTS

I would like to thank a number of people for their assistance and support through my studies at Missouri State University. Before I was a Masters Student, there was Mr. John Rost, a High School History teacher whose encouragement led to my choosing this course of study. Likewise, Dr. Marie Brown, whose classes at the University of Kansas opened up a world that was much broader than the history of Russia between the Communist Revolution and the Cold War.

Ambassador Joseph DeTrani, General John Rose, Colonel Richard Downie, and Doctors Keith Payne and Peppino DeBiasco each shaped my graduate course of study. This in turn informed my Thesis, and I am grateful both for their commitment to my education throughout my studies at Missouri State University.

Similarly, my Thesis Advisory Board members were crucial in formulating and finalizing this topic. Ambassador Robert Joseph, Professor David Trachtenberg, and Dr. Andrei Shoumikhin were each instrumental in the development of this product.

From beyond the halls of academia, I would like to thank Mrs. Sydney Johnson, my professional mentor, who has been a key figure in guiding and advising my interest in civilian nuclear energy. And, of course, my parents and brothers, who have relentlessly supported my efforts through two more years of higher education.

TABLE OF CONTENTS

Executive Summary.....	1
The Draw of Nuclear power.....	5
Barriers to Nuclear Energy	6
Benefits of Nuclear Energy	9
Nuclear Fuel Cycle	12
Research Reactors and Fuel Requirements	15
Indigenous Enrichment Programs.....	19
Possible Military Dimensions.....	21
Chapter Summary	23
Nuclear Cooperation Agreements	25
Republic of China	26
People’s Republic of China	29
Russian Federation.....	32
Chapter Summary	34
Establishing the “Gold” and “Silver” Standards.....	36
The U.S.-U.A.E. 123 Agreement.....	37
The U.S.-Vietnam 123 Agreement	42
Chapter Summary	46
Congressional Attempts to Restrict Civilian Nuclear Cooperation Agreements	48
S. 1138 (110 th Congress, First Session)	49
H.R. 885 (110 th Congress, First Session)	52
H.R. 7068 (110 th Congress, Second Session)	54
H.R. 1280 (112 th Congress, First and Second Sessions).....	56
S. Res. 269 (113 th Congress, First Session).....	62
S. J. Res. 36 (113 th Congress, Second Session).....	64
Chapter Summary	68
Conclusion: Iran, the JCPOA, and Future Nuclear Negotiations.....	70
Development of the Iranian Nuclear Program.....	70
Joint Comprehensive Plan of Action	74
Conclusion.....	77
Literature Cited (Reference)	80
Appendix: Summary of Section 123 of the Atomic Energy Act of 1954.....	94

LIST OF FIGURES

Figure 1. Separative Work Units Required to Turn 1 Tonne of Uranium into Enriched Uranium	18
---	----

EXECUTIVE SUMMARY

In 2009, the United States and the United Arab Emirates concluded a nuclear cooperation agreement which contained one very unusual clause: the United Arab Emirates would agree not to enrich uranium through domestic programs, requiring it instead to import enriched uranium from abroad. This commitment has since been referred to as the “Gold Standard” of nuclear nonproliferation. In the nearly six years since that agreement was signed, the United States has embarked on several nuclear cooperation negotiations with a variety of countries around the world. The “Gold Standard” has not been achieved in any of these subsequent negotiations.

At the conclusion of its negotiations, Vietnam agreed to a less-strict alternative. This was partly an outcome of the United States’ own choosing, having determined in 2012 that it should approach restrictions on enrichment and reprocessing on a case-by-case basis. Vietnam set the “Silver Standard” in 2014 when it made a political, but not legally binding, pledge to forego enrichment capacity.

Even among countries with which the United States maintains positive relations and considers to be of minimal proliferation risk, a non-enrichment clause is a unique feature of a nuclear cooperation agreement. It is unlikely that if a country poses a significant military or proliferation threat it will sign a legally-binding non-enrichment clause, particularly if such a clause is rare among close American cooperative partners. This makes the “Gold Standard” of nuclear nonproliferation an elusive goal, but one which has been proven to be obtainable.

By its very nature, a nuclear cooperation agreement cannot be undertaken solely by one country. It is a partnership wherein two countries agree that the supply of nuclear materials, technologies, and facilities by one to the other is beneficial to the advancement of the interests of both parties. The United States has signed nuclear cooperation agreements – called “123 Agreements” based on the requirements of Section 123 of the Atomic Energy Act of 1954 – with more than fifty countries and entities around the world, either individually or through an agreement with bodies such as Euratom.¹

In the United States, these cooperation agreements are essential legal frameworks for American businesses to export nuclear technologies and materials. The drawback is the dual-use nature of nuclear material; sensitive nuclear technologies and processes inherently run the risk of being applied to advance nuclear weapons programs. Although multilateral regimes and international treaties attempt to limit the spread of dangerous nuclear technologies, the risk of proliferation remains the utmost concern when entering into an agreement with a new partner.

There are warning signs that a partner country may be interested in a nuclear program that is less than peaceful. A fully self-contained nuclear fuel cycle infrastructure is expensive and cumbersome to develop, and is simply not economically feasible for nations operating a small number of standard civilian nuclear reactors. Research reactors, which required the more dangerous high-enriched uranium during the Cold War era, can be modified with today’s technology to operate on the same, more proliferation-resistant, fuel used in civilian nuclear reactors. However, the presence of such warning signs does not automatically mean that a country has begun developing nuclear weapons. A

¹ Issues & Policy, “Nuclear Cooperation Agreements,” Nuclear Energy Institute, 2015. Accessed August 28, 2015, <http://www.nei.org/Issues-Policy/Exports-Trade/Nuclear-Cooperation-Agreements>.

perceived scarcity in supply or even the choice of a nation to exercise its right under the Nuclear Nonproliferation Treaty to pursue civilian nuclear programs are examples of a valid justification to pursue either a self-contained nuclear fuel cycle or a research reactor which requires high-enriched uranium fuel.

As such, a nuclear cooperation agreement undertaken by the United States is traditionally a tightly-written document designed to ensure that the United States is not inadvertently contributing to military programs. Much like an understanding of the nuclear fuel cycle, the framework of nuclear cooperation agreements must be examined to appreciate the significance of the “Gold Standard.” Furthermore, agreements in this area signed after the “Gold Standard” are essential to tracing the evolution of U.S. attempts at advancing its nonproliferation agenda. With this context, the specific nuclear cooperation agreements signed between the United States and the United Arab Emirates, and between the United States and the Socialist Republic of Vietnam, may be examined to build a better understanding of how the agreements evolved.

Finally, a return to the legal basis of nuclear cooperation agreements emanating from the United States will be shown through attempts by Congress to mandate stricter nonproliferation controls in the agreement framework. Despite multiple attempts over several years and congresses, Section 123 of the Atomic Energy Act of 1954 has proven highly difficult to amend. As with all complex issues, this stems from a wide variety of factors, but likely includes concerns that overly restrictive agreements will make the United States less widely used among international suppliers, thus undermining U.S. commercial interests and eroding American influence in the global nonproliferation environment.

The end result has been that through half a decade of nuclear negotiations, the United States has moved progressively farther away from the “Gold Standard.” In so doing, the United States has eroded its position that the Treaty on the Nonproliferation of Nuclear Weapons does not grant signatory states the inherent right to enrich uranium. It has similarly sent a signal that civilian infrastructures capable of producing nuclear weapons components, such as enrichment facilities, are not inherently dangerous technologies.

This is most easily exemplified with the recently-concluded Iran Nuclear Negotiations. Although not a 123 Agreement, it nonetheless falls within the scope of these frameworks due to its effects on Iran’s civilian nuclear enterprise. The Iran deal allows Iran to enrich uranium, which is completely contrary to the “Gold Standard” of nonproliferation; if countries are led to believe that advanced nuclear infrastructures will create more favorable negotiating positions between them and the U.S., then they are unlikely to pursue civil nuclear cooperation with the U.S. while their programs are still in their infancy.

THE DRAW OF NUCLEAR POWER

Energy and economy are very closely linked. The United Nations Industrial Development Organization (UNIDO) described in a 2007 report “strong and proven empirical positive correlations between energy and economic growth, and between electricity use and economic development.”² Similarly, the U.S. Overseas Private Investment Corporation (OPIC) notes that “severe energy shortages limit growth prospects and impact every aspect of life from food production to access to healthcare and education and overall business activity.”³

It should come as little surprise, therefore, to find that the countries with the highest GDP⁴ and GDP per capita⁵ in 2012 also had 100% access to electricity.⁶ The methods for generating this vital electricity vary to an extent in and among countries, but hydrocarbons (oil, coal, and natural gas) currently dominate the energy industry: the EIA reports that 80% of power generated globally comes from such sources. Nuclear energy, in contrast, accounts for a mere 8% of globally-installed capacity.⁷

² Staff Working Paper, “Energy, Industry Modernization and Poverty Reduction: A Review and Analysis of Current Policy Thinking,” Research and Statistics Branch, United Nations Industrial Development Organization, June 2007. Accessed November 4, 2015, http://www.unido.org/fileadmin/user_media/Publications/Research_and_statistics/Branch_publications/Research_and_Policy/Files/Working_Papers/2007/WP062007%20-%20Energy,%20industry%20modernization%20and%20poverty%20reduction.pdf, p. v.

³ U.S. Overseas Private Investment Corporation, “Power Africa.” Accessed November 4, 2015, <https://www.opic.gov/opic-action/power-africa>.

⁴ World Bank, “Data: GDP (Current \$USD).” Accessed November 4, 2015, http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?order=wbapi_data_value_2012.

⁵ World Bank, “Data: GDP Per Capita (Current \$USD).” Accessed November 4, 2015, data.worldbank.org/indicator/NY.GDP.PCAP.CD?order=wbapi_data_value_2012.

⁶ World Bank, “Data: Access to Electricity (% of Population).” Accessed November 4, 2015, http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?order=wbapi_data_value_2012.

⁷ U.S. Energy Information Administration, “Annual Energy Outlook 2015 with Projections to 2040,” U.S. Department of Energy, April 2015. Accessed November 4, 2015, <http://www.eia.gov/forecasts/aeo/pdf/0383%282015%29.pdf>, p. 15.

Barriers to Nuclear Energy

There are a number of reasons why nuclear energy comprises such a small portion of global generating capacity (although this number is higher in individual countries such as France, where nuclear power plants generate 77% of the country's electrical output),⁸ but two will receive particular mention. Nuclear power plants are, first and foremost, costly to build and require a great deal of infrastructure and intellectual capital to operate. Second, in the unlikely event that a nuclear reactor suffers a catastrophic failure, the resulting damage to the community could potentially be devastating.

Nuclear power's cost barrier represents a significant financial burden to the private operators of these plants. The construction of a 1,100 MW second unit at the V.C. Summer nuclear power plant in South Carolina, for example, is expected to cost \$6.8 billion before it opens for operation in 2019.⁹ To contrast, a 1,200 MW combined-cycle natural gas power plant completed in Florida, which began operation in 2013, was built at a cost of approximately \$860 million.¹⁰

Compounding the steep capital costs is the time required to go from the beginning of construction to commercial operation; a 2004 report from the Brookings Institution identified that "the average lag from groundbreaking to operation had reached twelve years" in the U.S. by 1990 (compared to an average of seven years for nuclear power

⁸ U.S. Energy Information Administration, "Country Pages: France," U.S. Department of Energy, September 2015. Accessed November 4, 2015, <http://www.eia.gov/beta/international/analysis.cfm?iso=FRA>

⁹ Nuclear Power International, "Summer Nuclear Power Expansion to Cost \$6.8bn, Finish in 2019 & 2020," *Power Engineering*, March 13, 2015. Accessed November 6, 2015, <http://www.power-eng.com/articles/2015/03/summer-nuclear-power-expansion-to-cost-6-8bn-finish-in-2019-2020.html>.

¹⁰ Russel Ray, "A Report on Combined Cycle Projects in North America," *Power Engineering*, February 3, 2015. Accessed November 6, 2015, <http://www.power-eng.com/articles/2014/02/a-report-on-combined-cycle-projects-in-north-america.html>

plants built before 1979).¹¹ This represents a significant period of time during which the power station cannot recover its initial capital cost, which in turn means that an entity must be certain that a viable market exists a decade before the expected operational date of the nuclear power plant – and that the market will persist for decades afterward. There must also be a degree of certainty that a multi-billion-dollar facility will be allowed to operate once it reaches completion.

A second significant barrier to nuclear reactors is an investment climate which currently fears the results of a catastrophic failure of nuclear facilities. While documented critical failures at such facilities are very few in number, the potential damage that could result from a nuclear accident is nonetheless of sufficient magnitude that even a relatively mild incident can have far-reaching effects on the global nuclear industry.

The 2011 Fukushima Daiichi incident in Japan, for example, saw a massive earthquake trigger a tsunami which flooded backup generators designed to keep the plant's nuclear fuel cool even in the event the reactors themselves needed to be shut down. Three reactors subsequently melted down, leaking radioactive material over a significant radius around the power plant.¹² Following the accident at Fukushima, countries across the world saw a significant decrease in the number of applications for new nuclear facilities. Japan itself reduced its nuclear capacity to zero, although it does plan to restart parts of its nuclear fleet by the end of 2015.¹³

¹¹ Pietro S. Nivola, "The Political Economy of Nuclear Energy in the United States," *Brookings Institution*, September 2004. Accessed November 4, 2015, <http://www.brookings.edu/research/papers/2004/09/environment-nivola>.

¹² U.S. Nuclear Regulatory Commission, "Backgrounder on NRC Response to Lessons Learned from Fukushima," February 9, 2015. Accessed November 4, 2015, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/japan-events.html>.

¹³ Candace Dunn, "Japan Plans to Restart Some Nuclear Plants in 2015 After Fukushima Shutdown," Energy Information Administration, U.S. Department of Energy, February 11, 2015. Accessed November 4, 2015, <http://www.eia.gov/todayinenergy/detail.cfm?id=19951>.

Germany, like Japan, announced the end of its nuclear program following the Fukushima disaster. Unlike Japan, Germany's decision involves phasing out its current nuclear fleet through the year 2022, at which point no new nuclear facilities are anticipated to be approved. Prior to the shutdown, nuclear power represented approximately 15% of German electrical capacity.¹⁴

Fukushima is not the first incident in a nuclear power plant to cause global concern over the safety of nuclear energy. In 1979, in Pennsylvania, Three Mile Island Unit 2 suffered a partial meltdown due to a malfunction in the plant's cooling system. While the average radiation exposure to the approximately 2 million individuals in the community was less than the exposure of a medical x-ray, the plant was shuttered and the event prompted significant changes to the operation and management of American nuclear power plants.¹⁵

Seven years later, the fatal accident at the Chernobyl Nuclear Power Plant released significant radiation which threatened millions of residents in Ukraine, Russia, and Belarus.¹⁶ It is the first and only (to date) accident at a nuclear power plant which resulted in the loss of human life, and the only power plant meltdown which resulted in exposure to radiation sufficient to affect the health of plant workers.¹⁷ These three incidents describe the dangers associated with fissile materials, but over the lifetime of

¹⁴ World Nuclear Association, "Nuclear Power in Germany," November 2015. Accessed November 4, 2015, <http://www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Germany/>.

¹⁵ U.S. Nuclear Regulatory Commission, "Backgrounder on the Three Mile Island Accident," December 12, 2014. Accessed November 6, 2015, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html>.

¹⁶ U.S. Nuclear Regulatory Commission, "Backgrounder on Chernobyl Nuclear Power Plant Accident," December 12, 2014. Accessed November 6, 2015, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/chernobyl-bg.html>.

¹⁷ World Nuclear Association, "Safety of Nuclear Power Reactors," August 2015. Accessed November 6, 2015, <http://www.world-nuclear.org/info/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors/>.

the global nuclear industry such events have proven to be rare – just three such incidents during “160,000 reactor-years of operation.”¹⁸

Benefits of Nuclear Energy

Civilian nuclear power has a proven track record of reliability. It has consistently been among the cheaper energy alternatives to operate, and its outputs are less harmful to the environment compared to hydrocarbon sources. Each of these is a significant draw to American companies and to the international community.

Due in part to the inherent hazards associated with nuclear energy, and also as a result of lessons learned over decades of operating these plants, safeguards and protective measures in the nuclear industry have grown to address potential failures before they occur. This includes multilateral organizations, such as the IAEA’s safety standards, which “reflect an international consensus on what constitutes a high level of safety for protecting people and the environment” from the use of fissile materials.¹⁹ It also includes bilateral initiatives, where one country makes the knowledge of its nuclear regulatory authority (such as the U.S. Nuclear Regulatory Commission, or NRC) available to ensure that the best possible practices are used throughout the world. For example, the NRC is “actively involved” in assisting foreign states with the decommissioning of nuclear reactors, and maintains “arrangements with many foreign countries which include import/export, expert advice, information exchanges, and site visits.”²⁰

¹⁸ *Ibid.*

¹⁹ International Atomic Energy Agency, “IAEA Safety Standards,” December 9, 2014. Accessed November 10, 2015, <http://www-ns.iaea.org/standards/>.

²⁰ Giorgio N. Gnugnoli, “International Decommissioning Regulatory Initiatives and U.S. Nuclear Regulatory Commission Involvement,” U.S. Nuclear Regulatory Commission, August 2005. Accessed November 10, 2015, <http://pbdupws.nrc.gov/docs/ML0523/ML052360193.pdf>.

With its long record of reliability, countries which pursue nuclear power are able to take advantage of its sizeable environmentally-friendly attributes. In 2004, for example, the U.S. power generating sector reduced CO₂ emissions by 282 million metric tons. Improvements to, and increased generating capacity from, nuclear power plants accounted for 54% of these carbon emissions reductions.²¹ This is because nuclear power plants produce neither CO₂ nor other air pollutants as a direct byproduct of their power generating functions.²²

The effect of humans on the environment is a particularly sensitive topic in 2015, so much so that the Department of Defense's 2014 Quadrennial Defense Review directly lists climate change as a potential threat to future missions.²³ As such, nuclear power's low carbon footprint makes it an attractive option for the international community.²⁴

Finally, despite the significant capital required to build a nuclear power station, the operating costs of the plant are among the lowest of any source of electricity. For example, the average cost of electricity to the American residential consumer was just over \$0.12 per kilowatt hour in 2015.²⁵ Nuclear energy in the U.S., to contrast, was most recently estimated by the EIA as having a cost of approximately \$0.09 per kilowatt hour;

²¹ Power PartnersSM, "The Power PartnersSM Annual Report," January 2007. Accessed November 10, 2015, <http://uspowerpartners.org/Reports&pubs/PowerPartners%28sm%29-AnnualReport-Jan2007.pdf>, p. 3.

²² U.S. Energy Information Administration, "Nuclear Explained: Nuclear Power and the Environment," U.S. Department of Energy, December 15, 2014. Accessed November 10, 2015, http://www.eia.gov/energyexplained/index.cfm?page=nuclear_environment.

²³ U.S. Department of Defense, "Quadrennial Defense Review 2014," March 4, 2014. Accessed November 10, 2015, http://archive.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf, p. vi.

²⁴ World Nuclear Association, "Nuclear is Part of the Solution for Fighting Climate Change," November 5, 2015. Accessed November 10, 2015, http://www.world-nuclear.org/uploadedFiles/org/Features/Climate_Change/Nuclear4Climate%20Position%20Paper.pdf, p. 1.

²⁵ U.S. Energy Information Administration, "Electric Power Monthly with Data for August 2015," U.S. Department of Energy, October 2015. Accessed November 10, 2015, <http://www.eia.gov/electricity/monthly/pdf/epm.pdf>, table 5.3.

so-called “clean coal” power plants were estimated at \$0.14, and solar at \$0.11 after the application of government subsidies.²⁶

That nuclear energy is a cheap generating source (despite the significant construction costs) is a highly attractive trait to developing economies. The National Rural Electric Cooperative Association, a service organization for a network of energy providers across 47 states, released a study in July of 2015 detailing the effects of energy prices on the American economy. This study predicted that a mere 10% increase in electricity prices across its represented demographic (which primarily supplies agriculture and manufacturing) between 2020 and 2040 will cost the U.S. a cumulative \$2.8 trillion in lost GDP.²⁷ Although the study did not weigh in on the economic benefits of reducing electricity costs, it notes that increased costs of electricity “reduce the overall economic activity” of a region.²⁸ This is consistent with the case of Germany, where rising costs of energy due to an increased focus on renewable sources, combined with the shuttering of nuclear power post-Fukushima, harmed German economic competitiveness. The German government went so far as to revise green energy subsidy laws to combat escalating energy surcharges.²⁹

Although nuclear energy is by no means the only solution to environmental concerns and rising electricity costs, it is a competitive tool which is recognized internationally as one means to provide reliable electricity at a relatively low cost to the

²⁶ U.S. Energy Information Administration, “Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015,” U.S. Department of Energy, June 3, 2015. Accessed November 11, 2015, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.

²⁷ National Rural Electric Cooperative Association, “Affordable Electricity: Rural America’s Economic Lifeline,” July 27, 2015. Accessed November 3, 2015, <http://www.nreca.coop/wp-content/uploads/2015/07/Affordable-Electricity-Rural-Americas-Economic-Lifeline.pdf>, p. 1.

²⁸ *Ibid.*, p. 11.

²⁹ Matthew Karnitschnig, “Germany’s Expensive Gamble on Renewable Energy,” *Wall Street Journal*, August 26, 2014. Accessed November 11, 2015, <http://www.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602>.

consumer. The proof is in continued demand for nuclear power: outside of the United States, 60 nuclear power plants are under construction; 160 have either been planned or ordered; and 299 have been proposed. Assuming the current rate of expansion, the 437 nuclear power plants currently in existence will have more than doubled to 983 by the year 2030. In 18 of the countries scheduled to receive these, no nuclear power plants currently exist.³⁰

According to the Congressional Research Service, approximately “90% of the world’s existing commercial reactors (all except heavy water reactors and some gas-cooled reactors) require enriched uranium fuel.”³¹ New nuclear reactors are unlikely to deviate from this norm, and as such the demand for enriched uranium fuel is likely to grow along with the industry.

Nuclear Fuel Cycle

The full nuclear fuel cycle is an infrastructure- and capital-heavy construct which takes raw uranium to be processed into nuclear fuel. An overview of the process is useful for highlighting this fact, and shows why enrichment and reprocessing capabilities may be attractive to some countries to increase the security of their nuclear fuel supply. This capability, referred to as having a “closed fuel cycle,”³² allows for spent nuclear fuel to be reprocessed and reused for the purpose of operating a nuclear power plant.

³⁰ "World Nuclear Power Reactors & Uranium Requirements," World Nuclear Association, April 21, 2015. Accessed May 20, 2015.

³¹ Mary Beth Nikitin et al. “Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power,” Congressional Research Service (CRS Report no. RL34234), October 19, 2012, p. 11.

³² John Deutch and Ernest J. Moniz et al., “The Future of Nuclear Power: An Interdisciplinary MIT Study,” Massachusetts Institute of Technology, 2003. Accessed November 12, 2015, <http://web.mit.edu/nuclearpower/pdf/nuclearpower-ch4-9.pdf>, p. 29.

Nuclear fuel begins as uranium ore processed into “yellowcake,” where the ore is “acid-leached to extract uranium oxide.”³³ In order to power a light water reactor, uranium requires a concentration of U^{235} that is generally between 4% and 5%.³⁴ Due to uranium’s naturally low concentration of U^{235} ,³⁵ this yellowcake must be further processed and enriched before it can become fuel.

Once yellowcake is delivered to a conversion plant, it undergoes a number of chemical processes to convert it into uranium hexafluoride (UF_6) gas. This chemical compound contains two uranium isotopes: U^{235} , which is lighter and fissile; and U^{238} , which is heavier and not fissile. At this stage, the UF_6 is close to uranium’s natural concentration of 99.3% U^{238} to 0.7% U^{235} .³⁶

Fission, the splitting of an atom, releases significant amounts of heat.³⁷ A higher concentration of fissile material allows for more nuclear reactions and thus greater energy density. For the average low-enriched uranium (LEU) reactor to produce power from the fission process, the concentration of its fissile U^{235} must be significantly higher than the naturally-occurring 0.7% – it is typically required to be around 5%.³⁸

During the enrichment process, UF_6 is subjected to one of three methods to increase its U^{235} content. During gaseous diffusion, the UF_6 is filtered through porous barriers in gas form to capture U^{238} particles; when the appropriate U^{235} concentration is

³³ “Managing the Nuclear Fuel Cycle,” p. 8.

³⁴ World Nuclear Association, “Uranium Enrichment,” April 2015. Accessed June 1, 2015. <http://www.world-nuclear.org/info/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/uranium-enrichment/>.

³⁵ “Managing the Nuclear Fuel Cycle,” p. 8.

³⁶ World Nuclear Association, “Uranium: How does it Work?” March 2014. Accessed June 1, 2015. <http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Introduction/What-is-Uranium--How-Does-it-Work-/>.

³⁷ U.S. Nuclear Regulatory Commission, “Fission (fissioning),” March 20, 2015. Accessed June 1, 2015. <http://www.nrc.gov/reading-rm/basic-ref/glossary/fission-fissioning.html>.

³⁸ “Managing the Nuclear Fuel Cycle,” p. 11.

reached, it is cooled for transport. In the gas centrifuge process, UF_6 gas is subjected to a strong centrifugal force to pull U^{235} particles toward the center of their housing cylinders; this enriched UF_6 is then separated from the waste U^{238} to repeat the process until the appropriate concentration is reached. Finally, a laser may be employed to target non- U^{235} molecules to change their chemical makeup; this allows for them to be more easily separated to increase the UF_6 's U^{235} concentration.³⁹

Only when the UF_6 has been enriched can it be turned into fuel. The UF_6 arrives at a fuel fabrication plant (or less commonly, a separate conversion plant),⁴⁰ where it is converted into uranium dioxide (UO_2). UO_2 emerges as a powder, which is subsequently encased in ceramic to form a cylindrical pellet that is traditionally “just under one centimetre [sic] in diameter and a little more than one centimetre long.”⁴¹

These pellets are manufactured to be as similar to one another as is possible; they are then encased in tubes typically one-half inch in diameter and up to fifteen feet long to create a fuel rod, per the specifications of the plant to which they will be delivered. Fuel rods are subsequently attached to one another to form fuel arrays, which are similarly assembled in aptly-named “fuel assemblies.” These fuel assemblies are specially engineered products that are tailored to the needs of a specific power plant.⁴²

Once in the nuclear power plant, and fission is underway, fuel assembly arrays begin to lose the sufficient mass of U^{235} which allows a nuclear chain reaction to occur. However, plutonium-239 (Pu^{239}), a byproduct of the same nuclear reaction, can be

³⁹ U.S. Nuclear Regulatory Commission, “Uranium Enrichment,” October 21, 2014. Accessed June 1, 2015. <http://www.nrc.gov/materials/fuel-cycle-fac/ur-enrichment.html>.

⁴⁰ “Managing the Nuclear Fuel Cycle,” p. 14.

⁴¹ World Nuclear Association, “Nuclear Fuel Fabrication,” May 22, 2015. Accessed June 2, 2015. <http://world-nuclear.org/info/Nuclear-Fuel-Cycle/Conversion-Enrichment-and-Fabrication/Fuel-Fabrication/>.

⁴² “Managing the Nuclear Fuel Cycle,” p. 14.

blended with uranium at reprocessing plants to create “mixed-oxide (MOX) fuel” after the operating life of a reactor assembly has expired. Globally, MOX contributes to approximately 2% of new nuclear fuel production.⁴³

As an expensive and infrastructure-intensive endeavor for any nation, a full nuclear fuel cycle is not a particularly common occurrence in the international community. Enrichment and reprocessing plants alone, which would allow for MOX production, are economically questionable facilities given that “a single large enrichment plant can supply up to 25% of the world market,” and that such large commercial enrichment plants already exist in Canada, China, France, Russia, the United Kingdom, and the United States.⁴⁴

Research Reactors and Fuel Requirements

The use and benefits of nuclear material for peaceful purposes is guaranteed under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT),⁴⁵ which has near-universal membership.⁴⁶ However, there is a line between the use of nuclear power for peaceful means and for its use as a weapon. The National Nuclear Security Administration (NNSA) notes that both nuclear materials “and the facilities used to produce them” can be made to support nuclear weapons programs.⁴⁷

⁴³ *Ibid.*, p. 15.

⁴⁴ *Ibid.*, p. 11.

⁴⁵ “Treaty on the Non-Proliferation of Nuclear Weapons,” U.S. Department of State, March 5, 1970.

⁴⁶ India, Pakistan, North Korea, and Israel are not signatories to the NPT.

⁴⁷ “Introduction to International Safeguards,” Office of Nonproliferation and International Security, National Nuclear Security Administration, April, 2013. Accessed May 22, 2015. http://nnsa.energy.gov/sites/default/files/nnsa/04-13-inlinefiles/International%20Safeguards_1.pdf, p. 1.

When enriching uranium, the “standard measure of enrichment services” is the Separative Work Unit (SWU).⁴⁸ A SWU “measures the quantity of separative work⁴⁹ performed to enrich a given amount of uranium.”⁵⁰ Separative Work Units correspond to how much time uranium feed (generally expressed in tonnes or kilograms) spends in a centrifuge.

This is an important definition, as it highlights the fact that the only difference between uranium enriched for nuclear reactors and uranium enriched for nuclear weapons is the concentration of U²³⁵, which in turn is influenced primarily by the amount of separative work to which it has been subjected. Weapons-grade uranium, which is uranium enriched to above 90%, requires no special facilities or processes beyond what is required for the average nuclear reactor.⁵¹

It is this very principle which makes civilian research reactors a concern from a nonproliferation standpoint. More than 700 research reactors have been constructed globally, of which 247 continue to operate (with an additional 20 under construction or planned as of 2014).⁵² Like any technology, a research reactor is a benign tool on its own. In fact, research reactors contribute to “almost every field of science”.⁵³

Research reactors are typically operated for the radiation they produce as opposed to their energy output⁵⁴ (the output of every active research reactor across the world,

⁴⁸ U.S. Energy Information Administration, “Glossary: Separative Work Unit.” Accessed May 19, 2015. <http://www.eia.gov/tools/glossary/index.cfm?id=Separative%20work%20unit>.

⁴⁹ “Separative work” refers to the process of separating U²³⁵ from the U²³⁸ found in natural uranium.

⁵⁰ World Nuclear Association, “Uranium Enrichment”.

⁵¹ *Ibid.*

⁵² “Facing the Challenge: IAEA Support of Research Reactor Sustainability,” International Atomic Energy Agency, September 2014. https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/documents/14-26471_BRO_Research_Reactors_web.pdf, p. 2.

⁵³ “Backgrounder on Research and Test Reactors,” U.S. Nuclear Regulatory Commission, December 12, 2014.

⁵⁴ *Ibid.*

combined, is estimated at 3,000 MW – roughly equivalent to one civilian nuclear power plant).⁵⁵ This radiation can be used for a number of purposes which include:⁵⁶

- Neutron scattering, to analyze materials on a molecular level;
- Neutron radiography, which can determine “structural integrity and provide quality control for aerospace, automotive, and medical components”; and
- Neutron activation analysis, which can detect trace materials such as pollutants or can create radioactive material used in medicine.

These same types of reactors can also be used for education and training purposes. In the United States, for example, research reactors exist predominantly⁵⁷ on college campuses, and “were initially constructed for nuclear engineering and radiological science research and education.”⁵⁸ There are many peaceful incentives for the pursuit of a research reactor. However, these peaceful incentives can be used to mask a weapons development program.

The nonproliferation concern of a research reactor comes from the U²³⁵ content of the fuel required to operate it. Research reactors commonly consume highly-enriched uranium (HEU), which is uranium enriched to levels at or above 20%. A small minority require weapons-grade uranium for the same, civilian purposes described above.⁵⁹ Therefore, countries pursuing or operating a research reactor have a reason for requiring access to HEU. Notably, the technical requirements for enriching uranium mean that enriching from HEU levels to weapons-grade uranium is a significantly less intensive process than enriching LEU to HEU levels.

⁵⁵ “IAEA Support of Research Reactor Sustainability,” p. 1.

⁵⁶ “Backgrounder on Research and Test Reactors.”

⁵⁷ “Backgrounder on Research and Test Reactors.”

⁵⁸ “University Research Reactors: A Brief Overview”, The National Organization of Test, Research, and Training Reactors, September 19, 2000. Accessed June 12, 2015, <http://www.trtr.org/Links/OSTP%20Briefing%202000.pdf>, p. 6.

⁵⁹ “Research Reactors: Purpose and Future,” International Atomic Energy Agency, November 2010. Accessed June 17, 2015, https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/documents/RR_Purpose_and_Future_BODY.pdf, p. 2.

Data from the World Nuclear Association describes the relative work required to convert an input of uranium into an output of enriched uranium (Figure 1). The bulk of the enriching process (approximately 800-900 SWU per tonne of uranium feed) occurs to bring the U^{235} concentration up to LEU levels. To achieve highly-enriched uranium, the same input requires only a total of approximately 1,100 SWU – an increase of less than one-fourth of the effort required for standard fuel purposes. Once HEU levels are achieved, less than 200 additional SWU are required for the same input to be rendered weapons-grade uranium.

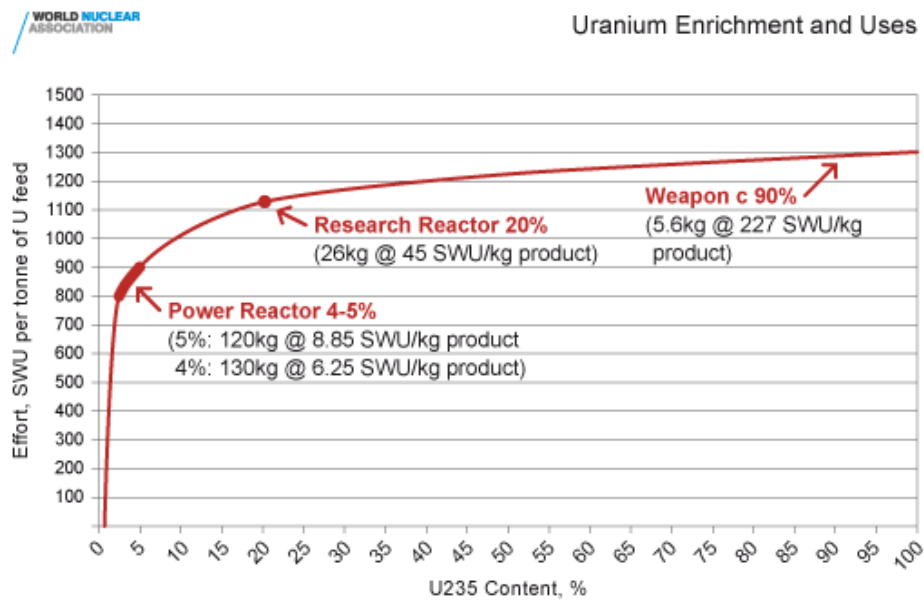


Figure 1. Separative Work Units required to turn 1 tonne of uranium into enriched uranium. The final mass decreases as the uranium becomes more highly enriched.⁶⁰

Neither the United States nor the international community is blind to the proliferation concerns of research reactor fuel requirements. While the International Atomic Energy Agency (IAEA) states its policy as being “to promote, support and assist

⁶⁰ World Nuclear Association, “Uranium Enrichment.”

Member States in the development and maintenance” of research reactors “for the benefit of the nuclear industry and the well-being of humanity,”⁶¹ it recognizes the need to “minimize civilian use of highly enriched uranium.”⁶² Similarly, the United States Department of Energy launched the “Reduced Enrichment for Research and Test Reactors (RETR) Program” in 1978 specifically to assist in converting HEU research reactors to LEU fuel requirements; under the RETR Program, 40 such reactors have been successfully converted.⁶³

Indigenous Enrichment Programs

Both research reactors and nuclear power have a legitimate need for enriched uranium fuels. However, the volumes of fuel required – as previously stated – do not necessarily make a fuel cycle logical from an economic standpoint. This is even more true in the case of research reactors where, despite their HEU requirements, the volume necessary to function is “far less”⁶⁴ than that of a nuclear power plant. A closed fuel cycle is little better, given the low prevalence of MOX fuel globally, and so a country’s pursuit of these facilities can function as a red flag that they may be pursuing programs that are not peaceful in nature.

While a red flag is not proof of malicious intent, one conclusion that can be drawn from a nation that has minimal nuclear infrastructure yet is pursuing an indigenous closed fuel cycle is that economics are not the primary motivation for the enrichment process.

⁶¹ “Research Reactors: Purpose and Future”, p. 4.

⁶² “Research Reactor Section: Fuel Cycle, Repatriation and Conversion,” International Atomic Energy Agency, January 13, 2014. Accessed June 18, 2015, <https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/rfuelcycle.html>.

⁶³ “RETR Department,” Nuclear Engineering Division, Argonne National Laboratory, February 5, 2013. Accessed June 18, 2015, <http://www.rertr.anl.gov/index.html>.

⁶⁴ “Facing the Challenge: IAEA Support of Research Reactor Sustainability.”

Brazil and Argentina, for example, each pursued small enrichment programs that were designed to provide a stable supply of enriched uranium “at a cost that is likely substantially higher than just procuring these services from large international suppliers.”⁶⁵ The development of indigenous enrichment capabilities in these countries began in response to restrictions on nuclear technology transfers following India’s decision to detonate an atomic device in 1974.⁶⁶ This suggests that the security and stability of supply was a significant factor for these countries, outweighing economic factors which would discourage these programs.

In fact, security of supply is among the stated reasons for Iran’s enrichment program. Ali Akbar Salehi, currently the chief of Iran’s Atomic Energy Organization (and the recipient of a PhD in nuclear engineering from MIT), has publicly identified 190,000 SWU of enrichment capacity as a core requirement to fuel Iran’s nuclear energy and research program “after the end of the [fuel supply] contract with Russia”.⁶⁷ If this assertion can be taken at face value,⁶⁸ then it would logically follow that the fear of losing the supply of nuclear material by outside influences is of such a great concern to some countries that no price is too high to pay to ensure that a reactor may be fueled, whether that price is concretely measurable in hard currency or more abstractly in the form of isolation from the international community.

⁶⁵ “Economic and Non-Proliferation Policy Considerations of Uranium Enrichment in Brazil and Argentina,” Pacific Northwest National Laboratory, U.S. Department of Energy, August 2008. Accessed June 22, 2015, http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17757.pdf, p. iii.

⁶⁶ *Ibid.*, p. 7.1.

⁶⁷ “Latest on Nuke Talks: What Iran, P5+1 Say,” The Iran Primer, United States Institute for Peace, July 10, 2014. Accessed June 23, 2015, <http://iranprimer.usip.org/blog/2014/jul/10/latest-uke-talks-what-iran-p51-say>.

⁶⁸ Iran’s nuclear program, particularly its possible military dimensions, is a controversial topic in 2015. A full analysis of whether or not Iranian officials can be considered credible advocates on this particular issue not only would require far more space than this paper can allow, but would require that the outcome of the Joint Comprehensive Plan of Action be reviewed in hindsight.

Possible Military Dimensions

On the other hand, Iran also shows that seventy years after the first and only nuclear detonations as part of a military campaign, the international community remains highly cautious about the circumstances under which a nuclear program is developed. It simply cannot be repeated often enough that the technologies remain nearly identical for both a peaceful nuclear enterprise and for a nuclear weapons program. This is why the openness of the host country is of paramount importance as the international community attempts to regulate the spread of such sensitive technologies and materials.

Unlike Iran, North Korea (DPRK) offers no ambiguity for what its nuclear program was designed to achieve. The North Korean nuclear weapons program dates back before 1985, when the United States announced that the DPRK was building a secret nuclear reactor near the town of Yongbyon – 90km from the capital of Pyongyang. North Korea was pressured into signing the Nuclear Non-Proliferation Treaty (NPT) that year, but initially “refused to sign a safeguards agreement with the International Atomic Energy Agency (IAEA), an obligation it had as a party to the [NPT].”⁶⁹

An inspections agreement was finally signed between the IAEA and the DPRK in 1992. By 1993, the IAEA had discovered and subsequently requested access to two unreported North Korean locations that were presumed to be storing nuclear waste. These requests were denied.⁷⁰ North Korea announced it would withdraw from the NPT in 1993,⁷¹ but suspended its decision to withdraw during negotiations led by the United

⁶⁹ “Nuclear Weapons Program: Current Status,” North Korean Country Page, Federation of American Scientists, November 16, 2006. Accessed June 23, 2015, <http://fas.org/nuke/guide/dprk/nuke/>.

⁷⁰ *Ibid.*

⁷¹ George Bunn and John B. Rhinelander, “NPT Withdrawal: Time for the Security Council to Step In,” Arms Control Association, *Arms Control Today*, May 1, 2005. Accessed October 3, 2015, https://www.armscontrol.org/act/2005_05/Bunn_Rhinelander.

States to deescalate tensions on the Korean Peninsula and dismantle the North Korean nuclear program. These efforts appeared to have been successful, with the DPRK freezing and planning to dismantle its nuclear infrastructure, and with pledges by the United States and South Korea to assist in the construction of a light water reactor to contribute to the North Korean civilian nuclear program.⁷²

North Korea became a critical nonproliferation concern in 2002, as it was between 1992 and 1994, when the CIA reported that the DPRK was procuring the requisite infrastructure capable of producing multiple nuclear warheads on an annual basis.⁷³ The existence of a clandestine enrichment program was acknowledged by DPRK officials that same year.⁷⁴ North Korea has since withdrawn from the NPT as of 2003,⁷⁵ and detonated nuclear devices in 2006, 2009, and 2013;⁷⁶ the DPRK's government has threatened the United States with nuclear war on multiple occasions in the last year alone, likely as a means to bolster its own deterrence posture.^{77,78,79}

The case of North Korea is significant for a variety of reasons, but one which shall receive special mention is the fact that its nuclear weapons program ostensibly began as a peaceful enterprise. In 1950, the Yongbyon plant was designed with the aid of

⁷² "Nuclear Weapons Program: Current Status."

⁷³ Mary Beth Nikitin, "North Korea's Nuclear Weapons: Technical Issues," Congressional Research Service, April 3, 2013. Accessed June 23, 2015. <https://www.fas.org/spp/crs/nuke/RL34256.pdf>, p. 10.

⁷⁴ Federation of American Scientists, FAS North Korean Country Page, "Nuclear Weapons Program: Current Status." Accessed June 25, 2015, <http://fas.org/nuke/guide/dprk/nuke/>.

⁷⁵ "NPT Withdrawal: Time for the Security Council to Step In."

⁷⁶ "North Korea's Nuclear Weapons: Technical Issues," p. 14-15.

⁷⁷ Kukil Bora, "North Korea Threatens 'Gangster' US With Nuclear Strikes, Cyber Warfare; Rules Out Talks," *International Business Times*, February 4, 2015. Accessed June 25, 2015, <http://www.ibtimes.com/north-korea-threatens-gangster-us-nuclear-strikes-cyber-warfare-rules-out-talks-1804738>.

⁷⁸ Will Ripley and Tim Schwarz, "Exclusive: North Korea Would Use Nukes if 'Forced,' Official Says," *CNN*, May 7, 2015. Accessed June 25, 2015, <http://edition.cnn.com/2015/05/07/asia/north-korea-official-interview/index.html>.

⁷⁹ AFP, "North Korea Threatens Nuclear Strike on White House," *The Telegraph*, July 29, 2014. Accessed June 25, 2015, <http://www.telegraph.co.uk/news/worldnews/asia/northkorea/10997161/North-Korea-threatens-nuclear-strike-on-White-House.html>.

the Soviet Union as a research reactor. By 1967, the plant was operational. Although the DPRK joined the NPT in 1985, safeguards inspections had failed to identify the DPRK's unreported storage sites prior to 1992. Whatever the original intent of the Yongbyon plant, by the 1990s it was apparent that North Korea had been capable of stockpiling enough weapons-grade plutonium for "one or two bombs."⁸⁰

Chapter Summary

Enriched uranium is one of the most versatile tools that mankind has harnessed to date. The use and development of nuclear power for peaceful purposes is guaranteed under the NPT, but whether or not enrichment is a similarly-guaranteed right is not explicitly addressed by the treaty.⁸¹ A nuclear fuel cycle being uneconomical for the average country, endeavors by a non nuclear weapons state to develop such a closed system may suggest that 'peaceful purposes' are not the final goal.

What is truly concerning is how closely civilian and military nuclear technologies mirror each other in the development phase. A nation enriching uranium above the 20% threshold may be attempting to reduce the threshold to a nuclear weapons program, or it may be attempting to fuel a research reactor which requires a denser concentration of U²³⁵ to produce isotopes useful for civilian applications (such as for medical or structural engineering purposes). A country could theoretically design a research reactor requiring

⁸⁰ "North Korea's Nuclear Weapons: Technical Issues," p. 1.

⁸¹ Article IV of the NPT states that "[n]othing in this Treaty shall be interpreted as affecting the inalienable right of all the Parties to the Treaty to develop research, production and use of nuclear energy for peaceful purposes without discrimination and in conformity with Articles I and II of this Treaty." Some parties have interpreted this to include the right to enrich (because enriched uranium fuel is required to operate nuclear power and research reactors), whereas others have interpreted it to omit or be silent on the right to enrich (as enriched uranium fuel may be imported from abroad, which can then be used for the development, research, production, &c. for peaceful purposes).

weapons-grade uranium to operate and, so long as civilian applications are the only result of the program, be well within its right under the NPT to require and demand a source of fuel for its reactor.

This is what makes the study of possible military dimensions such an important issue. Technologies, tools, and knowledge can be acquired by nearly any international actor – it is simply not possible to un-invent the nuclear bomb – but how these actors employ these assets is paramount to determining whether or not a malicious program will develop.

Ultimately, unless the nature of the actor can be known and predicted, only the control of uranium resources can prevent the occurrence of a new nuclear weapons state. Most international nuclear suppliers have prerequisites and requirements to facilitate this control, and international safeguards exist to ensure that uranium can be accounted for and recovered after it has been supplied. As one such supplier, the United States pursues its nonproliferation goals in part through restrictive nuclear cooperation agreements.

NUCLEAR COOPERATION AGREEMENTS

The current framework for U.S. nuclear cooperation agreements was set by the Atomic Energy Act of 1954. It is specifically Title I, Chapter 11, Section 123 (Section 123) of the Act which lays down the requirements for an agreement to be concluded with a foreign power (and which provides the source of the term “123 Agreement”). Section 123 outlines nine specific pledges (Appendix) that a collaborating country must adhere to in order to secure a 123 Agreement.

After signing a 123 Agreement, the President submits it to Congress for approval. The House Committee on Foreign Affairs and the Senate Foreign Relations Committee each receive a copy; by law, the proposed 123 Agreement must be held by these committees for 90 days of continuous session. This allows for an appropriate amount of time to be allotted for debating the merits and drawbacks of the proposed agreement; should Congress find flaws in the agreement, it may submit a bill to disapprove the agreement. Without passage of such a bill, however, the nuclear cooperation agreement enters into force automatically at the end of the review period.

Since the 1954 Act was signed, the United States has embarked on a number of these negotiations. In total, the National Nuclear Security Administration (NNSA) lists twenty-four active partnerships as of July 2015 (that number rises to twenty-five with the addition of Vietnam).⁸² Among these are nuclear weapons states (such as China and Russia), non-nuclear-weapons states (such as Japan and Morocco), international bodies

⁸² National Nuclear Security Administration, “123 Agreements for Peaceful Cooperation”. Accessed July 9, 2015, <http://nnsa.energy.gov/aboutus/ourprograms/nonproliferation/treatiesagreements/123agreementsforpeacefulcooperation>.

(such as the IAEA and the European Atomic Energy Community⁸³), and even countries that formerly maintained or pursued nuclear weapons (such as Ukraine and South Africa).

The conclusion of a 123 Agreement does not include the transfer of nuclear materials, technologies, or data in and of itself. Rather, it serves as a framework which authorizes American companies to conduct business with the cooperating Party. Such a framework exists “to prevent diversion of U.S. commercial nuclear materials, components and technology from their intended peaceful use.”⁸⁴

Below are overviews of three 123 Agreements either negotiated or re-negotiated by the United States after the “Gold Standard” was established in 2009; Vietnam and the U.A.E. are discussed in more detail in the following chapter (see page 36). These agreements provide necessary context for the diversity of American negotiating partners in nuclear cooperation agreements.

Republic of China

Among the first 123 Agreements negotiated by the United States, the Republic of China (Taiwan) signed a nuclear cooperation agreement one year after the passage of the Atomic Energy Act of 1954.⁸⁵ Prior to 1979, the United States recognized the government in exile in Taiwan as the legal government of China. Following the U.S.-

⁸³ *Ibid.*; the NNSA notes that “Euratom comprises the following Member States: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.”

⁸⁴ Nuclear Energy Institute, “Nuclear Cooperation Agreements”. Accessed July 10, 2015, <http://www.nei.org/Issues-Policy/Exports-Trade/Nuclear-Cooperation-Agreements>.

⁸⁵ Paul K. Kerr and Mary Beth Nikitin, “Nuclear Cooperation with Other Countries: A Primer,” Congressional Research Service (CRS Report no. RS22937), November 4, 2014. Accessed July 10, 2015, <http://www.fas.org/sgp/crs/nuke/RS22937.pdf>, p. 14.

P.R.C. Joint Communique in 1979 with the *People's* Republic of China (emphasis added), the United States instead took the position that “there is but one China, and Taiwan is part of China.” This declaration was made to recognize the Communist regime in Beijing, where the Chinese Communist Party controls the vast majority of sovereign Chinese territory. That being said, the United States was resolved to maintain “cultural, commercial, and other unofficial relationships with the people on Taiwan.” Taiwan and the United States have since enjoyed a “robust unofficial relationship.”⁸⁶

As an entity, Taiwan is perhaps most unique among American nuclear cooperation agreements in that it is technically neither a country nor a collection of countries; the United States considers the question of the sovereignty of the island of Taiwan to be “unsettled.” According to the Congressional Research Service, “the United States has supported a future determination of the island’s status in a peaceful manner” dating back to a statement made by President Truman in June of 1950.⁸⁷ So long as violence does not break out between Taipei and Beijing, the United States is content to let the island’s integration with or independence from mainland China progress at its own pace. In the meantime, cooperation and contact, of a non-official nature, primarily occurs between the American Institute in Taiwan and the Taipei Economic and Cultural Representative Office.

⁸⁶ Bureau of East Asian and Pacific Affairs, “Fact Sheet: U.S. Relations with Taiwan,” United States Department of State, February 12, 2015. Accessed July 10, 2015, <http://www.state.gov/r/pa/ei/bgn/35855.htm>.

⁸⁷ Shirly A. Kan and Wayne M. Morrison, “U.S.-Taiwan Relationship: Overview of Policy Issues,” Congressional Research Service (CRS Report no. R41952), December 11, 2014. Accessed July 10, 2015, <http://www.fas.org/sgp/crs/row/R41952.pdf>, p. 4.

Taiwan's 123 Agreement was renewed indefinitely in 2014,⁸⁸ having been re-negotiated in 2013. To date, the island has maintained a "reliable record on nonproliferation."⁸⁹ This record, despite Taiwan's lack of official status, would indicate that a truly robust counter to proliferation concerns is adherence to broader international frameworks (such as the NPT and IAEA safeguards). Taiwan, a close democratic partner of the United States, did include a legally-binding ban on the procurement of enrichment and reprocessing technologies in its 123 Agreement.⁹⁰ However, as the Carnegie Endowment for International Peace notes, each of Taiwan's nuclear reactors is "based on U.S. intellectual property," and Taiwan's current fuel cycle currently processes uranium through American vendors.⁹¹

In other words, due to Taiwan's over-reliance on American supplies and technology, the United States is free to mandate that Taiwan continue to not enrich uranium. This is not a scalable model for the international community, as the international community is far from reliant solely on American-sourced nuclear fuel. Furthermore, this ban is consistent with existing Taiwanese legislation that would phase out nuclear power on the island altogether.⁹² Applying the "Gold Standard" to Taiwan is somewhat of a hollow victory, therefore, as the nonproliferation goals which the United

⁸⁸ Barack Obama, "Message to the Congress -- Agreement for Cooperation Between the American Institute in Taiwan and the Taipei Economic and Cultural Representative Office Concerning Peaceful Uses of Nuclear Energy," The White House, Office of the Press Secretary, January 7, 2014. Accessed July 10, 2015, <https://www.whitehouse.gov/the-press-office/2014/01/07/message-congress-agreement-cooperation-between-american-institute-taiwan>.

⁸⁹ *Ibid.*, p. 19.

⁹⁰ United States Congress, House Committee on Foreign Affairs, "The Future of International Civilian Nuclear Cooperation," Hearing, July 10, 2014, 113th Congress, Second Session. Accessed July 31, 2015, <http://www.gpo.gov/fdsys/pkg/CHRG-113hhrg88626/pdf/CHRG-113hhrg88626.pdf>, p. 4.

⁹¹ Mark Hibbs, "Taiwan and the Gold Standard," Carnegie Endowment for International Peace, July 23, 2012. Accessed July 31, 2015, <http://carnegieendowment.org/2012/07/23/taiwan-and-gold-standard/czys>.

⁹² World Nuclear News, "New Nuclear Energy Policy for Taiwan," November 3, 2011. Accessed July 31, 2015, http://www.world-nuclear-news.org/NP-New_nuclear_energy_policy_for_Taiwan-0311117.html.

States sought through the “Gold Standard” had been achieved, arguably, decades before this 123 Agreement was renewed.

People’s Republic of China

Negotiated some decades after the agreement with Taiwan, and several years after the United States recognized the communist government of mainland China (the People’s Republic of China, or PRC), the 123 Agreement concluded between China and the United States was signed in 1985. Then, just as now, there were concerns regarding the PRC’s proliferation behavior. The waivers required to permit the export of materials and technologies to China were not issued until 1998, thirteen years later.⁹³

By the end of that same year, Congress had established the Cox Commission to determine whether or not sensitive data had been obtained by China as a result of American exports. The Commission released a declassified report in 1999 stating that China had ““stolen” classified information on the most advanced U.S. thermonuclear warheads,” in operations that dated back to the 1970s and had lasted at least through the duration of the Cox Commission. This included information on the entirety of the deployed American arsenal; re-entry vehicles; and even submarine-launched ballistic missile technologies.⁹⁴

⁹³ Sharon Squassoni and Chris Coughlin, “Nuclear Cooperation with China,” Center for Strategic and International Studies, July 16, 2015. Accessed July 18, 2015, <http://csis.org/publication/nuclear-cooperation-china>.

⁹⁴ Shirley A. Kan, “China: Suspected Acquisition of U.S. Nuclear Weapon Secrets,” Congressional Research Service (CRS Report no. RL30143), February 1, 2006. Accessed July 18, 2015. <http://www.fas.org/sgp/crs/nuke/RL30143.pdf>, p. 9.

China itself has expressed interest in being a nuclear supplier.⁹⁵ As recently as February of 2015, Beijing had announced that it had assisted Pakistan in developing six nuclear reactors.⁹⁶ Such cooperation has spanned the preceding decades into the early 1990s, and by the end of that decade China was suspected of having provided equipment for a heavy water reactor that Pakistan used to produce weapons-grade plutonium.⁹⁷

As a nuclear weapons state, there are some allowances to be made for how China uses material and non-material transfers under a 123 Agreement with the United States. However such allowances, as outlined in the exemptions above, describe only the transfer of sensitive technologies and technologies that China already possesses (or which would not greatly advance Chinese nuclear weapons programs). In theory, a 123 Agreement would limit China's ability to reprocess and enrich fuel and uranium sourced from the United States without expressed permission granted by the American government.

To avoid the hassle of coming to its American counterparts whenever it seeks to enrich or reprocess American-sourced nuclear material, an "advance consent" clause had been added to the U.S.-China 123 Agreement which Congress reviewed⁹⁸ and ultimately allowed to renew in 2015.⁹⁹ This would effectively relieve China from even the most basic restrictions of a nuclear cooperation agreement which adheres to the previously-

⁹⁵ "China to Boost Railway and Nuclear Exports," *China Daily*, February 7, 2015. Accessed July 18, 2015, http://www.china.org.cn/business/2015-02/07/content_34762057.htm.

⁹⁶ Prashanth Parameswaran, "China Confirms Pakistan Nuclear Projects," *The Diplomat*, February 10, 2015. Accessed July 18, 2015, <http://thediplomat.com/2015/02/china-confirms-pakistan-nuclear-projects/>.

⁹⁷ Shirley A. Kan, "China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues," Congressional Research Service (CRS Report no. RL31555), January 5, 2015. Accessed July 18, 2015, <http://www.fas.org/sgp/crs/nuke/RL31555.pdf>, p. 3.

⁹⁸ Mark Holt and Mary Beth Nikitin, "U.S.-China Nuclear Cooperation Agreement," Congressional Research Service (CRS Report no. RL33192), May 6, 2015. Accessed July 31, 2015. <https://www.fas.org/sgp/crs/row/RL33192.pdf>, p.11.

⁹⁹ World Nuclear News, "China-USA Cooperation Agreement Renewed," November 10, 2015. Accessed November 10, 2015, <http://www.world-nuclear-news.org/NP-China-USA-cooperation-agreement-renewed-1011157.html>.

established “Gold Standard” of nuclear nonproliferation by granting, as the name implies, advanced consent by the American government for the enrichment and reprocessing of American-sourced materials.

Notably, Euratom and India (the latter of which is one of China’s regional strategic rivals) both obtained an “advance consent” clause in their respective 123 Agreements. China likely required the same from the U.S. in order to maintain strategic competition with India in particular, and the Administration rationalized the decision to include the clause by explaining that rejecting the deal would “leave the United States in a weaker position to influence China’s nonproliferation behavior.”¹⁰⁰ The Congressional Research Service notes that China would only be able to conduct reprocessing of American material in “facilities that are under or are eligible for IAEA safeguards,” and that the resulting material “may not be for military use.”¹⁰¹

While the relevance of the “Gold Standard” as it applies to China may seem minimal, given China’s status as a nuclear weapons state under the NPT, to the contrary it further highlights the disparity between nuclear weapons states and non-nuclear weapons states as identified by the NPT. If advanced nuclear infrastructure can provide more favorable negotiating terms with the United States, then it is likely that countries will consider pursuing more advanced infrastructure before attempting to enter into a 123 Agreement with the United States. This could include the pursuit of enrichment and reprocessing capabilities.

¹⁰⁰ Arms Control Association, “Strengthening Congressional Oversight of 123 Agreements,” *Issue Briefs* (Volume 7, Issue 8, July 2, 2015). Accessed November 19, 2015, <https://www.armscontrol.org/Issue-Briefs/2015-07-02/Strengthening-Congressional-Oversight-of-123-Agreements>.

¹⁰¹ “U.S.-China Nuclear Cooperation Agreement,” p. 7.

Russian Federation

Like the People's Republic of China, the Russian Federation is a nuclear weapons state. The United States and Russia did not negotiate a 123 Agreement until 2008, nearly two decades after the fall of the Soviet Union. This agreement was preceded by a Joint Declaration by President George W. Bush and President Vladimir Putin in 2007 announcing a "bilateral Agreement between the [United States and Russia] for cooperation in the field of peaceful use of nuclear energy."¹⁰² Both the U.S. and Russia sought to expand access by developing nations to peaceful nuclear power, consistent both with international law and the goal of nuclear nonproliferation.

Through this Joint Declaration, both parties would seek to "permit states to gain the benefits of nuclear energy and to create a viable alternative to the acquisition of sensitive fuel cycle technologies."¹⁰³ Building on this key nonproliferation posture statement, President Bush submitted the U.S.-Russian 123 Agreement in May of 2008. However, the agreement was withdrawn from congressional consideration in September of that same year citing Russian military action in Georgia.¹⁰⁴

In May of 2010, two years after the Russian-U.S. 123 Agreement was negotiated and less than a year after the "Gold Standard" agreement with the United Arab Emirates was signed, the Russian Nuclear Cooperation Agreement was once again submitted to Congress.¹⁰⁵ Much of the debate over ratification of the agreement was less concerned

¹⁰² U.S. Government Printing Office, "Weekly Compilation of Presidential Documents Volume 43, Number 27 (Monday, July 9, 2007)." Accessed October 21, 2015, <http://www.gpo.gov/fdsys/pkg/WCPD-2007-07-09/html/WCPD-2007-07-09-Pg903-2.htm>, p. 903.

¹⁰³ *Ibid.*, p. 905.

¹⁰⁴ Mary Beth Nikitin, "U.S.-Russian Civilian Nuclear Cooperation Agreement: Issues for Congress," Congressional Research Service (CRS Report no. RL34655), January 11, 2011. Accessed July 29, 2015, <https://www.fas.org/sgp/crs/nuke/RL34655.pdf>, p. i.

¹⁰⁵ Barack Obama, "Message from the President Regarding a Peaceful Nuclear Agreement with Russia," The White House, Office of the Press Secretary, May 10, 2010. Accessed July 29, 2015,

with Russian military action, the aggression in Georgia having largely fallen out of the public debate, and more concerned with Russian support of Iranian nuclear and ballistic missile programs.¹⁰⁶ This is consistent with the concerns of the 110th Congress in 2008,¹⁰⁷ and in fact appears as key points in testimony both from government¹⁰⁸ and non-government¹⁰⁹ congressional witnesses during that period.

Given Russia's status as a nuclear energy supplier, it is generally accepted that Russia will continue enriching and exporting uranium to countries that both have and have not signed 123 Agreements with the United States, thus providing a limiting factor for the influence which the United States has in the realm of nuclear nonproliferation. However, Russian nonproliferation goals can be complimentary to those of the U.S.

In 2006, for example, Russia proposed the creation of a "system of international centers providing nuclear fuel cycle services."¹¹⁰ By May of 2007, two months prior to the U.S.-Russia Joint Declaration above, Russia and Kazakhstan had agreed to establish the International Uranium Enrichment Center.¹¹¹ Its stated purpose, which the United States supports, is to "ensure guaranteed supplies of uranium product to countries that

<https://www.whitehouse.gov/the-press-office/message-president-regarding-a-peaceful-nuclear-agreement-with-russia>.

¹⁰⁶ "U.S.-Russian Civilian Nuclear Cooperation Agreement," p. 5.

¹⁰⁷ Alicia Godsberg, "U.S.-Russia 123 Agreement on the Hill," Federation of American Scientists, June 18, 2008. Accessed July 29, 2015, <http://fas.org/blogs/security/2008/06/us-russia-123-agreement-on-the-hill/>.

¹⁰⁸ John C. Rood, "Agreement Between the United States and Russia for Cooperation in the Field of Peaceful Uses of Nuclear Energy," U.S. Department of State, Statement before the House Foreign Affairs Committee, June 12, 2008. Accessed July 29, 2015, <http://2001-2009.state.gov/t/us/rm/105880.htm>.

¹⁰⁹ Henry Sokolski, "The U.S.-Russia Nuclear Cooperation Agreement: The Case for Conditioning," Nonproliferation Education Center, Testimony Presented before a Hearing of the House Committee on Foreign Affairs, June 11, 2008. Accessed July 29, 2015, <http://www.npolicy.org/article.php?aid=222&rid=5>.

¹¹⁰ International Uranium Enrichment Center, "Key Dates." Accessed August 3, 2015, <http://eng.iuec.ru/about/dates/>.

¹¹¹ International Uranium Enrichment Center, "Agreement Between the Government of the Russian Federation and the Government of the Republic of Kazakhstan on Foundation of the International Uranium Enrichment Center," May 10, 2007 (Unofficial English Translation). Accessed August 3, 2015, http://www.iuec.ru/files/IUEC_Agreement.doc.

have elected to join the Center as an alternative to development of their own enrichment,”¹¹² provided that member countries adhere to IAEA safeguards and accept nuclear fuel supplies that are exported from the Russian Federation.¹¹³ As of August 2015, the member states are Russia, Kazakhstan, Ukraine, and Armenia.¹¹⁴

The Uranium Enrichment Center coordinated by Russia highlights two very important points: First, as with Taiwan and the United States, being the sole supplier of nuclear fuel is a key means of dissuading states from pursuing enrichment technologies of their own accord. Second, and very much related to the first point, the United States is far from the only nuclear supplier in the global community.

Chapter Summary

The three selected nuclear cooperation agreements above highlight the diversity in American nuclear negotiating partners. Taiwan, entirely reliant on the United States for its nuclear program, shows that dominance of supply can be a crucial factor in mandating limits on enrichment and reprocessing rights. Russia and China, an established and emerging nuclear supplier, respectively, are both nuclear weapons states as defined by the NPT. In both of these cases, existing enrichment and reprocessing infrastructure as well as existing supply relationships between these powers and other countries make banning this enrichment and reprocessing capacity untenable politically.

Each of these agreements was additionally re-negotiated following the establishment of the “Gold Standard.” Although enrichment and reprocessing were

¹¹² International Uranium Enrichment Center, “Supplies to Shareholders.” Accessed August 3, 2015, http://eng.iuec.ru/activities/supplies_to_shareholders/.

¹¹³ International Uranium Enrichment Center, “Participation Conditions.” Accessed August 3, 2015, http://eng.iuec.ru/activities/participation_conditions/.

¹¹⁴ International Uranium Enrichment Center, “Main.” Accessed August 3, 2015, <http://eng.iuec.ru/>.

successfully banned in the U.A.E., attempting to do the same with nuclear weapons powers that were, and remain, highly unlikely to relinquish their own nuclear infrastructures would likely have been a fruitless effort; this paper does not recommend that the United States should have applied the “Gold Standard” to Russia and China. However, offering more favorable negotiating terms to nations with advanced nuclear infrastructures likely has the unintended consequence of causing less-developed nations to pursue their own advanced nuclear infrastructures before turning to the United States for assistance. This would allow them to receive the most favorable terms from a 123 Agreement with the United States.

ESTABLISHING THE “GOLD” AND “SILVER” STANDARDS

The “Gold” and “Silver” Standards were set, in the realm of nuclear nonproliferation, by the United Arab Emirates and the Socialist Republic of Vietnam. Under the “Gold Standard,” the United Arab Emirates agreed to be legally bound from enriching or reprocessing uranium on its own territory through the 123 Agreement that it signed with the United States of America. This was an unprecedented step in terms of American civilian nuclear cooperation; the only other entity to agree to such a ban had previously been Taiwan (see page 26).

When the United States began its 123 negotiations with Vietnam, there was hope, particularly from members of Congress,¹¹⁵ that the “Gold Standard” would become the chief pursuit of American nuclear cooperation negotiations. Instead, Vietnam established the “Silver Standard” with a political commitment against enrichment and reprocessing that was not legally binding. Senator Bob Corker (R-TN), the Ranking Member of the Senate Foreign Relations Committee at the time, criticized the Obama administration for its “inconsistent and confusing” standards for nuclear cooperation agreements, stating that such a track record could potentially compromise “our nation’s nonproliferation policies and goals.”¹¹⁶ Through reviewing the text of both 123 Agreements, trends between the “Gold” and “Silver” standards can be examined for how well they may apply to future negotiations.

¹¹⁵ Bob Corker, “Corker: Inconsistency in Civilian Nuclear Deals Threatens U.S. Non-Proliferation Goals,” United States Senate Committee on Foreign Relations, October 28, 2013. Accessed August 18, 2015, <http://www.foreign.senate.gov/press/ranking/release/corker-inconsistency-in-civilian-nuclear-deals-threatens-us-non-proliferation-goals>.

¹¹⁶ *Ibid.*

The U.S.-U.A.E. 123 Agreement

On May 21, 2009, President Barack Obama submitted the text of the proposed nuclear cooperation agreement between the United States and the United Arab Emirates to the 111th Congress for review, pursuant to Section 123 of the Atomic Energy Act of 1954. As a non-nuclear-weapons party to the NPT, the U.A.E. was already barred from receiving any scientific or technical assistance leading to the development of a nuclear weapon. Even so, the United States determined that “prior to U.S. licensing of exports of nuclear material, equipment, components, or technology” or any other nuclear cooperation pursuant to the 123 Agreement, the Additional Protocol would have to come into force over the U.A.E.’s nuclear program.¹¹⁸

The Additional Protocol “grants the IAEA complementary legal authority to verify a State’s safeguards obligations.” It grants the IAEA information about (and access to) the entirety of a state’s nuclear fuel cycle; more latitude, ease of entry into a country, and access to communications, for IAEA inspectors; and additional access to information and records which make identifying undeclared nuclear sites easier for the IAEA. While the Additional Protocol is on the whole more invasive of the host country, the benefits to global nonproliferation goals are great enough that 126 countries and Euratom have brought the Additional Protocol into force, with an additional 20 countries having signed it (with entry into force pending).¹¹⁹

¹¹⁸ U.S. Government Printing Office, “Message from the President of the United States Transmitting the Text of a Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates Concerning Peaceful Uses of Nuclear Energy Pursuant to 42 U.S.C. 2153(b), (d),” House Document 111-43, 111th Congress (1st Session), May 21, 2009, pp. 1-2.

¹¹⁹ International Atomic Energy Agency, “Additional Protocol,” September 22, 2015. Accessed October 3, 2015, <https://www.iaea.org/safeguards/safeguards-legal-framework/additional-protocol>.

Prior to the submission of the text of the 123 Agreement, however, the United Arab Emirates had undergone its own internal review of the requirements for a domestic nuclear program. The U.A.E. had found that, starting in 2007, annual demand for electricity was predicted to increase by 9% through 2020. In a government white paper released in 2008 identifying this and other relevant findings, the U.A.E. noted that non-nuclear, renewable energy sources such as solar would realistically (given the technology available at the time) cover approximately 7% of peak daily demand by the 2020 timeframe. It was therefore decided that nuclear energy would be the most appropriate source of electricity for the growing country “as a proven, environmentally promising and commercially competitive option”.¹²⁰

One very significant portion of the white paper was highlighted in a press release by the Embassy of the United Arab Emirates in Washington, D.C. upon the white paper’s release. “Embodied in the UAE policy on peaceful nuclear energy are a pledge to forego any domestic enrichment or reprocessing capability in favor of long-term external fuel supply arrangements,” it states, along with “a pledge to conclude a number of pertinent international agreements, including the IAEA Additional Protocol”.¹²¹ The United States and the United Arab Emirates released a “Memorandum of Understanding” one day after

¹²⁰ Government of the United Arab Emirates, “Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy,” March 23, 2008. Accessed August 21, 2015, <https://www.fanr.gov.ae/En/Documents/whitepaper.pdf>, pp. 1-2.

¹²¹ Embassy of the United Arab Emirates, “UAE Government Releases Comprehensive Policy White Paper on the Evaluation and Potential Development of Peaceful Nuclear Energy,” April 20, 2008. Accessed August 24, 2015, www.uae-embassy.org/sites/default/files/Press_Policy_Paper_Peaceful_Nuclear_Energy.pdf, p. 2.

the white paper was released, stating the U.S. intent to assist the U.A.E. with its nuclear program.¹²²

This would seem to imply that talks for nuclear cooperation between the two powers predated the completion of the white paper. It is difficult to determine whether the philosophy to forego domestic enrichment capabilities came from within the U.A.E. or was imposed upon it by its partners throughout the negotiating process, but in the years following the 123 Agreement the UAE has been a vocal advocate of the “Gold Standard.” Hamad Al Kaabi, the UAE representative to the IAEA in 2012, publicly stated that it “does not make sense” for nations developing new civilian nuclear power initiatives to pursue enrichment capabilities just months after the Obama administration decided to pursue a case-by-case negotiating strategy for enrichment and reprocessing bans.¹²³

Within the 123 Agreement itself, the pledge not to enrich is enshrined in Article 7, which states that

The United Arab Emirates shall not possess sensitive nuclear facilities within its territory or otherwise engage in activities within its territory for, or relating to, the enrichment or reprocessing of material, or for the alteration in form or content (except by irradiation or further irradiation or, if agreed by the Parties, post-irradiation examination) of plutonium, uranium 233, high enriched uranium, or irradiated source or special fissionable material.¹²⁴

The Agreement also specifies in Article 6 that material transferred under the agreement may not be enriched or reprocessed without prior approval from the United States,

¹²² Office of the Spokesman, “U.S.-United Arab Emirates Memorandum of Understanding on Nuclear Energy Cooperation,” United States Department of State, April 21, 2008. Accessed August 24, 2015, <http://2001-2009.state.gov/r/pa/prs/ps/2008/apr/103859.htm>.

¹²³ April Yee, “UAE Presses the Case for Nuclear Gold Standard,” *The National*, April 19, 2012. Accessed November 19, 2015, <http://www.thenational.ae/business/energy/uae-presses-the-case-for-nuclear-gold-standard>.

¹²⁴ Article 7, “Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates,” p. 7.

although “irradiation” and “further irradiation” are exempt (as in Article 7).¹²⁵ An exemption of irradiation is likely to allow for the naturally-occurring irradiation of plutonium byproduct during the operation of a civilian nuclear power plant.¹²⁶

Under the Agreed Minute,¹²⁷ the restriction on modifying special or fissionable material is further defined to require that such activities take place on the territory of an agreed third party.¹²⁸ This would provide a model for other countries to follow by showing future partners that all rights guaranteed under the NPT (including those of controversial nature such as the modification of special and fissionable materials) could be exercised under a multilateral system, so long as unreasonable transfers and proliferation concerns can be adequately guarded against. Such a model reinforces existing multilateral regimes by its very nature, as these are the regimes upon which the 123 Agreement will have to rely to ensure that the U.A.E.’s nuclear fuel supply remains uninterrupted, and would increase the U.S. stature as a nuclear facilitator.

For all of the benefits of the 123 Agreement with the United Arab Emirates, however, two key drawbacks become apparent. Article 13 of the 123 Agreement governs the penalties for violating “the provisions of Article 5, 6, 7, 8, 9, or 10;” the violation of IAEA safeguards; and the detonation of a nuclear device by the United Arab Emirates. Due to the bilateral nature of 123 Agreements, the United States is limited under the

¹²⁵ Article 6, “Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates,” p. 7.

¹²⁶ World Nuclear Association, “Plutonium,” May 2015. Accessed August 24, 2015, <http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Fuel-Recycling/Plutonium/>.

¹²⁷ Under “Article 1 – Definitions” of the 123 Agreement between the U.S. and the UAE, “‘Agreed Minute’ means the minute annexed to this Agreement, which is an integral part hereof;” it is a list of additional legally-binding items negotiated between the two parties that are not explicitly covered under Section 123 of the Atomic Energy Act of 1954.

¹²⁸ Agreed Minute, “Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates,” pp. 16-17.

agreement to “requiring the return of any material, equipment or components transferred under this Agreement and any special fissionable material produced through their use”.¹²⁹

Although options outside of Article 13 exist for taking punitive measures against a theoretical violation of the 123 Agreement, such as diplomatic condemnation, sanctions, or even military intervention, any response that is not detailed within the agreement itself will require support from domestic partners (such as Congress and the American people) or that from international partners (such as the European Union for comprehensive sanctions regimes to be effective). The Article 13 measures can only govern material sourced from American suppliers, and will not require other nations to suspend nuclear material transfers should a violation occur. To the contrary, the U.A.E. would remain freely able to obtain special and fissionable material from nuclear suppliers with less stringent safeguards than the United States requires.

Second, the terms of the 123 Agreement, although signed and implemented as a binding legal agreement, are not final. The Agreed Minute contains a section entitled “Equal Terms and Condition for Cooperation” which affirms that the terms of the agreement between the United States and the United Arab Emirates “shall be no less favorable in scope and effect than those which may be accorded...to any other non-nuclear weapon State in the Middle East in a peaceful nuclear cooperation agreement.”¹³⁰ It is logical to conclude that this section of the Agreed Minute played a key role in facilitating the enrichment ban undertaken by the U.A.E. Should the United States sign a nuclear cooperation agreement with another non-nuclear-weapons Middle Eastern state

¹²⁹ Article 13, “Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates,” p. 10.

¹³⁰ Agreed Minute, “Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates,” p. 17.

that is more favorable (which would likely include the definition by the U.A.E. as not requiring such a state to forego enrichment and reprocessing capabilities), then the U.A.E. could request that the 123 Agreement signed with the United States be revisited to renegotiate the terms of the nuclear cooperation agreement, and thus restore its competitive status with the remainder of the region.¹³¹

Even so, the 123 Agreement signed with the United Arab Emirates stands as one of the strictest nuclear cooperation treaties that the United States has negotiated. Drafted under the George W. Bush Administration, it was signed under President Barack Obama and hailed by the State Department and the President as the “Gold Standard” for nuclear nonproliferation. Members of the House Committee on Foreign Affairs, particularly the Subcommittee on Terrorism, Nonproliferation, and Trade, were optimistic that this “Gold Standard” would become the norm for future nuclear cooperation negotiations.¹³² By the time of the 123 Agreement with Vietnam, however, the “Gold Standard” model of nuclear nonproliferation would prove to be an elusive goal that has yet to be replicated.

The U.S.-Vietnam 123 Agreement

On May 8, 2014, five years after the “Gold Standard” nuclear cooperation agreement with the United Arab Emirates, President Obama submitted to Congress the text of a proposed 123 Agreement with Vietnam.¹³³ Talks surrounding the American-

¹³¹ *Ibid.*

¹³² United States Congress, House Committee on Foreign Affairs, “The Global Nuclear Revival and U.S. Nonproliferation Policy,” Hearing, March 17, 2011, 112th Congress (1st Session). Accessed through the United States Government Printing Office, August 25, 2015, <http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg65302/html/CHRG-112hhrg65302.htm>.

¹³³ U.S. Government Printing Office, “Message from the President of the United States Transmitting the Text of a Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the Socialist Republic of Vietnam Concerning Peaceful Uses of Nuclear Energy

Vietnamese nuclear cooperation, however, predate a 2010 Memorandum of Understanding signed between the two governments reaffirming “a common commitment to the responsible expansion of civil nuclear power”.¹³⁴ Diplomacy tends to build off of previous successes, and so this MOU being signed mere months after the U.S.-U.A.E. 123 had entered into force indicates that the United States should have attempted to pursue a “Gold Standard” agreement with Vietnam as well.

It did not, however, and this seems to have been the result of disagreement between the Departments of State and Energy. While the State Department under Deputy Secretary James Steinberg called “Gold Standard” agreements a “broad policy objective” in 2010,¹³⁵ Deputy Secretary Daniel Poneman of the Department of Energy stated that same year that requiring “any kind of pledges about what [Vietnam] should or should not be doing to their own fuel cycle” would be “inappropriate,” particularly at that stage in negotiations.¹³⁶ The disagreement between the two was great enough that the Vietnam negotiations were placed on hold while the National Security Council conducted an interagency review on the subject of universal application of the “Gold Standard.”¹³⁷

Vietnam, according to the Nuclear Proliferation Assessment Statement submitted with the text of its 123 Agreement, has maintained an excellent nonproliferation record. It signed the NPT in 1982; entered a Safeguards Agreement into force in 1990; entered the

Pursuant to 42 U.S.C. 2153(b), (d),” House Document 113-109, 113th Congress (2nd Session), May 9, 2014, p. 1.

¹³⁴ Office of the Spokesman, “U.S.-Vietnam Cooperation on Civil Nuclear Power and Nuclear Security,” U.S. Department of State, March 30, 2010. Accessed August 27, 2015, <http://www.state.gov/r/pa/prs/ps/2010/03/139255.htm>.

¹³⁵ Phillip J. Crowley, “Daily Press Briefing: August 5, 2010,” U.S. Department of State, August 5, 2010. Accessed October 16, 2015, <http://www.state.gov/r/pa/prs/dpb/2010/08/145750.htm>.

¹³⁶ Daniel Horner, “Lawmakers Eye Fixes to Law on Nuclear Pacts,” Arms Control Association, October 6, 2010. Accessed October 16, 2015, http://www.armscontrol.org/act/2010_10/NuclearPacts.

¹³⁷ Henry Sokolski, “Obama’s Nuclear Mistake,” *National Review*, February 7, 2012. Accessed November 19, 2015, <http://www.nationalreview.com/article/290330/obamas-nuclear-mistake-henry-sokolski>.

Additional Protocol into force as of 2012, and is party to the Comprehensive Nuclear Test Ban Treaty (signed 1996, ratified 2006).¹³⁸ In other words, since the installation of the Dalat research reactor by the Soviet Union in 1963, Vietnam has been a responsible partner in the realm of civilian nuclear energy. This includes the decision by the Vietnamese government to modify its research reactor to operate on low-enriched uranium, where previously it required high-enriched uranium;¹³⁹ the upgrade was completed in 2007¹⁴⁰ and the last shipment of Vietnamese HEU was returned to Russia in 2013.¹⁴¹

Such nonproliferation cooperation has not ended at Vietnam's borders, either. In its tenure on the United Nations Security Council (2008-2009), Vietnam supported sanctions against both Iran and North Korea for their nuclear programs. It also voted to extend the mandate of UNSCR 1540, which "obliges States, *inter alia*, to refrain from supporting by any means non-State actors from developing, acquiring, manufacturing, possessing, transporting, transferring or using nuclear, chemical or biological weapons and their delivery systems." It also imposes binding obligations "on all States" to prevent the proliferation of WMDs and WMD delivery systems.¹⁴² Vietnam subsequently "hosted a workshop implementing UNSCR 1540 for countries in Southeast Asia."¹⁴³ Despite such

¹³⁸ "Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the Socialist Republic of Vietnam Concerning Peaceful Uses of Nuclear Energy," p. 24.

¹³⁹ Sandor Toszer and Greg Webb, "Vietnam Removes High Enriched Uranium Research Reactor Fuel," International Atomic Energy Agency, July 3, 2013 (updated February 24, 2015). Accessed August 28, 2015, <https://www.iaea.org/newscenter/news/vietnam-removes-high-enriched-uranium-research-reactor-fuel>.

¹⁴⁰ Pavel Podvig, "IFPM Blog: Vietnam to Return Spent Fuel of Research Reactor in Dalat to Russia," International Panel on Fissile Materials, March 16, 2012. Accessed August 28, 2015, http://fissilematerials.org/blog/2012/03/vietnam_to_return_spent_f.html.

¹⁴¹ "Vietnam Removes High Enriched Uranium Research Reactor Fuel."

¹⁴² United Nations Security Council, 1540 Committee, "United Nations Security Council Resolution 1540 (2004)." Accessed October 3, 2015, <http://www.un.org/en/sc/1540/>.

¹⁴³ "Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the Socialist Republic of Vietnam Concerning Peaceful Uses of Nuclear Energy," p. 25.

a strong nonproliferation record, however, Vietnam ultimately stopped short of binding itself under the “Gold Standard.”

In the Preamble to the 123 Agreement between the United States and Vietnam, “the intent of the Socialist Republic of Vietnam to rely on existing international markets for nuclear fuel services” is affirmed. This, as opposed to the acquisition of “sensitive nuclear technologies,” would be Vietnam’s pledge to obtain enriched uranium for its power plants.¹⁴⁴ As a political statement, and not one enshrined within the articles of the agreement, the decision by Vietnam to neither enrich nor reprocess uranium is not legally binding. It has since been labeled the “Silver Standard” of nuclear nonproliferation.¹⁴⁵

A lack of a legally-binding mandate to forego enrichment and reprocessing is not the only significant step back from the “Gold Standard.” Whereas the U.S.-U.A.E. 123 Agreement would be violated by the enrichment or reprocessing of any sensitive or fissile material by the United Arab Emirates, under the U.S.-Vietnam 123 Agreement, only material that is American in origin is restricted without prior American consent from enrichment and reprocessing. Should Vietnam enrich or reprocess Russian-origin material, for example, the United States has no legal grounds to withdraw from the agreement and demand the return of what was supplied pursuant to the 123 Agreement.¹⁴⁶

What is most striking, however, is the cause cited for withdrawing from the “Gold Standard” by President Obama’s Administration. In 2012, the State Department sent a letter to Congress detailing a case-by-case policy for enrichment and reprocessing

¹⁴⁴ *Ibid*, p. 3.

¹⁴⁵ Sigurd Neubauer, “Saudi Arabia’s Nuclear Envy,” *Foreign Affairs*, November 16, 2014. Accessed August 28, 2015, <https://www.foreignaffairs.com/articles/middle-east/2014-11-16/saudi-arabias-nuclear-envy>.

¹⁴⁶ “Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the Socialist Republic of Vietnam Concerning Peaceful Uses of Nuclear Energy,” pp. 7-8, 14.

restrictions. The State Department argued that overly restrictive 123 Agreements could drive potential cooperative partners to foreign suppliers such as France and Russia. It further asserted that consent rights offered through nuclear trade agreements can play a critical role in ensuring that nonproliferation regimes are upheld, that U.S. influence would be minimized without a wide array of civilian nuclear partner states, and that pursuing options other than a case-by-case basis would “[raise] questions about [U.S.] reliability as a supplier.”¹⁴⁷

Chapter Summary

Civilian nuclear energy, and indeed any form of cooperative nuclear endeavor, is a particularly sensitive subject due to the dual-use nature of the materials and technologies involved. Protecting a country’s right to exercise the authorities granted to it under the NPT can come at odds with the need of the United States and the international community to counter avenues for nuclear proliferation. An interpretation, for example, that the NPT confers the right to enrich uranium would allow for a signatory country to build enrichment and reprocessing facilities; this would then create another source by which enrichment and reprocessing technologies could spread to rogue actors.

In comparing the agreements that the United States signed with Vietnam and the U.A.E., the difficulty of pursuing the “Gold Standard” on a global scale becomes apparent. Countries are likely to pursue their own interests which, as in the case of the U.A.E., can coincide with the broader needs of the international community. However,

¹⁴⁷ Daniel B. Poneman and Ellen O. Tauscher, Correspondence between the United States Department of State and the United States Congress, U.S. Department of State, January 10, 2012. Accessed August 28, 2015, through the Nonproliferation Education Center, <http://npolicy.org/article.php?aid=1139&rt=&key=poneman&sec=article&author=>.

Vietnam's 123 Agreement and the Agreed Minute addendum to the U.A.E.'s 123 Agreement show that countries are wary of how the global security situation will evolve.

Vietnam likely does not envision a scenario in which it would have to enrich or reprocess nuclear fuel on its own territory in the future, or it would not have pledged to forgo this capacity, but the government of Vietnam cannot predict the future. Without a legally-binding clause which mandates forgoing enrichment and reprocessing facilities, it is in a position to pursue these facilities in the future if the needs of the state require doing so. The U.A.E. similarly ensured that it would be able to re-negotiate its access to enrichment and reprocessing facilities should such a capacity be granted to its regional counterparts.

CONGRESSIONAL ATTEMPTS TO RESTRICT CIVILIAN NUCLEAR COOPERATION AGREEMENTS

One key method of tracking the climate of political issues, whether foreign or domestic, is to review legislation put forward by the United States Congress on the subject. The United States has traditionally supported strong safeguards and verification regimes with regard to foreign powers,¹⁴⁸ and so it is no surprise that Congress would seek to further enhance existing restrictions on foreign nuclear partners in the interests of the American people. Such are the bills that will be explored below.

Although it is the role of the Executive Branch to negotiate with foreign powers, it does so within the boundaries of law laid out by the Legislative Branch. The role of Congress is to advise on and consent to bilateral agreements as negotiated by the President. Congress can also establish laws, such as the Atomic Energy Act of 1954, to which the Executive Branch must adhere; such laws may be subsequently modified by Congress in order to ensure that the best interests of the nation are being represented.

A number of bills have been selected dating back to the first session of the 110th Congress (2007). These bills were chosen based on their intent to modify the nuclear cooperation negotiating process, either by mandating bans on foreign uranium enrichment, or by assuming heightened oversight of the global nuclear trade. In examining these bills, a sense of the climate surrounding the U.S. role in cooperative nuclear programs can be offered.

¹⁴⁸ Warren Stern and Susan Pepper, “Building an Effective Nonproliferation Program: U.S. Support of IAEA Safeguards,” Federation of American Scientists, May 21, 2013. Accessed August 17, 2015, <https://fas.org/pir-pubs/building-an-effective-nonproliferation-program-u-s-support-of-iaea-safeguards/>.

The 110th Congress was chosen as it creates a baseline which predates the 2009 “Gold Standard.” This is particularly important, as the attempts by Congress to mandate stricter terms for 123 Agreements have traditionally been unsuccessful. Despite what may or may not be considered failures in legislation (which is a somewhat subjective determination), this will allow for better insight as to how Congress’ vision for the American nonproliferation regime has evolved after a cooperative foreign state agreed to forego enrichment and reprocessing capacity.

Bills which have been detailed below do not include every attempt by Congress to influence all aspects of the nuclear fuel cycle as it relates to the United States.¹⁴⁹ However, it is a faithful look at the bills which would have influenced 123 Agreements and nuclear fuel safeguards with foreign states between the 110th and 114th Congresses.

S. 1138 (110th Congress, First Session)

On April 18, 2007, Senator Richard Lugar (R-IN) introduced the “Nuclear Safeguards and Supply Act of 2007” (S. 1138) to the Senate Floor. Referred to the Senate Committee on Foreign Relations, S. 1138 sought to “enhance nuclear safeguards and to provide assurances of nuclear fuel supply to countries that forgo certain fuel cycle activities.”¹⁵⁰ Senator Lugar was joined by Senators Evan Bayh (D-IN) and Charles Hagel (R-NE) as cosponsors.¹⁵¹

Title I of the Act makes several foundational observations regarding the nuclear fuel cycles of foreign countries. Among these observations is the fact that Congress has

¹⁴⁹ See, for example, the as-yet unresolved debate surrounding the nuclear waste repository in Yucca Mountain, Nevada.

¹⁵⁰ Nuclear Safeguards and Supply Act of 2007, S. 1138, 110th Congress (1st Session), 2007.

¹⁵¹ Cosponsors, Nuclear Safeguards and Supply Act of 2007, S. 1138, 110th Congress (1st Session), April 18, 2007. Accessed August 6, 2015, <https://www.congress.gov/bill/110th-congress/senate-bill/1138>.

“long supported” the assurance of supply of foreign civilian nuclear programs. Furthermore, Congress has similarly supported “assistance to the developing world for nuclear and non-nuclear energy sources.”¹⁵² These are not particularly groundbreaking observations, as these items are the basic tenets of the Treaty on the Nonproliferation of Nuclear Weapons (to which the United States is a signatory).

Senator Lugar and his cosponsors also asserted the finding that a “reawakened interest” in nuclear energy would lead additional foreign states to seek their own “fuel cycle facilities and nuclear know-how.”¹⁵³ They cite a United Nations report¹⁵⁴ which asserted that “creating incentives for countries to forgo the development of domestic uranium enrichment and reprocessing facilities is essential” to reducing the risk and threat of a nuclear attack, in part by reducing avenues for nuclear proliferation to occur¹⁵⁵ (thereby reducing the number of possible instances wherein a nuclear launch could take place). Ultimately, Senators Lugar, Bayh, and Hagel would see existing IAEA safeguards and the Additional Protocol (which represent “minimum standards”) expanded and strengthened, with incentives offered to emerging nuclear powers to keep them from producing enriched uranium domestically.

Consistent with these findings, Title I, Section 102 of the Act would have declared the continuation of American policy to provide adequate supplies of nuclear fuel to foreign states. Additionally, it would have declared the new policy of simultaneously discouraging the development of enrichment and reprocessing technologies among

¹⁵² Title 1, Nuclear Safeguards and Supply Act of 2007, S. 1138, 110th Congress (First Session), 2007.

¹⁵³ *Ibid.*

¹⁵⁴ United Nations, “Report of the High-Level Panel on Threats, Challenges, and Change,” 2004. http://www.un.org/en/peacebuilding/pdf/historical/hlp_more_secure_world.pdf.

¹⁵⁵ *Ibid.*, ix.

emerging foreign powers, and of encouraging the creation of bi- and multi-lateral nuclear fuel supply assurances.

Title II, Section 202 of the Act would have required the President to submit to Congress a report “detailing the feasibility of establishing an International Nuclear Fuel Authority (INFA) as called for in section 104 (a)(1) of the Nuclear Non-Proliferation Act of 1978 (22 U.S.C. 3223(a)(1)).”¹⁵⁶ This largely would have been a feasibility report providing Congress with the estimated cost, political, and legal barriers to establishing such a body. Although this Act would neither establish an international governing body nor prohibit foreign powers from enriching, it would have laid the groundwork for “Gold Standard” style agreements to become the norm during American 123 Agreement negotiations before the agreement with the U.A.E. had been negotiated.

The Senate Committee on Foreign Relations noted in its report that international bodies, such as the one laid out in Title II, were generally received favorably by the international community.¹⁵⁷ Furthermore, the Report states that the Act would be signing into law a policy which President Bush had articulated several years previously – namely, that “the world’s leading nuclear exporters should ensure that states have reliable access at a reasonable cost” to nuclear fuel supplies.¹⁵⁸ The last action taken on S. 1138 was that it was placed on the Legislative Calendar, indicating that it never received a Floor Vote. As such, S. 1138 never became law.

¹⁵⁶ Title II, Nuclear Safeguards and Supply Act of 2007, S. 1138, 110th Congress (1st Session), 2007.

¹⁵⁷ United States Senate, “Report: Nuclear Safeguards and Supply Act of 2007,” Committee on Foreign Relations, S. Rpt. 110-151, 110th Congress (1st Session), 2007. Accessed August 6, 2015, <https://www.congress.gov/110/crpt/srpt151/CRPT-110srpt151.pdf>, p. 8.

¹⁵⁸ *Ibid.*, p. 9.

H.R. 885 (110th Congress, First Session)

The first version of the “International Nuclear Fuel for Peace and Nonproliferation Act of 2007 (H.R. 885) was submitted to the House Floor by Representative Tom Lantos (D-CA) on February 7, 2007. Referred to the House Committee on Foreign Affairs, H.R. 885 was drafted in order to “support the establishment of an international regime for the assured supply of nuclear fuel for peaceful means and to authorize voluntary contributions to the International Atomic Energy Agency to support the establishment of an international nuclear fuel bank.” Mr. Lantos was originally joined by Representatives Gary Ackerman (D-NY) and Brad Sherman (D-CA) as cosponsors.¹⁵⁹

Title I of the H.R. 885 found that, since 1946, “the number of countries that possess nuclear weapons and the means to create such weapons makes the world less secure and stable” due to the increased chance of use posed by such proliferation. The Act also asserted that it is in the interest of the global community for the number of enriching states to be held to a minimum; financing and constructing enrichment and reprocessing facilities in new states was “indefensible on economic grounds alone.” The Congressmen asserted, according to Title I, Section 101 of the Act, that multilateral nuclear fuel suppliers could “reassure countries that are dependent upon or will construct nuclear power reactors that they will have an assured supply of nuclear fuel at current

¹⁵⁹ International Nuclear Fuel for Peace and Nonproliferation Act of 2007, H.R. 885, 110th Congress (1st Session), 2007. Accessed August 10, 2015, <https://www.congress.gov/bill/110th-congress/house-bill/885/text>.

market prices,” so long as said countries agree to not pursue domestic enrichment capabilities.¹⁶⁰

To further the findings of Section 101 (reinforced in the “Sense of the Congress” Section 102), Title II would have authorized voluntary contributions to the IAEA “for the purpose of supporting the establishment of an international nuclear fuel bank to maintain a reserve of low-enriched uranium for reactor fuel to provide to eligible countries in the case of a disruption in the supply of reactor fuel by normal market mechanisms.”¹⁶¹

Under the oversight of the IAEA, the designated country (which would be a non-nuclear-weapons state under the NPT) would be unable to have its own enrichment and reprocessing programs.¹⁶²

H.R. 885 passed the House by a two-thirds majority on June 18, 2007.¹⁶⁵

However, certain changes were made to the text to reflect amendments by other members of the House of Representatives. Primarily, these were clerical changes (for example, identifying of the NPT in more specific terms in Title I, Section 101; and removing explicit mentions of specific nuclear powers throughout Title I).¹⁶⁶ The only major substantive change involved nuance over how this center would be funding.¹⁶⁷

For the Act’s referral to the Senate, Congressmen Lantos, Ackerman, and Sherman were joined by ten additional cosponsors, including Representative Ileana Ros-Lehtinen (R-FL), who has been particularly active in attempting to pass legislation

¹⁶⁰ Title I, Section 101, International Nuclear Fuel for Peace and Nonproliferation Act of 2007, H.R. 885, 110th Congress (1st Session), 2007.

¹⁶¹ Title II, Section 201, International Nuclear Fuel for Peace and Nonproliferation Act of 2007, H.R. 885, 110th Congress (1st Session), 2007.

¹⁶² *Ibid.*

¹⁶⁵ “International Nuclear Fuel for Peace and Nonproliferation Act of 2007,” *Congressional Record*, 153:98 (June 18, 2007), pp. H6597-H6600. Accessed August 10, 2015, <https://www.congress.gov/congressional-record/2007/06/18/house-section/article/H6597-1>.

¹⁶⁶ “International Nuclear Fuel for Peace and Nonproliferation Act of 2007,” Title I.

¹⁶⁷ “International Nuclear Fuel for Peace and Nonproliferation Act of 2007,” Title II.

designed to restrict the enrichment capacity of foreign states.¹⁶⁸ Having been referred to the Senate, it was read twice before being sent to the Senate Foreign Relations Committee. While H.R. 885 never itself became public law, portions of the bill related to the establishment of an international fuel bank were enacted under the Consolidated Appropriations Act for FY2008 (P.L. 110-161).¹⁶⁹

H.R. 7068 (110th Congress, Second Session)

One year after S. 1138 left committee, Representative Ileana Ros-Lehtinen (R-FL) submitted the “Western Hemisphere Counterterrorism and Nonproliferation Act of 2008” (H.R. 7068). Referred to the House Committee on Foreign Affairs, H.R. 7068 sought to “bolster regional capacity and cooperation to counter current and emerging threats,” “prevent the proliferation of nuclear, chemical, and biological weapons” in the Western Hemisphere, and “secure universal adherence to agreements regarding nuclear nonproliferation” (along with “other purposes”). Representative Ros-Lehtinen was joined by Representatives Dan Burton (R-IN), Connie Mack (R-FL), and Steve Chabot (R-OH) as cosponsors.¹⁷⁰

Nuclear nonproliferation first appears as a significant topic in Title II of the Act. Title II predominantly found against the governments of Argentina, Brazil, Venezuela, and Iran, expressing that these governments may be proliferation concerns in the areas of nuclear, biological, and chemical weapons materials and technologies. To advance the

¹⁶⁸ “Cosponsors,” International Nuclear Fuel for Peace and Nonproliferation Act of 2007, H.R. 885, 110th Congress (1st Session), 2007. <https://www.congress.gov/bill/110th-congress/house-bill/885/cosponsors>.

¹⁶⁹ Mary Beth Nikitin, Anthony Andrews, and Mark Holt, “Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power” (CRS Report no. RL34234), September 3, 2008. Accessed November 9, 2015, <http://fpc.state.gov/documents/organization/110366.pdf>, p. CRS-28.

¹⁷⁰ Western Hemisphere Counterterrorism and Nonproliferation Act of 2008, H.R. 7068, 110th Congress (2nd Session), 2008. Accessed August 7, 2015, <https://www.congress.gov/bill/110th-congress/house-bill/7068>.

nonproliferation of weapons of mass destruction, Title II would have required the United States to implement a much stricter policy toward requiring additional IAEA safeguards. This would include opposing the negotiation by any state of a “Small Quantities Protocol” (SQP) with the IAEA, which “sets aside many of the operative provisions of a general safeguards agreement” and renders the verification process of nuclear materials and facilities (that they are not being used or diverted for illicit purposes) “significantly impaired.”¹⁷¹

However, the Act does not end its mandate to the Executive Branch at a stricter policy stance. H.R. 7068 would also require the President of the United States

[To] use all available political, economic, and diplomatic tools to ensure that each country in the Western Hemisphere—

- (1) has signed and implemented a comprehensive safeguards agreement with the IAEA;
- (2) has signed and implemented an Additional Protocol to its safeguards agreement;
- (3) guarantees unrestricted access for IAEA personnel to all nuclear-related facilities;
- (4) has implemented the provisions of United Nations Security Council Resolution 1540;
- (5) has acceded to, ratified, and fully implemented the conventions referred to in section 202(a)(4);
- (6) does not negotiate with the IAEA an SQP if that country did not have an SQP as of January 1, 2008; and
- (7) withdraws formally from or renegotiates an SQP agreement if a country has such an agreement.¹⁷²

The Act would also authorize sanctions that could be imposed against any Western Hemisphere country which did not abide in full with the above requirements. Specifically, nonhumanitarian foreign assistance could be ceased with the offending

¹⁷¹ Section 203, Title II, Western Hemisphere Counterterrorism and Nonproliferation Act of 2008, H.R. 7068, 110th Congress (2nd Session), 2008.

¹⁷² Section 204, Title II, Western Hemisphere Counterterrorism and Nonproliferation Act of 2008, H.R. 7068, 110th Congress (2nd Session), 2008.

country. Additionally, “the sale, provision, or transfer of articles, including the issuance of any specific license or grant of any other specific permission or authority to export any goods or technology under” the Export Administration Act of 1979; the Arms Export Control Act; the Atomic Energy Act of 1954; or “any other statute that requires the prior review and approval of the United States Government as a condition for the export or re-export of goods or services” could be terminated.

Inherent in the Act, and explicitly stated in Section 205, is opposition to the “development or acquisition by any country” of nuclear fuel fabrication capacity by any state that did not possess it prior to January 1, 2008. The Act goes so far as to state that “all available political, economic, and diplomatic tools” should be used by the President of the United States to ensure that such development and acquisition is prevented.¹⁷³ Title II culminated in the declaration that any country assisting either Venezuela or Cuba in developing their respective domestic nuclear programs would be barred from negotiating and licensing exports pursuant to a 123 Agreement with the United States.¹⁷⁴

H.R. 7068 was introduced to the House Floor and referred to the Committee on Foreign Affairs. The Act did not leave the Committee, and thus does not have a voting record associated with it. As such, the Act never became public law.

H.R. 1280 (112th Congress, First and Second Sessions)

Representative Ileana Ros-Lehtinen (R-FL) made another attempt to influence nuclear exports with the 112th Congress on March 31, 2011. A bill introduced “To amend

¹⁷³ Section 205, Title II, Western Hemisphere Counterterrorism and Nonproliferation Act of 2008, H.R. 7068, 110th Congress (2nd Session), 2008.

¹⁷⁴ Section 209, Title II, Western Hemisphere Counterterrorism and Nonproliferation Act of 2008, H.R. 7068, 110th Congress (2nd Session), 2008.

the Atomic Energy Act of 1954 to require congressional approval of agreements for peaceful nuclear cooperation with foreign countries, and for other purposes,” H.R. 1280 was referred initially to the House Committees on Foreign Affairs and Rules.

Representative Ros-Lehtinen was initially joined by Representatives Howard Berman (D-CA), Edward Royce (R-CA), Brad Sherman (D-CA), Jeff Fortenberry (R-NE), and Edward Markey (D-MA) as cosponsors of the bill.¹⁷⁵

As introduced on the House Floor, Section 1 of H.R. 1280 sought immediately to set a higher bar for concluding 123 Agreements between the United States and partner countries. H.R. 1280 would have required 123 Agreement partners to treat all nuclear technology, materials, and facilities as American in origin for the purposes of export, enrichment, and reprocessing. This in turn would mandate prior U.S. consent for these activities. Section 1 would also have amended the Atomic Energy Act to include two key restrictions on partner states, namely:

(10) a guaranty by the cooperating party that no nationals of a third country shall be permitted access to any reactor, related equipment, or sensitive materials transferred under the agreement for cooperation without the prior consent of the United States; and

(11) if the cooperating party does not operate, as of April 1, 2011, enrichment or reprocessing facilities, a requirement as part of the agreement for cooperation or other legally binding document that is considered part of the agreement that no enrichment or reprocessing activities, or acquisition or construction of facilities for such activities, will occur within the territory over which the cooperating party exercises sovereignty.¹⁷⁶

Such an amendment as item (11) above would have been a significant victory for the American nonproliferation regime, as it would have required the partner state to

¹⁷⁵ H.R. 1280, “To amend the Atomic Energy Act of 1954 to require congressional approval of agreements for peaceful nuclear cooperation with foreign countries, and for other purposes,” 112th Congress (1st Session), March 31, 2011. Accessed August 11, 2015, <https://www.congress.gov/bill/112th-congress/house-bill/1280/text>.

¹⁷⁶ Section 1, H.R. 1280, 112th Congress (1st Session), March 31, 2011.

affirm the American interpretation of the NPT that there is no inherent right to enrich under the Treaty. Item (10), as it is written above, could be interpreted as requiring prior American consent even for routine IAEA inspections of American-origin facilities were the inspectors themselves not American citizens. Taken together, these two amendments to the Atomic Energy Act alone would have firmly declared American sovereignty over the global nuclear enterprise, whether or not the United States was prepared to enforce such a role, by stating that U.S. law trumps international law among 123 Agreement parties.

Section 1 of the Act as introduced to the Floor would have gone further to restrict not just the nuclear programs of partner states, but WMD programs as a whole for those nations seeking nuclear cooperation with the United States. It set out as a requirement for negotiations that the partner nation had to be a signatory to the Chemical Weapons Convention, the Biological Weapons Convention, and “all other international agreements to which the United States is a party regarding the export of nuclear, chemical, biological, and advanced conventional weapons, including missiles and other delivery systems.” The same amendment to the Atomic Energy Act would also have required that the partner country be “closely cooperating with the United States to prevent state sponsors of terrorism” from “acquiring or developing chemical, biological, or nuclear weapons or related technologies”, or from “acquiring or developing destabilizing numbers and types of advanced conventional weapons, including ballistic missiles”.¹⁷⁷

Section 2 of the Act would have mandated “the policy of the United States to oppose the withdrawal of any country that is a party to the Treaty on the Non-Proliferation of Nuclear Weapons.” Non-humanitarian assistance could not have been

¹⁷⁷ *Ibid.*

provided to any country which withdrew from the NPT. All "material, equipment, or components transferred under an agreement for civil nuclear cooperation that is in force pursuant to section 123 of the Atomic Energy Act of 1954" would have needed to have been returned to the United States under such circumstances, as well as "any special fissionable material produced through the use of such material, equipment, or components previously provided to a country that withdraws from the [NPT]."¹⁷⁸

Under Section 3, the President would have been mandated by law to compare the nonproliferation conditions of foreign countries with which the United States would engage in civilian nuclear cooperation with that of the United States. A report would have to be submitted to Congress for each 123 Agreement negotiation, detailing "the extent to which the exports of each such country incorporate United States-origin components, technology, or materials that require United States approval for re-export;" whether and to what extent the partner country is investing in American civilian nuclear energy; and "any United States grant, concessionary loan or loan guarantee, or any other incentive or inducement to any such country or entity related to nuclear exports or investments in the United States."¹⁷⁹

Finally, H.R. 1280 as introduced in the House would have required monthly updates by the President to Congress on the status and content of new or renegotiated 123 Agreements. Congress would also have to vote in the affirmative for a 123 Agreement to enter into force. This would have been a substantial change to the current law, which enters a 123 Agreement into force so long as Congress does not explicitly vote against the Agreement. Having been amended in May of 2012, H.R. 1280 sat in Committee for

¹⁷⁸ Section 2, H.R. 1280, 112th Congress (1st Session), March 31, 2011.

¹⁷⁹ Section 3, H.R. 1280, 112th Congress (1st Session), March 31, 2011.

consideration for several months. On October 1, 2012, it was discharged from the House Committee on Energy and Commerce to be considered by the whole House of Representatives.

Several key changes exist between the H.R. 1280 as introduced and as reported. First, H.R. 1280 as reported would have struck the requirement in Section 1 that the partner country give up its right to enrich uranium. In its place, a “legal regime providing for adequate protection from civil liability that will allow for the participation of United States suppliers in any effort by the country to develop civilian nuclear power” was called for. It would also have eliminated the President’s authority to exempt a proposed Agreement that does not meet this requirement.¹⁸⁰

This change provides insight to the political climate surrounding nuclear cooperation agreements. While the original bill would have imposed key nonproliferation restrictions against the cooperating party, amendments to the text favored language on providing economic incentives for American businesses. This is likely due to the Obama administration’s coming out against H.R. 1280, citing “the bill’s potentially devastating effects on U.S. exports, jobs, and the economy.” The Administration similarly asserted that the bill would “severely limit the U.S. ability to strengthen nonproliferation conditions with other countries.” It is reasonable to conclude that amendments to the bill were designed to alleviate the concerns of the Obama administration.¹⁸¹

¹⁸⁰ Section 1, H.R. 1280 As Reported, 112th Congress (2nd Session), October 1, 2012. Accessed August 12, 2015, <https://www.congress.gov/bill/112th-congress/house-bill/1280/text>.

¹⁸¹ Gary Locke, Correspondence between the Secretary of Commerce and the Civil Nuclear Trade Advisory Committee, July 18, 2011, U.S. Department of Commerce. Accessed through the Nuclear Energy Institute on November 19, 2015, <http://www.nei.org/CorporateSite/media/filefolder/Policy/Trade/Locke.pdf>.

Second, H.R. 1280 as reported added an eighth section entitled “Prohibition on Assistance to State Sponsors of Proliferation of Weapons of Mass Destruction.”¹⁸² Section 8 of the bill would have targeted countries which abused technologies and weapons systems, and which were active in the transfer of these items. Rather than preventing the spread of nuclear technologies by limiting access to them in the first place, these would have been punitive measures designed to deter proliferation offenses from occurring.

Finally, H.R. 1280 as reported added Sections 9 and 10 to the bill as introduced. Section 9 would have made it “the policy of the United States to ensure that each country that is a party to the Treaty on the Non-Proliferation of Nuclear Weapons should bring into force an Additional Protocol to its safeguards agreement with the IAEA.” Whether or not a country had an Additional Protocol in force would also be taken into consideration when negotiating a 123 Agreement.¹⁸³ Section 10 was a “Sense of the Congress” clause which, while not legally binding, would have expressed the opinion of the House and Senate that the U.S. would not seek to impose new restrictions on promising cooperative countries. Rather, Congress would direct the Executive Branch to selectively pursue nuclear cooperation agreements with countries that already were in line with existing U.S. nonproliferation policies.

However, H.R. 1280 as reported was never presented to the Senate. Despite the addition of Representatives Dan Burton (R-IN), Jeff Flake (R-AZ), Steve Chabot (R-OH), and John Conyers (D-MI) as cosponsors, signaling strong bipartisan support, H.R. 1280 was ultimately not voted on by the full House of Representatives. H.R. 1280 never

¹⁸² Section 8, H.R. 1280 As Reported, 112th Congress (2nd Session), October 1, 2012.

¹⁸³ Section 9, H.R. 1280 As Reported, 112th Congress (2nd Session), October 1, 2012.

became law, and the Administration's efforts to block the bill from advancing likely played a key role in this outcome.

S. Res. 269 (113th Congress, First Session)

On October 16, 2013, Senator Marco Rubio (R-FL) introduced a bill on the Senate Floor to express “the sense of the Senate on United States policy regarding possession of enrichment and reprocessing capabilities by the Islamic Republic of Iran.” The resolution, S. Res. 269, was referred to the Senate Foreign Relations Committee. Senator Rubio was joined by Senator James Risch (R-ID) as cosponsor.

Introduced as the Iran nuclear negotiations were gaining momentum, S. Res. 269 was designed as a “Sense of the Senate” document to express dissatisfaction with the Iranian nonproliferation record. Two key findings that Senator Rubio offered when drafting this document were boasts by Hassan Rouhani, the President of Iran, that Iran had previously been successful at “buying time” for its nuclear programs in the past; and the statement of Iranian Supreme Leader Ayatollah Khamenei “that if Iran ‘intended to possess nuclear weapons, no power could stop us.’”¹⁸⁶

Furthermore, Senator Rubio cited Iran's “decades-long track record of cheating on and violating commitments” and its “nuclear and missile programs in violation of multiple United Nations Security Council resolutions” when expressing his dissatisfaction with the emerging nuclear negotiations. Most notably, however, the text as introduced in the Senate stated that “19 other nations currently access peaceful nuclear energy without any enrichment or reprocessing activities on their soil,” and asserted that

¹⁸⁶ S. Res. 269, “Expressing the sense of the Senate on United States policy regarding possession of enrichment and reprocessing capabilities by the Islamic Republic of Iran,” 113th Congress (1st Session), 2013. Accessed August 13, 2015, <https://www.congress.gov/bill/113th-congress/senate-resolution/269>.

“the Government of Iran could likewise achieve access to peaceful nuclear energy without enrichment or reprocessing activities on its own soil.”¹⁸⁷

With these, and other, findings in mind, Senator Rubio expressed for consideration the “Sense of the Senate” that

- (1) it shall be the policy of the United States that the Government of Iran will not be allowed to develop a nuclear weapon and that all instruments of United States power and influence remain on the table to prevent this outcome;
- (2) the Government of Iran does not have an absolute or inherent right to enrichment and reprocessing technologies under the Treaty on the Non-Proliferation of Nuclear Weapons, done at Washington, London, and Moscow July 1, 1968, and entered into force March 5, 1970 (commonly known as the “Nuclear Non-Proliferation Treaty”);
- (3) relief of sanctions related to Iran’s nuclear program imposed upon Iran by the United States should only be provided once Iran has completely abandoned its nuclear weapons program, including any enrichment or reprocessing capability, and has provided complete transparency to the International Atomic Energy Agency regarding its work on weaponization of a nuclear device; and
- (4) until the Government of Iran has taken the actions set forth in paragraph (3), Congress should move to pass a new round of additional sanctions without delay.¹⁸⁸

Perhaps most relevant to the topic of the “Gold Standard” would have been Item (2) above, which states in no uncertain terms that the NPT does not inherently confer the “right to enrich” upon any signatory. While the interpretation of the remainder of the “Sense of the Senate” clause can reasonably be said to speak to Iran specifically, the invocation of the NPT would likely have served as a wider signal regarding American foreign policy that the United States’ commitment to limiting enrichment globally had not wavered. This would have been highlighted with financial incentives for Iran to agree to the American position that enrichment was not its inherent right: the relief of sanctions in exchange for dismantling its enrichment and reprocessing capacity.

¹⁸⁷ *Ibid.*

¹⁸⁸ *Ibid.*

S. Res. 269 ultimately received moderately strong partisan support among Republican Senators. By the end of the 113th Congress, Senator Rubio was joined by Senators James Inhofe (R-OK), John Cornyn (R-TX), Mark Kirk (R-IL), Roy Blunt (R-MO), David Vitter (R-LA), Pat Roberts (R-KS), Orrin Hatch (R-UT), Michael Enzi (R-WY), Chuck Grassley (R-IA), Mitch McConnell (R-KY), and Ted Cruz (R-TX).¹⁸⁹ However, the nuclear negotiations that were occurring with Iran at the time likely had a negative impact on the bill's passage; the negotiating power of the President would have been impacted by the passage of this "Sense of Congress," and so the Executive Branch would have devoted considerable effort to defeating the bill.

S. J. Res. 36 (113th Congress, Second Session)

On May 22, 2014, Senator Robert Menendez (D-NJ) submitted a resolution on the Vietnamese 123 Agreement for consideration by the Senate. "Relating to the approval and implementation of the proposed agreement for nuclear cooperation between the United States and the Socialist Republic of Vietnam," S. J. Res 36 was designed to set a fixed, thirty-year window on America's global civilian nuclear exports.¹⁹⁰

Section 1 of the resolution as introduced in the Senate would have given Congress' explicit approval for the 123 Agreement with Vietnam.¹⁹¹ Under Section 2, the Atomic Energy Act of 1954 would be amended such that "no license to export pursuant to an agreement that has entered into force pursuant to the requirements of such section

¹⁸⁹ "Cosponsors," S. Res. 269, 113th Congress (1st Session), 2013. Accessed August 13, 2015, <https://www.congress.gov/bill/113th-congress/senate-resolution/269/cosponsors>.

¹⁹⁰ S. J. Res 36, "Relating to the approval and implementation of the proposed agreement for nuclear cooperation between the United States and the Socialist Republic of Vietnam," 113th Congress (2nd Session), 2014. Accessed August 14, 2015, <https://www.congress.gov/bill/113th-congress/senate-joint-resolution/36/text>.

¹⁹¹ Section 1, S. J. Res 36, 113th Congress (2nd Session), 2014.

123 may be issued after the date that is 30 years after the date of entry into force of such agreement.”¹⁹² The resolution would also have eased the renewal process for 123 Agreements, by allowing Congress to “enact a joint resolution permitting the issuance of such licenses for an additional period of not more than 30 years” without requiring the submission of a new 123 Agreement by the President of the United States.¹⁹³

S. J. Res 36 garnered the support of two cosponsors during its time being debated in the Senate. Senators Tim Kaine (D-VA) and Jeanne Shaheen (D-NH) signed on as cosponsors in June of 2014. By August of the same year, the joint resolution had successfully passed the Senate. It was referred in the House, and submitted to the Committee on Foreign Affairs.

As referred, the resolution had been amended to strengthen congressional oversight of the nuclear export process. In Section 2, the language of the text struck references to export licenses in favor of mandating that “no funds may be used to implement any aspect of an agreement for civil nuclear cooperation” after a duration of thirty years had passed. Additionally, the President would have to certify “within the final five years of the agreement” that the terms and conditions of the agreement had been upheld by the partner state, and “that the agreement continues to be in the interest of the United States.” Congress would then pass a resolution allowing the cooperation agreement to continue for an additional thirty-year period.¹⁹⁴

Under the resolution as introduced, Section 2 exempted “any agreement with a country that is a member country of the North Atlantic Treaty Organization, or Australia,

¹⁹² Section 2, S. J. Res 36, 113th Congress (2nd Session), 2014.

¹⁹³ Section 3, S. J. Res 36, 113th Congress (2nd Session), 2014.

¹⁹⁴ Section 2, S. J. Res 36, “Relating to the approval and implementation of the proposed agreement for nuclear cooperation between the United States and the Socialist Republic of Vietnam,” as referred in the House, 113th Congress (2nd Session), 2014.

Israel, Japan, the Republic of Korea, New Zealand, the Taipei Economic and Cultural Representative Office in the United States (TECRO), or the International Atomic Energy Agency” from the thirty-year limitation and renewal requirements.¹⁹⁵ As referred in the House, however, only TECRO and the IAEA would be exempt.¹⁹⁶ In both versions, agreements entered into prior to August 1st, 2014, would be exempt from the requirements of S. J. Res 36, allowing the previously-negotiated end terms to conclude before said agreements would fall under the jurisdiction of the revised renewal requirements.

Finally, Section 3 as introduced in the Senate was struck and incorporated into Section 2 as referred in the House above. Section 4 as referred in the House added reporting requirements for Nuclear Proliferation Assessment Statements (NPAS), pursuant to Section 123 of the Atomic Energy Act of 1954. Although the NPAS is required to be submitted, in classified and unclassified formats, to the President, Section 4 as referred would have required that the NPAS be submitted also to “the appropriate congressional committees.” This submission would largely have included background information on the nuclear posture of the potential partner state.¹⁹⁷

Some of the information requested is, in fact, rather basic in terms of the context of agreement ratification. For example, the “assessment of the consistency of the text of the proposed agreement for cooperation with all the requirements of the Atomic Energy Act of 1954” is in part the purpose of assembling the congressional committee in the first place.¹⁹⁸ This would seem to indicate the need of the congressional body for a

¹⁹⁵ Section 2, S. J. Res 36, as introduced, 113th Congress (2nd Session), 2014.

¹⁹⁶ Section 2, S. J. Res 36, as referred.

¹⁹⁷ S. J. Res. 36, as referred.

¹⁹⁸ *Ibid.*

homogenous source of information detailing the nonproliferation concerns regarding the potential partner country.

Other items as would have been required by the resolution would seem to serve the American public in terms of ease of access to information. “A historical review and assessment of past proliferation activity of the cooperating party” combined with “list of all the treaties and agreements related to non-proliferation of weapons of mass destruction to which the cooperating party is also a party” (and the domestic laws governing WMD proliferation issues) would have been entered into the Congressional Record,¹⁹⁹ which is a public document to which the American people would have access. Given Congress’ role in advising and consenting to treaties with foreign powers, and its mandate to be the voice of the American people, this would have given the opportunity for the American people themselves to be more informed about such agreements. This, of course, would only have applied to the unclassified NPAS – the classified annex would, as the name implies, have remained restricted to those with the appropriate clearance and access.

Despite the support it garnered in the Senate, S. J. Res. 36 failed to receive traction in the House Committee on Foreign Affairs. It was never voted on by the full House floor, and thus did not advance for signature by the President. Although the Act never became public law, and the proposed amendments to the Atomic Energy Act were not codified, by law passage in the Senate was sufficient to enact the proposed nuclear cooperation with Vietnam.

¹⁹⁹ *Ibid.*

Chapter Summary

Congress' attempts to mandate stricter terms within 123 Agreements do not appear to have primarily been motivated by the "Gold Standard" signed with the United Arab Emirates. Rather, they appear to be motivated by a desire for heightened oversight over the global nuclear fuel cycle. This would include stricter safeguards for 123 Agreement parties. In some cases, it would also have included enforcing safeguards restrictions against countries that had not signed a 123 Agreement.

Senator Lugar's bill in the 110th Congress is an example of one such bill. By offering a program to secure global access to nuclear fuel supplies, S. 1138 would have incentivized the removal of domestic enrichment programs globally by offering a neutral, third party medium that would take custodianship of fuel for nuclear reactors. The additional reporting requirements and use of American funds (invoking Congress' "Power of the Purse") would have ensured congressional oversight over this proposed international body.

As the bills reviewed were written, they can be interpreted as representing a viewpoint that without signing a 123 Agreement with the United States, a foreign power seeking nuclear fuel and a civilian nuclear program will be greatly hindered in this pursuit. If this is the case, then such attempts at drafting law will likely fail: the United States is far from the only nuclear supplier, and making stricter the requirements for conducting business with the United States will likely serve only to make the United States a less lucrative supplier in the nuclear trade. This was the Obama administration's argument in the 2012, when the Departments of State and Energy informed Congress in part that "France and Russia in particular are very aggressive in pursuing nuclear

business worldwide, and offer favorable terms. Neither imposes [enrichment and reprocessing] conditions in their agreements.”²⁰⁰

In balancing nonproliferation concerns with economic considerations from 2007-2015, Congress has highlighted a negotiating environment wherein the barrier to entry for civilian nuclear cooperation with the U.S. has been relaxed to allow for a larger number of potential cooperative partners. Henry Sokolski, Executive Director of the Nonproliferation Policy Education Center and former Deputy for Nonproliferation Policy in the Department of Defense, characterized this idea that “nuclear salesmanship should supersede security” as highly misguided.²⁰¹ It has further been argued that countries seeking the “U.S. stamp of approval” for their nuclear programs would have kept demand for 123 Agreements high, thus negating the need to make these agreements attractive from a largely economic standpoint.²⁰²

²⁰⁰ “Correspondence between the United States Department of State and the United States Congress.”

²⁰¹ Elaine M. Grossman, “U.S. Nuclear Trade Policy Concerns Mounting on Capitol Hill,” *Global Security Newswire*, Nuclear Threat Initiative, February 17, 2012. Accessed November 20, 2015, <http://www.nti.org/gsn/article/us-nuclear-trade-policy-concerns-mounting-capitol-hill/>.

²⁰² Jessica C. Varnum, “U.S. Nuclear Cooperation as Nonproliferation: Reforms or the Devil You Know?”, *Nuclear Threat Initiative*, November 27, 2012. Accessed November 20, 2015, http://www.nti.org/analysis/articles/us-nuclear-cooperation-nonproliferation-reforms-or-devil-you-know/#_ednref24.

CONCLUSION: IRAN, THE JCPOA, AND FUTURE NUCLEAR NEGOTIATIONS

In July of 2015, Iran signed an international agreement to suspend portions of its nuclear program. Although not a 123 Agreement, and although the U.S. will not be authorizing the transfer of nuclear materials to Iran as a result of the agreement, it is nonetheless an important event in American nuclear negotiations. The U.S. has long attempted to halt the spread of military nuclear programs, and so any concessions made to Iran, a rogue actor in the international community, are likely to be sought by cooperative partners abroad in future nuclear negotiations.

Development of the Iranian Nuclear Program

In 1953, President Dwight D. Eisenhower addressed the United Nations General Assembly to propose the establishment of an international atomic energy agency. Under the direction of the U.N., this body (which ultimately became the IAEA) would “be made responsible for the impounding, storage and protection of the contributed fissionable and other materials.” Its “special purpose” would be to provide global access to nuclear energy for peaceful purposes.²⁰³

On March 25, 1957, Iran and the United States signed an agreement regarding the cooperative use of civilian nuclear power under the Atoms for Peace program. Entered

²⁰³ Dwight D. Eisenhower, “Address by Mr. Dwight D. Eisenhower, President of the United States of America, to the 470th Plenary Meeting of the United Nations General Assembly,” United Nations General Assembly, December 8, 1953. Accessed November 13, 2015 through the International Atomic Energy Agency, <https://www.iaea.org/about/history/atoms-for-peace-speech>.

into force in 1959, the agreement made it possible for the United States to supply Iran with a research reactor. Construction of this facility began in 1960.²⁰⁴

The United States supplied weapons-grade uranium to fuel the reactor beginning in 1967,²⁰⁵ but banned transfers of highly enriched fuels to the country following the 1979 Islamic Revolution; Iran maintains a stockpile of U.S.-origin nuclear material that was never returned.²⁰⁶ In the years between the establishment of peaceful cooperation and the revolution, however, Iran went to great effort to show the international community that it was pursuing a peaceful program.

In 1968, the NPT was first made available for countries to sign. Iran did so that same year, and ratified the treaty in 1970.²⁰⁷ Four years later, Iran led an effort to establish a Middle East nuclear-weapons-free zone.²⁰⁸ Even after the revolution, Iran made attempts to show its willingness to abide by international norms; in 1987, Iran struck a bilateral agreement with Argentina to convert the Tehran Research Reactor to use fuel enriched to just under 20% instead of weapons-grade uranium. Tehran Research Reactor has been operating with this LEU since 1993.²⁰⁹

Despite these noteworthy efforts, however, the international community has found multiple reasons to be concerned with the Iranian nuclear program. The U.S. Intelligence Community expressed in 1974 that Iran likely harbored nuclear weapons ambitions,

²⁰⁴ Paul K. Kerr, "Iran's Nuclear Program: Status," Congressional Research Service (CRS Report no. RL34544), October 17, 2012. Accessed November 13, 2015, <https://www.fas.org/sgp/crs/nuke/RL34544.pdf>, p. 1.

²⁰⁵ Institute for Science and International Security, "Tehran Research Reactor." Accessed November 13, 2015, <http://www.isisnucleariran.org/sites/facilities/tehran-research-reactor-trr/>.

²⁰⁶ Christina Walrond, "Timeline 1967-1993: Argentine Low-Enriched Uranium at Tehran Research Reactor," October 7, 2009. Accessed November 11, 2015, http://isis-online.org/uploads/isis-reports/documents/Tehran_reactor_timeline.pdf, p. 1.

²⁰⁷ "Iran's Nuclear Program: Status," p. 1.

²⁰⁸ Alireza Nader, "Iran and a Nuclear-Weapon-Free Middle East," *Arms Control Today*, Arms Control Association, August 30, 2011. Accessed November 13, 2015, https://www.armscontrol.org/2011_09/Iran_and_a_Nuclear-Weapon-Free_Middle_East.

²⁰⁹ "Tehran Research Reactor."

noting that “Iran’s course will be strongly influenced by Indian nuclear programs.”²¹⁰ The pre-revolutionary government of Iran worked to develop a full nuclear fuel cycle, to include enrichment and reprocessing capabilities.²¹¹ Concerns about the Iranian nuclear program grew to the point that the western states (including the U.S.) “in the shadow of India’s successful nuclear test in May 1974,” withdrew support for it.²¹²

These concerns grew, for the U.S. in particular, following the Iranian Revolution and the ascension of a government that was vehemently anti-American in nature.

Although Iran suspended its nuclear program in 1979,²¹³ the Arms Control Association notes that Iran “views the United States as the central threat to its continued existence and as the greatest obstacle to its regional ambitions,” and that “Tehran’s efforts to develop a possible nuclear weapons capability should therefore be viewed through the prism of its rivalry with the United States.”²¹⁴

Iran’s nuclear program suspension lasted for approximately three years; the Central Intelligence Agency reported that Iran restarted its program in 1982. In its report, the CIA stated that “Iran does not pose a weapons proliferation threat at this time,” but that uranium enrichment and reprocessing programs started prior to the Islamic

²¹⁰ Director of Central Intelligence, “Special National Intelligence Estimate: Prospects for Further Proliferation of Nuclear Weapons,” U.S. Central Intelligence Agency, August 23, 1974. Accessed November 13, 2015, through George Washington University’s National Security Archive, <http://nsarchive.gwu.edu/NSAEBB/NSAEBB240/snle.pdf>, p. 38.

²¹¹ Kelsey Davenport, Daryl G. Kimball, and Greg Thielmann, “Solving the Iranian Nuclear Puzzle: The Joint Comprehensive Plan of Action,” 4th Edition, Section 1, Arms Control Association, June 22, 2014. Accessed November 13, 2015, https://www.armscontrol.org/reports/Solving-the-Iranian-Nuclear-Puzzle/2014/06/Section_one.

²¹² Greg Bruno, “Backgrounder: Iran’s Nuclear Program,” Council on Foreign Relations, March 10, 2010. Accessed November 13, 2015, <http://www.cfr.org/iran/irans-nuclear-program/p16811>.

²¹³ “Iran’s Nuclear Program: Status,” p. 1.

²¹⁴ “Iran and a Nuclear-Weapon-Free Middle East.”

Revolution “could provide a foundation for future weapons development.”²¹⁵ If Iran is driven by a desire to achieve a sense of strategic balance with the U.S., and if it is developing weapons, then the U.S. and its allies would likely be the target of an Iranian nuclear weapons program.

In 1987, Iran received schematics for constructing uranium enrichment centrifuges through the A. Q. Khan network. Five years later, the U.S. Congress passed “the Iran-Iraq Arms Nonproliferation Act of 1992, which prohibits the transfer of controlled goods or technology that might contribute “knowingly and materially” to Iran’s proliferation of advanced conventional weapons.” It passed the Iran-Libya Sanctions Act in 1996, penalizing American and foreign entities which invested \$20 million or more in the Iranian energy sector within the space of one year.²¹⁶

Despite these sanctions, the Iranian nuclear program progressed undeterred. Reports surfaced by 2002 that Iran was hiding secret nuclear facilities in Natanz (uranium enrichment) and Arak (plutonium production). The IAEA became involved soon after. While Iran was initially cooperative in the IAEA’s inspections, the IAEA found Iran to be noncompliant with its NPT safeguards agreement. Key to this noncompliance was Iran’s “hiding [of] a wide range of strategic nuclear work.”²¹⁷

In July of 2006, the United Nations Security Council (UNSC) announced its concerns that, despite three years of inspections, the IAEA was “unable to provide assurances about Iran’s undeclared nuclear material and activities.” The UNSC adopted

²¹⁵ U.S. Central Intelligence Agency, “Middle East-South Asia: Nuclear Handbook,” May 1988. Accessed November 13, 2015, http://www.foia.cia.gov/sites/default/files/document_conversions/89801/DOC_0001033097.pdf, p. 25.

²¹⁶ Arms Control Association, “Timeline of Nuclear Diplomacy with Iran,” October 2015. Accessed November 14, 2015, <https://www.armscontrol.org/factsheet/Timeline-of-Nuclear-Diplomacy-With-Iran>.

²¹⁷ Michael Adler, “Iran and the IAEA,” *The Iran Primer*, U.S Institute of Peace. Accessed November 14, 2015, <http://iranprimer.usip.org/resource/iran-and-iaea>.

resolution 1696, requiring Iran to “suspend all enrichment-related and reprocessing activities,” and allowed one month for compliance before Iran would “face the possibility of economic and diplomatic sanctions.” Iran, in response, reiterated its position that its program was peaceful in nature, and further stated that no ties between its facilities and a nuclear weapons program had been described by the IAEA.²¹⁸

By 2008, the UNSC had imposed strong sanctions against Iran and had authorized countries to board and inspect Iranian-flagged vessels in order to prevent shipments of nuclear materials and technologies to the state from occurring. Iran admitted in September of 2009 to constructing and maintaining a secret nuclear facility at Fordow. Unilateral sanctions imposed by the United States against Iran grew increasingly severe through 2013, as Iran consistently defied the UNSC²¹⁹ and as President Obama regularly reiterated that the United States was “committed to preventing Iran from acquiring nuclear weapons.”²²⁰

Joint Comprehensive Plan of Action

On November 24, 2013, the five permanent members of the UNSC and Germany (P5+1) signed an agreement with Iran called the “Joint Plan of Action” (JPOA). The JPOA was designed to, over the course of six months, move to freeze the Iranian nuclear program until a comprehensive deal could be reached with Iran that would preclude the

²¹⁸ Press Release, “Security Council Demands Iran Suspend Uranium Enrichment by 31 August, or Face Possible Economic, Diplomatic Sanctions,” United Nations Security Council, July 31, 2006. Accessed November 15, 2015, <http://www.un.org/press/en/2006/sc8792.doc.htm>.

²¹⁹ Patrick Christy and Robert Zarate, “FPI Fact Sheet: Timeline on Diplomacy and Pressure on Iran’s Nuclear Program,” Foreign Policy Initiative, July 7, 2014. Accessed November 15, 2015, <http://www.foreignpolicyi.org/content/timeline-diplomacy-and-pressure-irans-nuclear-program>.

²²⁰ Office of the Press Secretary, “Remarks by the President at the AIPAC Policy Conference 2011,” The White House, May 22, 2011. Accessed November 15, 2015, <https://www.whitehouse.gov/the-press-office/2011/05/22/remarks-president-aipac-policy-conference-2011>.

country from developing nuclear weapons. Extended for an additional six months in July of 2014, and again in November of the same year until June of 2015, the JPOA in part halted the enrichment of Iranian UF₆ above 20%; required the facilitation of daily access for IAEA inspectors to Natanz and Fordow; and required Iran to refrain from constructing new enrichment sites. In return, the P5+1 repatriated \$4.2 billion (USD) to Iran, and agreed to not impose new nuclear sanctions against the state (whether from the U.S., the U.N., or the E.U.).²²¹

The culmination of the JPOA was the similarly-titled “Joint Comprehensive Plan of Action” (JCPOA), which was signed between the P5+1 and Iran on July 14, 2015. Designed to ensure that Iran’s nuclear program evolves for peaceful purposes, the JCPOA promises “comprehensive lifting of all UN Security Council sanctions as well as multilateral and national sanctions related to Iran’s nuclear programme” in return for “comprehensive measures providing for transparency and verification.”²²²

However, the JCPOA was met immediately with criticism that it allowed Iran too much freedom to operate its nuclear industry. The JCPOA was allowed to pass through Congress largely on party lines (with Democrats supporting the President and Republicans against), but even Democratic supporters were hesitant to endorse it: House Democratic Whip Steny Hoyer (D-MD) went on record to say that the agreement was “not one which I would have negotiated, nor one I think should have been agreed to,” stating that it “gives too much to Iran and demands too little in return.”²²³ Part of this

²²¹ Arms Control Association, “Implementation of the Joint Plan of Action at a Glance,” October 2015. Accessed November 16, 2015, <https://www.armscontrol.org/Implementation-of-the-Joint-Plan-of-Action-At-A-Glance>.

²²² U.S. Department of State, “Full Text of the Joint Comprehensive Plan of Action,” July 14, 2015. Accessed November 16, 2015, <http://www.state.gov/documents/organization/245317.pdf>, p. 2.

²²³ Stany Hoyer, “Hoyer Statement on the Iran Deal,” September 9, 2015. Accessed November 16, 2015, <http://www.democraticwhip.gov/content/hoyer-statement-iran-deal>.

concern comes from the very idea of relieving nuclear-related sanctions; in a letter signed by 344 members of the House of Representatives, it was noted that “[a]lmost all sanctions related to Iran’s nuclear program are also related to Tehran’s advancing ballistic missile program, intensifying support for international terrorism, and other unconventional weapons programs.”²²⁴ The United States would *de facto* allow funding for these activities by suspending or removing sanctions related to the nuclear program, given the significant overlap between them.

Perhaps most relevant to the issue of the “Gold Standard” comes from the Administration’s stance regarding the JCPOA. As the chief negotiating party on behalf of the U.S., the Obama administration was very pleased with the outcome of the Iran deal, noting that the JCPOA “blocks the four pathways to a nuclear weapon.” The tradeoff is that the JCPOA provides by default consent for Iran’s enrichment program, and allows Iran to keep more than 6,000 centrifuges for enriched uranium production.²²⁵

This is in stark contrast to, and entirely incompatible with, the “Gold Standard” statement of 2009, where the U.A.E. was praised for entirely forgoing enrichment and reprocessing capacities. To subsequently hail the JCPOA as being “the strongest non-proliferation agreement ever negotiated”²²⁷ is to tacitly declare that enrichment and reprocessing capabilities are not inherent proliferation risks.

²²⁴ U.S. House of Representatives, Letter to the President of the United States of America, July 9, 2014. Accessed November 16, 2015, through the House Committee on Foreign Affairs, <http://foreignaffairs.house.gov/sites/republicans.foreignaffairs.house.gov/files/Iran%20sanctions%20letter.pdf>.

²²⁵ The White House, “The Historic Deal that will Prevent Iran from Acquiring a Nuclear Weapon: How the U.S. and the International Community will Block All of Iran’s Pathways to a Nuclear Weapon.” Accessed November 16, 2015, <https://www.whitehouse.gov/issues/foreign-policy/iran-deal>.

²²⁷ Office of the Press Secretary, “Remarks by the President on the Iran Nuclear Deal,” The White House, August 5, 2015. Accessed August 28, 2015, <https://www.whitehouse.gov/the-press-office/2015/08/05/remarks-president-iran-nuclear-deal>.

Conclusion

In the nearly six years following the signing of the 123 Agreement between the United States and the United Arab Emirates, the “Gold Standard” has not been aggressively pursued. This is the opinion of Senator Corker, who describes an “administration [that] appears to have walked away from this “Gold Standard”...compromising our nation’s non-proliferation policies and goals.”²²⁹ In fairness to the administration, it is likely that if President Obama believed that the “Gold Standard” was vital to U.S. nonproliferation goals, then the Departments of State and Energy would not have clearly eschewed it in 2012 in favor of a case-by-case policy.²³⁰

Additionally, whether or not the United States can return to the “Gold Standard” is a separate question from whether or not it should. The Department of State makes a valid argument in identifying competition in the global nuclear trade as a reason to not pursue strict adherence to the “Gold Standard.” Russian involvement in Vietnam’s nuclear infrastructure, for example, predates that of U.S. involvement. Nuclear fuel supply and construction initiatives already existed in Vietnam, and would continue to exist even if the United States withdrew its support of the Vietnamese nuclear endeavor. Without a 123 Agreement, U.S. influence in Vietnamese civilian nuclear infrastructure would at best be minimal.

This lends credence to the notion that Congress repeatedly failed to amend Section 123 of the Atomic Energy Act of 1954 because it could not reach a consensus on how to strengthen the American nonproliferation regime without sacrificing opportunities for the U.S. to remain competitive in the development of civilian nuclear infrastructure in

²²⁹ “Corker: Inconsistency in Civilian Nuclear Deals Threatens U.S. Non-Proliferation Goals.”

²³⁰ “Correspondence between the United States Department of State and the United States Congress.”

foreign states. If so, then it is likely that the U.S. will remain unable to achieve the “Gold Standard”: a greater breadth in the number of countries signing 123 Agreements was outlined in the Departments of State and Energy’s letter to Congress in 2012 as being a key policy objective.²³¹ As a 123 Agreement is an authorization framework to allow the transfer of nuclear facilities, materials, and technologies, the U.S. could choose to pursue greater restrictions on top of the standard 123 Agreement with countries that it determines require additional safeguards once the actual transfers are to take place.

A similar precedent is highlighted in the recently-announced Iran nuclear deal. Among the concessions and requirements of the deal, Iran is to keep portions of its enrichment capacity intact.²³² Despite this unofficial validation of Iran’s enrichment capabilities, President Barack Obama subsequently called the Iran deal “the strongest non-proliferation agreement ever negotiated.”²³³ In labeling the deal as such, a shift in negotiating priorities becomes evident: total bans on enrichment and reprocessing are lifted in favor of other concessions, yet as an outcome of nuclear negotiations the deal is stronger than the “Gold Standard.”

This departure from the “Gold Standard” will likely affect future 123 Agreements. Countries within the international community are unlikely to accept greater restrictions on their civilian nuclear infrastructures than were applied to rogue actors. Iran has highlighted what nuclear-weapons states under the NPT have understood for decades: an advanced nuclear infrastructure grants much greater leeway for negotiating with nuclear powers. The rapid shift in U.S. nuclear negotiating policy between 2009 and 2012 as

²³¹ *Ibid.*

²³² “Full Text of the Iran Nuclear Deal,” *The Washington Post*, July 14, 2015. Accessed August 28, 2015, <http://npolicy.org/article.php?aid=1139&rt=&key=poneman&sec=article&author=>, p. 6.

²³³ “Remarks by the President on the Iran Nuclear Deal.”

stated by the Departments of State and Energy likely signaled to foreign states that enrichment and reprocessing capabilities were achievable under the right circumstances.

From 2012 to 2015, nuclear negotiations were dominated by two nuclear weapons states and a rogue actor. In the cases of China, Russia, and Iran, advanced nuclear infrastructures likely made maintaining enrichment and reprocessing capabilities plausible outcomes for their respective negotiating teams. President Obama is somewhat complicit in creating this atmosphere; his remarks that “no deal” with Iran would be worse than the worst-case scenario under the JCPOA²³⁴ echoes statements made by the administration during the Chinese 123 renegotiation, and will likely make future negotiating partners unwilling to accept severe restrictions to their enrichment and reprocessing capabilities.

²³⁴ Washington Post Staff, “Full Text: Obama: ‘It Would Be Irresponsible to Walk Away From’ Iran Nuclear Deal,” *Washington Post*, July 14, 2015. Accessed November 20, 2015, <https://www.washingtonpost.com/news/post-politics/wp/2015/07/14/full-text-obama-it-would-be-irresponsible-to-walk-away-from-iran-nuclear-deal/>.

LITERATURE CITED (REFERENCE)

- Adler, Michael, "Iran and the IAEA," *The Iran Primer*, U.S Institute of Peace. Accessed November 14, 2015, <http://iranprimer.usip.org/resource/iran-and-iaea>.
- AFP, "North Korea Threatens Nuclear Strike on White House," *The Telegraph*, July 29, 2014. Accessed June 25, 2015, <http://www.telegraph.co.uk/news/worldnews/asia/northkorea/10997161/North-Korea-threatens-nuclear-strike-on-White-House.html>.
- Arms Control Association, "Implementation of the Joint Plan of Action at a Glance," October 2015. Accessed November 16, 2015, <https://www.armscontrol.org/Implementation-of-the-Joint-Plan-of-Action-At-A-Glance>.
- Arms Control Association, "Timeline of Nuclear Diplomacy with Iran," October 2015. Accessed November 14, 2015, <https://www.armscontrol.org/factsheet/Timeline-of-Nuclear-Diplomacy-With-Iran>.
- Arms Control Association, "Strengthening Congressional Oversight of 123 Agreements," *Issue Briefs* (Volume 7, Issue 8, July 2, 2015). Accessed November 19, 2015, <https://www.armscontrol.org/Issue-Briefs/2015-07-02/Strengthening-Congressional-Oversight-of-123-Agreements>.
- "Atomic Energy Act of 1954", As Amended (P.L. 83-703). Article 1, Chapter 11, Section 123. Accessed July 7, 2015 via the Nuclear Regulatory Commission, <http://www.nrc.gov/about-nrc/governing-laws.html>.
- "Backgrounder on Research and Test Reactors," U.S. Nuclear Regulatory Commission, December 12, 2014.
- Bora, Kukil, "North Korea Threatens 'Gangster' US With Nuclear Strikes, Cyber Warfare; Rules Out Talks," *International Business Times*, February 4, 2015. Accessed June 25, 2015, <http://www.ibtimes.com/north-korea-threatens-gangster-us-nuclear-strikes-cyber-warfare-rules-out-talks-1804738>.
- Bruno, Greg, "Backgrounder: Iran's Nuclear Program," Council on Foreign Relations, March 10, 2010. Accessed November 13, 2015, <http://www.cfr.org/iran/irans-nuclear-program/p16811>.
- Bunn, George and Rhinelander, John B., "NPT Withdrawal: Time for the Security Council to Step In," Arms Control Association, *Arms Control Today*, May 1, 2005. Accessed October 3, 2015, https://www.armscontrol.org/act/2005_05/Bunn_Rhinelande.

- Bureau of East Asian and Pacific Affairs, "Fact Sheet: U.S. Relations with Taiwan," United States Department of State, February 12, 2015. Accessed July 10, 2015, <http://www.state.gov/r/pa/ei/bgn/35855.htm>.
- "China to Boost Railway and Nuclear Exports," *China Daily*, February 7, 2015. Accessed July 18, 2015, http://www.china.org.cn/business/2015-02/07/content_34762057.htm.
- Christy, Patrick and Zarate, Robert, "FPI Fact Sheet: Timeline on Diplomacy and Pressure on Iran's Nuclear Program," Foreign Policy Initiative, July 7, 2014. Accessed November 15, 2015, <http://www.foreignpolicyi.org/content/timeline-diplomacy-and-pressure-irans-nuclear-program>.
- "Cosponsors," International Nuclear Fuel for Peace and Nonproliferation Act of 2007, H.R. 885, 110th Congress (1st Session), 2007. <https://www.congress.gov/bill/110th-congress/house-bill/885/cosponsors>.
- Cosponsors, Nuclear Safeguards and Supply Act of 2007, S. 1138, 110th Congress (1st Session), April 18, 2007. Accessed August 6, 2015, <https://www.congress.gov/bill/110th-congress/senate-bill/1138>.
- "Cosponsors," S. Res. 269, 113th Congress (1st Session), 2013. Accessed August 13, 2015, <https://www.congress.gov/bill/113th-congress/senate-resolution/269/cosponsors>.
- Corker, Bob, "Corker: Inconsistency in Civilian Nuclear Deals Threatens U.S. Non-Proliferation Goals," United States Senate Committee on Foreign Relations, October 28, 2013. Accessed August 18, 2015, <http://www.foreign.senate.gov/press/ranking/release/corker-inconsistency-in-civilian-nuclear-deals-threatens-us-non-proliferation-goals>.
- Crowley, Phillip J., "Daily Press Briefing: August 5, 2010," U.S. Department of State, August 5, 2010. Accessed October 16, 2015, <http://www.state.gov/r/pa/prs/dpb/2010/08/145750.htm>.
- Davenport, Kelsey and Kimball, Daryl G., and Greg Thielmann, "Solving the Iranian Nuclear Puzzle: The Joint Comprehensive Plan of Action," 4th Edition, Section 1, Arms Control Association, June 22, 2014. Accessed November 13, 2015, https://www.armscontrol.org/reports/Solving-the-Iranian-Nuclear-Puzzle/2014/06/Section_one.
- Deutch, John and Moniz, Ernest J., et al. "The Future of Nuclear Power: An Interdisciplinary MIT Study," Massachusetts Institute of Technology, 2003. Accessed November 12, 2015, <http://web.mit.edu/nuclearpower/pdf/nuclearpower-ch4-9.pdf>.
- Director of Central Intelligence, "Special National Intelligence Estimate: Prospects for Further Proliferation of Nuclear Weapons," U.S. Central Intelligence Agency,

August 23, 1974. Accessed November 13, 2015, through George Washington University's National Security Archive, <http://nsarchive.gwu.edu/NSAEBB/NSAEBB240/snle.pdf>.

Dunn, Candace, "Japan Plans to Restart Some Nuclear Plants in 2015 After Fukushima Shutdown," Energy Information Administration, U.S. Department of Energy, February 11, 2015. Accessed November 4, 2015, <http://www.eia.gov/todayinenergy/detail.cfm?id=19951>.

"Economic and Non-Proliferation Policy Considerations of Uranium Enrichment in Brazil and Argentina," Pacific Northwest National Laboratory, U.S. Department of Energy, August 2008. Accessed June 22, 2015, http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17757.pdf.

Eisenhower, Dwight D., "Address by Mr. Dwight D. Eisenhower, President of the United States of America, to the 470th Plenary Meeting of the United Nations General Assembly," United Nations General Assembly, December 8, 1953. Accessed November 13, 2015 through the International Atomic Energy Agency, <https://www.iaea.org/about/history/atoms-for-peace-speech>.

Embassy of the United Arab Emirates, "UAE Government Releases Comprehensive Policy White Paper on the Evaluation and Potential Development of Peaceful Nuclear Energy," April 20, 2008. Accessed August 24, 2015, www.uae-embassy.org/sites/default/files/Press_Policy_Paper_Peaceful_Nuclear_Energy.pdf.

"Facing the Challenge: IAEA Support of Research Reactor Sustainability," International Atomic Energy Agency, September 2014. Accessed June 18, 2015, https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/documents/14-26471_BRO_Research_Reactors_web.pdf.

Federation of American Scientists, FAS North Korean Country Page, "Nuclear Weapons Program: Current Status." Accessed June 25, 2015, <http://fas.org/nuke/guide/dprk/nuke/>.

"Full Text of the Iran Nuclear Deal," *The Washington Post*, July 14, 2015. Accessed August 28, 2015, <http://npolicy.org/article.php?aid=1139&rt=&key=poneman&sec=article&author=>.

Gnugnoli, Giorgio N., "International Decommissioning Regulatory Initiatives and U.S. Nuclear Regulatory Commission Involvement," U.S. Nuclear Regulatory Commission, August 2005. Accessed November 10, 2015, <http://pbadupws.nrc.gov/docs/ML0523/ML052360193.pdf>.

- Godsberg, Alicia, "U.S.-Russia 123 Agreement on the Hill," Federation of American Scientists, June 18, 2008. Accessed July 29, 2015, <http://fas.org/blogs/security/2008/06/us-russia-123-agreement-on-the-hill/>.
- Government of the United Arab Emirates, "Policy of the United Arab Emirates on the Evaluation and Potential Development of Peaceful Nuclear Energy," March 23, 2008. Accessed August 21, 2015, <https://www.fanr.gov.ae/En/Documents/whitepaper.pdf>.
- Grossman, Elaine M., "U.S. Nuclear Trade Policy Concerns Mounting on Capitol Hill," *Global Security Newswire*, Nuclear Threat Initiative, February 17, 2012. Accessed November 20, 2015, <http://www.nti.org/gsn/article/us-nuclear-trade-policy-concerns-mounting-capitol-hill/>.
- Hibbs, Mark, "Taiwan and the Gold Standard," Carnegie Endowment for International Peace, July 23, 2012. Accessed July 31, 2015, <http://carnegieendowment.org/2012/07/23/taiwan-and-gold-standard/czys>.
- Holt, Mark and Nikitin, Mary Beth, "U.S.-China Nuclear Cooperation Agreement," Congressional Research Service (CRS Report no. RL33192), May 6, 2015. Accessed July 31, 2015. <https://www.fas.org/sgp/crs/row/RL33192.pdf>.
- Horner, Daniel, "Lawmakers Eye Fixes to Law on Nuclear Pacts," Arms Control Association, October 6, 2010. Accessed October 16, 2015, http://www.armscontrol.org/act/2010_10/NuclearPacts.
- Hoyer, Stany, "Hoyer Statement on the Iran Deal," September 9, 2015. Accessed November 16, 2015, <http://www.democraticwhip.gov/content/hoyer-statement-iran-deal>.
- H.R. 1280, "To amend the Atomic Energy Act of 1954 to require congressional approval of agreements for peaceful nuclear cooperation with foreign countries, and for other purposes," 112th Congress (1st Session), March 31, 2011. Accessed August 11, 2015, <https://www.congress.gov/bill/112th-congress/house-bill/1280/text>.
- Institute for Science and International Security, "Tehran Research Reactor." Accessed November 13, 2015, <http://www.isisnucleariran.org/sites/facilities/tehran-research-reactor-trr/>.
- International Atomic Energy Agency, "Additional Protocol," September 22, 2015. Accessed October 3, 2015, <https://www.iaea.org/safeguards/safeguards-legal-framework/additional-protocol>.
- International Atomic Energy Agency, "IAEA Safety Standards," December 9, 2014. Accessed November 10, 2015, <http://www-ns.iaea.org/standards/>.

- International Nuclear Fuel for Peace and Nonproliferation Act of 2007, H.R. 885, 110th Congress (1st Session), 2007. Accessed August 10, 2015, <https://www.congress.gov/bill/110th-congress/house-bill/885/text>.
- International Nuclear Fuel for Peace and Nonproliferation Act of 2007,” *Congressional Record*, 153:98 (June 18, 2007), pp. H6597-H6600. Accessed August 10, 2015, <https://www.congress.gov/congressional-record/2007/06/18/house-section/article/H6597-1>.
- International Uranium Enrichment Center, “Agreement Between the Government of the Russian Federation and the Government of the Republic of Kazakhstan on Foundation of the International Uranium Enrichment Center,” May 10, 2007 (Unofficial English Translation). Accessed August 3, 2015, http://www.iuec.ru/files/IUEC_Agreement.doc.
- International Uranium Enrichment Center, “Key Dates.” Accessed August 3, 2015, <http://eng.iuec.ru/about/dates/>.
- International Uranium Enrichment Center, “Main.” Accessed August 3, 2015, <http://eng.iuec.ru/>.
- International Uranium Enrichment Center, “Participation Conditions.” Accessed August 3, 2015, http://eng.iuec.ru/activities/participation_conditions/.
- International Uranium Enrichment Center, “Supplies to Shareholders.” Accessed August 3, 2015, http://eng.iuec.ru/activities/supplies_to_shareholders/.
- “Introduction to International Safeguards,” Office of Nonproliferation and International Security, National Nuclear Security Administration, April, 2013. Accessed May 22, 2015. http://nnsa.energy.gov/sites/default/files/nnsa/04-13-inlinefiles/International%20Safeguards_1.pdf.
- Issues & Policy, “Nuclear Cooperation Agreements,” Nuclear Energy Institute, 2015. Accessed August 28, 2015, <http://www.nei.org/Issues-Policy/Exports-Trade/Nuclear-Cooperation-Agreements>.
- Kan, Shirley A., “China and Proliferation of Weapons of Mass Destruction and Missiles: Policy Issues,” Congressional Research Service (CRS Report no. RL31555), January 5, 2015. Accessed July 18, 2015, <http://www.fas.org/sgp/crs/nuke/RL31555.pdf>.
- Kan, Shirley A., “China: Suspected Acquisition of U.S. Nuclear Weapon Secrets,” Congressional Research Service (CRS Report no. RL30143), February 1, 2006. Accessed July 18, 2015. <http://www.fas.org/sgp/crs/nuke/RL30143.pdf>.
- Kan, Shirley A. and Morrison, M. Wayne, “U.S.-Taiwan Relationship: Overview of Policy Issues,” Congressional Research Service (CRS Report no. R41952),

December 11, 2014. Accessed July 10, 2015,
<http://www.fas.org/sgp/crs/row/R41952.pdf>.

Karnitschnig, Matthew, "Germany's Expensive Gamble on Renewable Energy," *Wall Street Journal*, August 26, 2014. Accessed November 11, 2015,
<http://www.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602>.

Kerr, Paul K., "Iran's Nuclear Program: Status," Congressional Research Service (CRS Report no. RL34544), October 17, 2012. Accessed November 13, 2015,
<https://www.fas.org/sgp/crs/nuke/RL34544.pdf>, p. 1.

Kerr, Paul K. and Nikitin, Mary Beth, "Nuclear Cooperation with Other Countries: A Primer," Congressional Research Service (CRS Report no. RS22937), November 4, 2014. Accessed July 10, 2015, <http://www.fas.org/sgp/crs/nuke/RS22937.pdf>.

"Latest on Nuke Talks: What Iran, P5+1 Say," The Iran Primer, United States Institute for Peace, July 10, 2014. Accessed June 23, 2015,
<http://iranprimer.usip.org/blog/2014/jul/10/latest-nuke-talks-what-iran-p51-say>.

Locke, Gary, Correspondence between the Secretary of Commerce and the Civil Nuclear Trade Advisory Committee, July 18, 2011, U.S. Department of Commerce. Accessed through the Nuclear Energy Institute on November 19, 2015,
<http://www.nei.org/CorporateSite/media/filefolder/Policy/Trade/Locke.pdf>.

Nader, Alireza, "Iran and a Nuclear-Weapon-Free Middle East," *Arms Control Today*, Arms Control Association, August 30, 2011. Accessed November 13, 2015,
https://www.armscontrol.org/2011_09/Iran_and_a_Nuclear-Weapon-Free_Middle_East.

National Nuclear Security Administration, "123 Agreements for Peaceful Cooperation". Accessed July 9, 2015,
<http://nnsa.energy.gov/aboutus/ourprograms/nonproliferation/treatiesagreements/123agreementsforpeacefulcooperation>.

National Rural Electric Cooperative Association, "Affordable Electricity: Rural America's Economic Lifeline," July 27, 2015. Accessed November 3, 2015,
<http://www.nreca.coop/wp-content/uploads/2015/07/Affordable-Electricity-Rural-Americas-Economic-Lifeline.pdf>.

Neubauer, Sigurd, "Saudi Arabia's Nuclear Envy," *Foreign Affairs*, November 16, 2014. Accessed August 28, 2015, <https://www.foreignaffairs.com/articles/middle-east/2014-11-16/saudi-arabias-nuclear-envy>.

Nikitin, Mary Beth, "North Korea's Nuclear Weapons: Technical Issues," Congressional Research Service, April 3, 2013. Accessed June 23, 2015,
<https://www.fas.org/sgp/crs/nuke/RL34256.pdf>.

- Nikitin, Mary Beth, “U.S.-Russian Civilian Nuclear Cooperation Agreement: Issues for Congress,” Congressional Research Service (CRS Report no. RL34655), January 11, 2011. Accessed July 29, 2015, <https://www.fas.org/sgp/crs/nuke/RL34655.pdf>.
- Nikitin, Mary Beth, et al. “Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power” (CRS Report no. RL34234), September 3, 2008. Accessed November 9, 2015, <http://fpc.state.gov/documents/organization/110366.pdf>.
- Nikitin, Mary Beth, et al. “Managing the Nuclear Fuel Cycle: Policy Implications of Expanding Global Access to Nuclear Power,” Congressional Research Service (CRS Report no. RL34234), October 19, 2012.
- Nivola, Pietro S., “The Political Economy of Nuclear Energy in the United States,” *Brookings Institution*, September 2004. Accessed November 4, 2015, <http://www.brookings.edu/research/papers/2004/09/environment-nivola>.
- Nuclear Energy Institute, “Nuclear Cooperation Agreements”. Accessed July 10, 2015, <http://www.nei.org/Issues-Policy/Exports-Trade/Nuclear-Cooperation-Agreements>.
- Nuclear Power International, “Summer Nuclear Power Expansion to Cost \$6.8bn, Finish in 2019 & 2020,” *Power Engineering*, March 13, 2015. Accessed November 6, 2015, <http://www.power-eng.com/articles/2015/03/summer-nuclear-power-expansion-to-cost-6-8bn-finish-in-2019-2020.html>.
- Nuclear Safeguards and Supply Act of 2007, S. 1138, 110th Congress (1st Session), 2007.
- “Nuclear Weapons Program: Current Status,” North Korean Country Page, Federation of American Scientists, November 16, 2006. Accessed June 23, 2015, <http://fas.org/nuke/guide/dprk/nuke/>.
- Obama, Barack, “Message from the President Regarding a Peaceful Nuclear Agreement with Russia,” The White House, Office of the Press Secretary, May 10, 2010. Accessed July 29, 2015, <https://www.whitehouse.gov/the-press-office/message-president-regarding-a-peaceful-nuclear-agreement-with-russia>.
- Obama, Barack, “Message to the Congress -- Agreement for Cooperation Between the American Institute in Taiwan and the Taipei Economic and Cultural Representative Office Concerning Peaceful Uses of Nuclear Energy,” The White House, Office of the Press Secretary, January 7, 2014. Accessed July 10, 2015, <https://www.whitehouse.gov/the-press-office/2014/01/07/message-congress-agreement-cooperation-between-american-institute-taiwan>.
- Office of the Press Secretary, “Remarks by the President at the AIPAC Policy Conference 2011,” The White House, May 22, 2011. Accessed November 15,

2015, <https://www.whitehouse.gov/the-press-office/2011/05/22/remarks-president-aipac-policy-conference-2011>.

Office of the Press Secretary, “Remarks by the President on the Iran Nuclear Deal,” The White House, August 5, 2015. Accessed August 28, 2015, <https://www.whitehouse.gov/the-press-office/2015/08/05/remarks-president-iran-nuclear-deal>.

Office of the Spokesman, “U.S.-United Arab Emirates Memorandum of Understanding on Nuclear Energy Cooperation,” United States Department of State, April 21, 2008. Accessed August 24, 2015, <http://2001-2009.state.gov/r/pa/prs/ps/2008/apr/103859.htm>.

Office of the Spokesman, “U.S.-Vietnam Cooperation on Civil Nuclear Power and Nuclear Security,” U.S. Department of State, March 30, 2010. Accessed August 27, 2015, <http://www.state.gov/r/pa/prs/ps/2010/03/139255.htm>.

Parameswaran, Prashanth, “China Confirms Pakistan Nuclear Projects,” *The Diplomat*, February 10, 2015. Accessed July 18, 2015, <http://thediplomat.com/2015/02/china-confirms-pakistan-nuclear-projects/>.

Podvig, Pavel, “IFPM Blog: Vietnam to Return Spent Fuel of Research Reactor in Dalat to Russia,” International Panel on Fissile Materials, March 16, 2012. Accessed August 28, 2015, http://fissilematerials.org/blog/2012/03/vietnam_to_return_spent_f.html.

Poneman, Daniel B., and Tauscher, Ellen O., Correspondence between the United States Department of State and the United States Congress, U.S. Department of State, January 10, 2012. Accessed August 28, 2015, through the Nonproliferation Education Center, <http://npolicy.org/article.php?aid=1139&rt=&key=poneman&sec=article&author=>.

Power PartnersSM, “The Power PartnersSM Annual Report,” January 2007. Accessed November 10, 2015, <http://uspowerpartners.org/Reports&pubs/PowerPartners%28sm%29-AnnualReport-Jan2007.pdf>.

Press Release, “Security Council Demands Iran Suspend Uranium Enrichment by 31 August, or Face Possible Economic, Diplomatic Sanctions,” United Nations Security Council, July 31, 2006. Accessed November 15, 2015, <http://www.un.org/press/en/2006/sc8792.doc.htm>.

Ray, Russel, “A Report on Combined Cycle Projects in North America,” *Power Engineering*, February 3, 2015. Accessed November 6, 2015, <http://www.power-eng.com/articles/2014/02/a-report-on-combined-cycle-projects-in-north-america.html>.

- “Research Reactor Section: Fuel Cycle, Repatriation and Conversion,” International Atomic Energy Agency, January 13, 2014. Accessed June 18, 2015, <https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/rrfuelcycle.html>.
- “Research Reactors: Purpose and Future,” International Atomic Energy Agency, November 2010. Accessed June 17, 2015, https://www.iaea.org/OurWork/ST/NE/NEFW/Technical-Areas/RRS/documents/RR_Purpose_and_Future_BODY.pdf.
- “RETR Department,” Nuclear Engineering Division, Argonne National Laboratory, February 5, 2013. Accessed June 18, 2015, <http://www.rertr.anl.gov/index.html>.
- Ripley, Will and Schwarz, Tim, “Exclusive: North Korea Would Use Nukes if ‘Forced,’ Official Says,” *CNN*, May 7, 2015. Accessed June 25, 2015, <http://edition.cnn.com/2015/05/07/asia/north-korea-official-interview/index.html>.
- Rood, John C., “Agreement Between the United States and Russia for Cooperation in the Field of Peaceful Uses of Nuclear Energy,” U.S. Department of State, Statement before the House Foreign Affairs Committee, June 12, 2008. Accessed July 29, 2015, <http://2001-2009.state.gov/t/us/rm/105880.htm>.
- S. J. Res 36, “Relating to the approval and implementation of the proposed agreement for nuclear cooperation between the United States and the Socialist Republic of Vietnam,” 113th Congress (2nd Session), 2014. Accessed August 14, 2015, <https://www.congress.gov/bill/113th-congress/senate-joint-resolution/36/text>.
- S. Res. 269, “Expressing the sense of the Senate on United States policy regarding possession of enrichment and reprocessing capabilities by the Islamic Republic of Iran,” 113th Congress (1st Session), 2013. Accessed August 13, 2015, <https://www.congress.gov/bill/113th-congress/senate-resolution/269>.
- Sokolski, Henry, “Obama’s Nuclear Mistake,” *National Review*, February 7, 2012. Accessed November 19, 2015, <http://www.nationalreview.com/article/290330/obamas-nuclear-mistake-henry-sokolski>.
- Sokolski, Henry, “The U.S.-Russia Nuclear Cooperation Agreement: The Case for Conditioning,” Nonproliferation Education Center, Testimony Presented before a Hearing of the House Committee on Foreign Affairs, June 11, 2008. Accessed July 29, 2015, <http://www.npolicy.org/article.php?aid=222&rid=5>.
- Squassoni, Sharon and Coughlin, Chris, “Nuclear Cooperation with China,” Center for Strategic and International Studies, July 16, 2015. Accessed July 18, 2015, <http://csis.org/publication/nuclear-cooperation-china>.
- Staff Working Paper, “Energy, Industry Modernization and Poverty Reduction: A Review and Analysis of Current Policy Thinking,” Research and Statistics

- Branch, United Nations Industrial Development Organization, June 2007.
 Accessed November 4, 2015,
http://www.unido.org/fileadmin/user_media/Publications/Research_and_statistics/Branch_publications/Research_and_Policy/Files/Working_Papers/2007/WP062007%20-%20Energy,%20industry%20modernization%20and%20poverty%20reduction.pdf.
- Stern, Warren and Pepper, Susan, “Building an Effective Nonproliferation Program: U.S. Support of IAEA Safeguards,” Federation of American Scientists, May 21, 2013.
 Accessed August 17, 2015, <https://fas.org/pir-pubs/building-an-effective-nonproliferation-program-u-s-support-of-iaea-safeguards/>.
- “Treaty on the Non-Proliferation of Nuclear Weapons,” U.S. Department of State, March 5, 1970.
- Toszer, Sandor and Webb, Greg, “Vietnam Removes High Enriched Uranium Research Reactor Fuel,” International Atomic Energy Agency, July 3, 2013 (updated February 24, 2015). Accessed August 28, 2015,
<https://www.iaea.org/newscenter/news/vietnam-removes-high-enriched-uranium-research-reactor-fuel>.
- United Nations, “Report of the High-Level Panel on Threats, Challenges, and Change,” 2004.
http://www.un.org/en/peacebuilding/pdf/historical/hlp_more_secure_world.pdf.
- United Nations Security Council, 1540 Committee, “United Nations Security Council Resolution 1540 (2004).” Accessed October 3, 2015,
<http://www.un.org/en/sc/1540/>.
- United States Congress, House Committee on Foreign Affairs, “The Future of International Civilian Nuclear Cooperation,” Hearing, July 10, 2014, 113th Congress, Second Session. Accessed July 31, 2015,
<http://www.gpo.gov/fdsys/pkg/CHRG-113hrg88626/pdf/CHRG-113hrg88626.pdf>.
- United States Congress, House Committee on Foreign Affairs, “The Global Nuclear Revival and U.S. Nonproliferation Policy,” Hearing, March 17, 2011, 112th Congress (1st Session). Accessed through the United States Government Printing Office, August 25, 2015, <http://www.gpo.gov/fdsys/pkg/CHRG-112hrg65302/html/CHRG-112hrg65302.htm>.
- United States Senate, “Report: Nuclear Safeguards and Supply Act of 2007,” Committee on Foreign Relations, S. Rpt. 110-151, 110th Congress (1st Session), 2007.
 Accessed August 6, 2015, <https://www.congress.gov/110/crpt/srpt151/CRPT-110srpt151.pdf>.

- “University Research Reactors: A Brief Overview”, The National Organization of Test, Research, and Training Reactors, September 19, 2000. Accessed June 12, 2015, <http://www.trtr.org/Links/OSTP%20Briefing%202000.pdf>.
- U.S. Central Intelligence Agency, “Middle East-South Asia: Nuclear Handbook,” May 1988. Accessed November 13, 2015, http://www.foia.cia.gov/sites/default/files/document_conversions/89801/DOC_0001033097.pdf.
- U.S. Department of Defense, “Quadrennial Defense Review 2014,” March 4, 2014. Accessed November 10, 2015, http://archive.defense.gov/pubs/2014_Quadrennial_Defense_Review.pdf.
- U.S. Department of State, “Full Text of the Joint Comprehensive Plan of Action,” July 14, 2015. Accessed November 16, 2015, <http://www.state.gov/documents/organization/245317.pdf>.
- U.S. Energy Information Administration, “Annual Energy Outlook 2015 with Projections to 2040,” U.S. Department of Energy, April 2015. Accessed November 4, 2015, <http://www.eia.gov/forecasts/aeo/pdf/0383%282015%29.pdf>.
- U.S. Energy Information Administration, “Country Pages: France,” U.S. Department of Energy, September 2015. Accessed November 4, 2015, <http://www.eia.gov/beta/international/analysis.cfm?iso=FRA>.
- U.S. Energy Information Administration, “Electric Power Monthly with Data for August 2015,” U.S. Department of Energy, October 2015. Accessed November 10, 2015, <http://www.eia.gov/electricity/monthly/pdf/epm.pdf>, table 5.3.
- U.S. Energy Information Administration, “Glossary: Separative Work Unit.” Accessed May 19, 2015, <http://www.eia.gov/tools/glossary/index.cfm?id=Separative%20work%20unit>.
- U.S. Energy Information Administration, “Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015,” U.S. Department of Energy, June 3, 2015. Accessed November 11, 2015, http://www.eia.gov/forecasts/aeo/electricity_generation.cfm.
- U.S. Energy Information Administration, “Nuclear Explained: Nuclear Power and the Environment,” U.S. Department of Energy, December 15, 2014. Accessed November 10, 2015, http://www.eia.gov/energyexplained/index.cfm?page=nuclear_environment.
- U.S. Government Printing Office, “Message from the President of the United States Transmitting the Text of a Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the Socialist Republic of Vietnam Concerning Peaceful Uses of Nuclear Energy Pursuant to 42

U.S.C. 2153(b), (d),” House Document 113-109, 113th Congress (2nd Session), May 9, 2014.

U.S. Government Printing Office, “Message from the President of the United States Transmitting the Text of a Proposed Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates Concerning Peaceful Uses of Nuclear Energy Pursuant to 42 U.S.C. 2153(b), (d),” House Document 111-43, 111th Congress (1st Session), May 21, 2009.

U.S. Government Printing Office, “Weekly Compilation of Presidential Documents Volume 43, Number 27 (Monday, July 9, 2007).” Accessed October 21, 2015, <http://www.gpo.gov/fdsys/pkg/WCPD-2007-07-09/html/WCPD-2007-07-09-Pg903-2.htm>.

U.S. House of Representatives, Letter to the President of the United States of America, July 9, 2014. Accessed November 16, 2015, through the House Committee on Foreign Affairs, <http://foreignaffairs.house.gov/sites/republicans.foreignaffairs.house.gov/files/Iran%20sanctions%20letter.pdf>.

U.S. Nuclear Regulatory Commission, “Backgrounder on Chernobyl Nuclear Power Plant Accident,” December 12, 2014. Accessed November 6, 2015, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/chernobyl-bg.html>. U.S.

U.S. Nuclear Regulatory Commission, “Backgrounder on NRC Response to Lessons Learned from Fukushima,” February 9, 2015. Accessed November 4, 2015, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/japan-events.html>.

U.S. Nuclear Regulatory Commission, “Fission (fissioning),” March 20, 2015. Accessed June 1, 2015. <http://www.nrc.gov/reading-rm/basic-ref/glossary/fission-fissioning.html>.

U.S. Nuclear Regulatory Commission, “Uranium Enrichment,” October 21, 2014. Accessed June 1, 2015. <http://www.nrc.gov/materials/fuel-cycle-fac/uranium-enrichment.html>.

U.S. Overseas Private Investment Corporation, “Power Africa.” Accessed November 4, 2015, <https://www.opic.gov/opic-action/power-africa>.

Varnum, Jessica C., “U.S. Nuclear Cooperation as Nonproliferation: Reforms or the Devil You Know?”, *Nuclear Threat Initiative*, November 27, 2012. Accessed November 20, 2015, http://www.nti.org/analysis/articles/us-nuclear-cooperation-nonproliferation-reforms-or-devil-you-know/#_ednref24.

- Walrond, Christina, "Timeline 1967-1993: Argentine Low-Enriched Uranium at Tehran Research Reactor," October 7, 2009. Accessed November 11, 2015, http://isis-online.org/uploads/isis-reports/documents/Tehran_reactor_timeline.pdf.
- Washington Post Staff, "Full Text: Obama: 'It Would Be Irresponsible to Walk Away From' Iran Nuclear Deal," *Washington Post*, July 14, 2015. Accessed November 20, 2015, <https://www.washingtonpost.com/news/post-politics/wp/2015/07/14/full-text-obama-it-would-be-irresponsible-to-walk-away-from-iran-nuclear-deal/>.
- Western Hemisphere Counterterrorism and Nonproliferation Act of 2008, H.R. 7068, 110th Congress (2nd Session), 2008. Accessed August 7, 2015, <https://www.congress.gov/bill/110th-congress/house-bill/7068>.
- White House, The, "The Historic Deal that will Prevent Iran from Acquiring a Nuclear Weapon: How the U.S. and the International Community will Block All of Iran's Pathways to a Nuclear Weapon." Accessed November 16, 2015, <https://www.whitehouse.gov/issues/foreign-policy/iran-deal>.
- World Bank, "Data: Access to Electricity (% of Population)." Accessed November 4, 2015, http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?order=wbapi_data_value_2012.
- World Bank, "Data: GDP (Current \$USD)." Accessed November 4, 2015, http://data.worldbank.org/indicator/NY.GDP.MKTP.CD?order=wbapi_data_value_2012.
- World Bank, "Data: GDP Per Capita (Current \$USD)." Accessed November 4, 2015, data.worldbank.org/indicator/NY.GDP.PCAP.CD?order=wbapi_data_value_2012
- World Nuclear Association, "Nuclear Power in Germany," November 2015. Accessed November 4, 2015, <http://www.world-nuclear.org/info/Country-Profiles/Countries-G-N/Germany/>.
- World Nuclear Association, "Nuclear Fuel Fabrication," May 22, 2015. Accessed June 2, 2015. <http://world-nuclear.org/info/Nuclear-Fuel-Cycle/Conversion-Enrichment-and-Fabrication/Fuel-Fabrication/>.
- World Nuclear Association, "Nuclear is Part of the Solution for Fighting Climate Change," November 5, 2015. Accessed November 10, 2015, http://www.world-nuclear.org/uploadedFiles/org/Features/Climate_Change/Nuclear4Climate%20Position%20Paper.pdf.
- World Nuclear Association, "Plutonium," May 2015. Accessed August 24, 2015, <http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Fuel-Recycling/Plutonium/>.

- World Nuclear Association, "Safety of Nuclear Power Reactors," August 2015. Accessed November 6, 2015, <http://www.world-nuclear.org/info/safety-and-security/safety-of-plants/safety-of-nuclear-power-reactors/>.
- World Nuclear Association, "Uranium Enrichment," April 2015. Accessed June 1, 2015. <http://www.world-nuclear.org/info/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/uranium-enrichment/>.
- World Nuclear Association, "Uranium: How does it Work?" March 2014. Accessed June 1, 2015. <http://www.world-nuclear.org/info/Nuclear-Fuel-Cycle/Introduction/What-is-Uranium--How-Does-it-Work-/>.
- World Nuclear Association, "World Nuclear Power Reactors & Uranium Requirements," April 21, 2015. Accessed May 20, 2015.
- World Nuclear News, "China-USA Cooperation Agreement Renewed," November 10, 2015. Accessed November 10, 2015, <http://www.world-nuclear-news.org/NP-China-USA-cooperation-agreement-renewed-1011157.html>.
- World Nuclear News, "New Nuclear Energy Policy for Taiwan," November 3, 2011. Accessed July 31, 2015, http://www.world-nuclear-news.org/NP-New_nuclear_energy_policy_for_Taiwan-0311117.html.
- Yee, April, "UAE Presses the Case for Nuclear Gold Standard," *The National*, April 19, 2012. Accessed November 19, 2015, <http://www.thenational.ae/business/energy/uae-presses-the-case-for-nuclear-gold-standard>.

APPENDIX: SUMMARY OF SECTION 123 OF THE ATOMIC ENERGY ACT OF 1954

The Atomic Energy Act of 1954 lists nine pledges by which partner countries must abide. They are outlined as follows:²³⁵

1. A guarantee of safeguards for all material and equipment – obtained, used, and/or produced – provided subsequent to the conclusion of a nuclear cooperation agreement. This guarantee is indefinite, and extends beyond the natural or artificial lifetime of the treaty.
2. If the Party is a non-nuclear-weapons state, all nuclear material for any peaceful purpose anywhere in the cooperating Party’s sovereign territory must be subjected to IAEA safeguards. This includes material that is not American in origin.
3. A guarantee that no material, equipment, or data will be used in the pursuit of detonating a military nuclear device; or for any military purposes. An exemption exists under subsection 91c of the Act for “nonnuclear parts of atomic weapons” provided to states that have “made substantial progress in the development of atomic weapons” so long as such a transfer does not “contribute significantly to that nation’s atomic weapon design, development, or fabrication capability.”²³⁶
4. The United States will maintain the right to demand the return of any nuclear materials and equipment transferred under the Agreement, and of any material produced as a result of the Agreement, should the

²³⁵ “Atomic Energy Act of 1954”, As Amended (P.L. 83-703). Article 1, Chapter 11, Section 123. Accessed July 7, 2015 via the Nuclear Regulatory Commission, <http://www.nrc.gov/about-nrc/governing-laws.html>.

²³⁶ Atomic Energy Act of 1954, Article 1, Chapter 9, Section 91, Subsection (c).

cooperating Party detonate a nuclear device. Exemptions exist for Agreements formed under subsection 91c (see point #3 above), and for nuclear weapons states.

5. A guarantee that any materials transferred pursuant to the Agreement will not be re-transferred to any unauthorized Party without the explicit consent of the United States. The following exemptions may apply:
 - a. Subsection 91c (see point #3 above);
 - b. Subsection 144b: Authorization of the President to cooperate with a nation or regional defense organization (where the United States is a member), communicating restricted data for expressed purposes of training, evaluation, defense planning, and developing delivery systems. The President of the United States must determine that such an arrangement “will not constitute an unreasonable risk to the common defense and security” of the United States and the international community. This exemption cannot be made independent of a 123 Agreement;²³⁷
 - c. Subsection 144c: Communication of restricted data to improve atomic weapons design, provided that the cooperating Party has made substantial progress in their development already. Additionally, the communication of restricted data for military reactors should they not constitute an unreasonable risk to the

²³⁷ Atomic Energy Act of 1954, Article 1, Chapter 9, Section 144, Subsection (b).

common defense and security. This exemption similarly cannot be made independent of a 123 Agreement;²³⁸

- d. Subsection 144d: The communication of restricted data to support a program to control and account for fissile and weapons material; “control of and accounting for atomic weapons”; verifying of treaties; and establishing international standards for classifying data related to atomic weapons and fissile material. This must promote the common defense and security, and may not pose an unreasonable risk to the same. Like Subsection 144b and 1441c exemptions, this cannot be undertaken independent of a 123 Agreement.²³⁹
6. The cooperating Party must guarantee that nuclear materials produced or received pursuant to this Agreement and relevant nuclear facilities will be placed under adequate physical security.
7. A guarantee that no materials transferred or processed pursuant to this Agreement will be reprocessed, enriched, “or otherwise altered” without the expressed consent of the United States. Exemptions exist under subsections 91c (see point #3 above), 144b, 144c, and 144d (see point #5 above, sub-bullets (b), (c), and (d) respectively).
8. A guarantee by the cooperating Party that plutonium, U²³³, and uranium enriched above 20% U²³⁵ transferred or produced pursuant to this Agreement will not be stored in any facility without the expressed, prior

²³⁸ Atomic Energy Act of 1954, Article 1, Chapter 9, Section 144, Subsection (c).

²³⁹ Atomic Energy Act of 1954, Article 1, Chapter 9, Section 144, Subsection (d).

approval of the United States. Exemptions exist under subsections 91c (see point #3 above), 144b, 144c, and 144d (see point #5 above, sub-bullets (b), (c), and (d) respectively).

9. A guarantee that all materials, data, facilities, and equipment transferred, and any material produced using the aforementioned transfers, will be subjected to all requirements laid out in Section 123. The President may make exemptions under subsections 91c (see point #3 above), 144b, 144c, and 144d (see point #5 above, sub-bullets (b), (c), and (d) respectively), if such an exemption would prevent jeopardizing either the common defense and security, or American nonproliferation goals.
 - a. Except in the cases of the aforementioned exemptions, the Secretary of State will be the primary negotiator for a 123 Agreement.
 - b. Nuclear Proliferation Assessment Statements must include a classified annex with the consultation of the Director of Central Intelligence to summarize relevant, classified information. An unclassified version shall be provided to the President analyzing the consistency of the proposed treaty with the requirements of Section 123, and analyzing the safeguards and control mechanisms of the cooperating Party.
 - c. Under the aforementioned exemptions, proposals will be submitted by either the Secretary of Energy or the Secretary of Defense, as applicable.