

# THE FUTURE OF INTERNATIONAL CIVILIAN NUCLEAR COOPERATION

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## HEARING BEFORE THE COMMITTEE ON FOREIGN AFFAIRS HOUSE OF REPRESENTATIVES ONE HUNDRED THIRTEENTH CONGRESS SECOND SESSION

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# CONTENTS

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	Page
WITNESSES	
Mr. Henry D. Sokolski, executive director, Nonproliferation Policy Education Center .....	5
Mr. Daniel S. Lipman, executive director, Supplier Programs, Nuclear Energy Institute .....	12
Mr. Leonard S. Spector, executive director, Washington, DC, Office, James Martin Center for Nonproliferation Studies .....	21
LETTERS, STATEMENTS, ETC., SUBMITTED FOR THE HEARING	
Mr. Henry D. Sokolski: Prepared statement .....	7
Mr. Daniel S. Lipman: Prepared statement .....	14
Mr. Leonard S. Spector: Prepared statement .....	23
APPENDIX	
Hearing notice .....	54
Hearing minutes .....	55
The Honorable Gerald E. Connolly, a Representative in Congress from the Commonwealth of Virginia: Prepared statement .....	57
Mr. Henry D. Sokolski: Material submitted for the record .....	59



## THE FUTURE OF INTERNATIONAL CIVILIAN NUCLEAR COOPERATION

THURSDAY, JULY 10, 2014

HOUSE OF REPRESENTATIVES,  
COMMITTEE ON FOREIGN AFFAIRS,  
*Washington, DC.*

The committee met, pursuant to notice, at 9:43 a.m., in room 2172 Rayburn House Office Building, Hon. Ed Royce (chairman of the subcommittee) presiding.

Mr. ROYCE. This committee will come to order. Today we assess the role of civilian nuclear cooperation agreements, known as “123 agreements,” 123 agreements as known by Mr. Sokolski, especially their role in U.S. nonproliferation policy and in promoting our nuclear industry abroad. Of note, the administration has recently submitted a proposed 123 agreement with Vietnam that is now under congressional review.

Nuclear cooperation agreements have the dual goals of advancing U.S. nonproliferation policy and also enhancing opportunities for the U.S. nuclear industry in foreign markets. Both are of great importance, but there is an unavoidable tension between the two. Those who stress nonproliferation argue that 123 agreements are a valuable tool in preventing the spread of uranium enrichment or the production of plutonium, also known as E&R technology which can be used to create a nuclear weapon. Others argue that unilateral efforts to bind other countries will not work because they can turn to other nuclear suppliers, such as France or Russia which impose few or no restrictions and that, of course, they are undermining the competitiveness of U.S. companies.

Last December, the Obama administration ended its 3-year review of U.S. policy on this subject, which pitted the State Department’s argument for nonproliferation against the Department of Energy’s advocacy for U.S. industry. The final decision was to continue to push for a “no E&R” commitment in nuclear cooperation agreements, but not to make that a requirement. For an administration that has held out nonproliferation as a signature issue, this is a dramatic retreat from the so-called “gold standard” policy under which countries were pressed to forego acquiring these potentially dangerous technologies begun under the previous administration.

The debate over these and other issues is reflected in the proposed 123 agreement with Vietnam. It has generated both praise and criticism, the latter focused on the absence of a binding restriction regarding E&R; its automatic renewal after 30 years, which

would eliminate the congressional review that has been the norm; and Vietnam's abysmal human rights record which we examined in committee hearing yesterday.

This discussion is not confined to Vietnam, but to those that follow as well. We are currently in negotiations to renew our 123 agreement with our ally, South Korea, which have been slowed by significant differences over E&R. Our agreement with China expires next year, and its renewal is certain to generate significant controversy. And the U.S. may begin discussions with Saudi Arabia over the massive nuclear energy program it is planning. That one is guaranteed to bring these critical issues into focus.

Of course, the Obama administration has made the goal of limiting the spread of enrichment technology all the more difficult by its ongoing negotiations with Iran. In November, the administration conceded that Iran will be allowed to retain a uranium enrichment capacity, a bomb making capacity, in any final deal. That is the effective melting of the "gold standard." The administration has conceded this dangerous technology to a state sponsor of terrorism that is under U.N. Security Council sanctions for egregious violations of its IAEA safeguards agreement.

Although today's topic may sound technical, it should be clear to all that it concerns fundamental U.S. interests, not only in the present but far into the future as well.

I now turn to the ranking member, Mr. Brad Sherman, for any remarks he may wish to make.

Mr. SHERMAN. Thank you, Mr. Chairman, and thank you for holding this hearing. You and I worked for so many years as chairman and ranking member of the Terrorism, Nonproliferation, and Trade Subcommittee. We had a hearing 6 years ago, entitled "Saving the NPT in an Era of Nuclear Renaissance," and we have had various other hearings, as you know, on the issues we now confront today at the full committee level, and they are certainly worthy of discussion at the full committee level.

In addition to the focus we had 6 years ago, we have seen Fukushima, but that disaster has not prevented many countries from looking at expanding or initiating a nuclear power program. Civil programs can provide countries with the know how, of course, to move toward a nuclear weapon. They can also provide electricity without the generation of greenhouse gases. And a number of countries will be attracted to this not only in a cost per kilowatt basis, but also as part of any economic—where there are economic incentives to reduce their carbon footprint, nuclear power will be particularly attractive.

Civil and nuclear programs can also provide cover for countries to pursue military programs. That is obvious. The means and the excuse to conduct activities related to a military program will be present in civil nuclear programs allowing countries to pursue weapons under the guise of a civilian program. It is a particularly weak excuse to say that a country wants to generate electricity if that country has or is contiguous with other countries which have natural gas which cannot be easily exported. The cost of liquefaction, transportation, and regassification of natural gas means that it is perhaps one third the cost in the area in which it is created, in which it is obtained, than it is shipped to distant

continents. Countries that have virtually free natural gas that have no other way to exploit it, like Iran, who say they need nuclear power for electricity should come under special scrutiny.

It is not a theoretical concern to say that a civilian program can cover for a military program. This is exactly what Iran is doing. India, which I want to point out did not sign the NPT and therefore was not bound by any treaty not to develop nuclear weapons, but in the case of India derived the fuel used from a civilian reactor for the fissile material used in its first weapons. That is why the so-called 123 agreements, including the Vietnam agreement which is now sitting before Congress, need to be deliberated more than is the current practice.

The current law puts Congress not in the driver seat, not as a coequal branch of government, not in the back seat, but in the trunk when it comes to deciding what our policy will be on nuclear cooperation agreements. These agreements come to Congress for a 90-day review. In order to stop them, both houses of Congress have to act within 90 days, something that in this Congress is unlikely to occur on a motherhood resolution. But even if both houses of Congress vote to stop such an agreement, it goes before the President for a possible veto and if the President vetoes the resolution, both houses have to override with a two thirds vote. I think that is an affront to the doctrines that underlie the first article of the U.S. Constitution. It is not meaningful review.

I am not saying that Congress needs to have an affirmative vote on every agreement. Congresswoman Ros-Lehtinen and I have introduced legislation, H.R. 3766, which would provide that Congress would have to affirmatively vote on an agreement unless that agreement met what I call the gold standard plus. That is to say it would have to have gold standard provisions dealing with a commitment by the country not to deploy enrichment and reprocessing, the two most proliferation and dangerous technologies needed to produce a bomb-grade material, and also agree to enhance inspections and verifications regimes, known as the additional protocol.

In addition, they would have to allow the American companies to compete by having liability provisions. No company will build a nuclear reactor without some liability protection, but Russia and France, their companies are state owned and so they claim sovereign immunity as their liability protection. Any 123 agreement that does not insist on liability protection for American companies basically is an agreement designed to cede the jobs which would have the effect, if not the design, of ceding the jobs to Russia and France. I believe that a reasonable compromise with the Executive Branch and industry might be available. And I thank the chair for his time and I especially thank the gentlelady from Florida for her work on the bill that I have just cited and I yield back.

Mr. ROYCE. We go now to Judge Poe, chair of the Subcommittee on Terrorism, Nonproliferation, and Trade, for 2 minutes.

Mr. POE. Thank you, Mr. Chairman. The Taiwan 123 Agreement seems on the surface to be an easy decision. Taiwan is a strong ally of the United States. Taiwan has a great democracy that shares the values of the United States as well. And the agreement has legally-binding language that Taiwan will not acquire enrichment or

reprocessing technology. This is important because such technology can very easily lead to the development of a nuclear bomb.

The proposed Vietnam 123 Agreement is the one I have concern with. First, there is no legally binding language like the Taiwan agreement that states that Vietnam will not acquire enrichment and reprocessing technology. Vietnam is not the ally that Taiwan is and it is ironic that we have stricter language in our deal with a close democratic ally than we do in a deal with a Communist country that has really proven not to be trustworthy.

However, it is also correct that the United States does not control the nuclear energy market like it did in the past and that each of these deals is important to the United States' industry and American jobs. We are not in the 1950s any more. Russia, China, France, South Korea, and Japan would all be happy to take our business in Vietnam if we just walk away from some kind of an agreement because Vietnam does not agree to forego enrichment and the preprocessing technology. The deals they strike will probably lead to greater proliferation risk than the current situation on the table before us. I do want to hear from the witnesses what they think about this situation.

Second, the proliferation risk is not the only problem we have with Vietnam. Over the last few years, human rights abuses by the Government of Vietnam have gotten worse. Pastor Quang has been detained and arrested by the Vietnam police 13 times. His crime? He is a Christian pastor who organizes prayer meetings. Such abuses continue in Vietnam. There are 100 stories like Pastor Quang and Congress should think twice before it rewards Vietnam's nuclear energy situation when it abuses and tortures and kills its own people. Human rights really do matter and I will yield back.

Mr. ROYCE. Thank you, Mr. Poe. We are joined this morning by a distinguished group of experts. Mr. Henry Sokolski is the executive director of the Nonproliferation Policy Education Center. He previously served as the Deputy for Nonproliferation Policy in the Department of Defense from 1989 to 1993. "Hammering Hank," as we know him in the office, also worked in the Office of the Secretary of Defense's Office of Net Assessment. It is his birthday, so congratulations, Henry, and I am going to assume it is your wife, Amanda, who is keeping you young.

Mr. Daniel Lipman is the executive director for Supplier Programs at the Nuclear Energy Institute. Formerly, he was senior vice president of Operation Support for Westinghouse Electric Company.

Mr. Leonard Spector, Sandy Spector as he is known, is deputy director of the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies. Previously, he served as Assistant Deputy Administrator for Arms Control and Nonproliferation at the U.S. Nuclear Security Administration where his portfolio included overseeing nuclear export control activities.

Without objection, the witnesses' full prepared statements will be made part of the record. Members are going to have 5 calendar days to submit any statements or questions or extraneous material for the record.



Mr. Sokolski, if you would please summarize your remarks to 5 minutes, for each of the members of the panel here and then we will go to questions.

**STATEMENT OF MR. HENRY D. SOKOLSKI, EXECUTIVE DIRECTOR, NONPROLIFERATION POLICY EDUCATION CENTER**

Mr. SOKOLSKI. Mr. Royce, Mr. Engel, members of the committee, I want to thank you for this important hearing. Before I begin, I would ask permission that not only my full testimony, but several brief items be placed in the record.

Mr. Chairman, when I last appeared before this committee it was considering legislation that would have significantly strengthened the role of Congress in approving U.S. nuclear cooperative agreements. The committee unanimously approved this legislation, but after industry objected, it never went to the floor. That was 3 years ago.

Congress now, as we have just heard, really does not have much of a hand in shaping nuclear cooperative agreements. It can continue to let the executive send up more agreements and allow them to come into course, but if Congress does, it will leave itself powerless to deal with three issues.

First, possible unilateral executive authorization of Chinese reprocessing of hundreds, I repeat, hundreds of bombs worth of plutonium each year from spent fuel processed in U.S.-designed reactors. China recently announced it will buy a so-called "peaceful" reprocessing plant from France and locate it at China's original weapons plutonium production site. This will obviously have military significance. Under the current U.S.-China nuclear agreement, the executive can authorize China to reprocess materials from eight or more U.S.-designed reactors that will be operating in China. Congress has no say. This understanding expires December 2015 and must be renegotiated. Does Congress not want to have any say in this?

Under the committee's stalled 2011 legislation, each Chinese reprocessing request would require congressional approval. I would urge the committee to reconsider that 2011 bill by marking up identical Ros-Lehtinen/Brad Sherman legislation, H.R. 3766.

Second, the elimination of periodic required reviews of nuclear agreements. Most U.S. nuclear agreements are for a fixed term and must be renegotiated. The Vietnam nuclear deal, however, stays in force in perpetuity unless one of the parties asks and succeeds in getting it renegotiated. The executive is sure to push this approach for future deals until all U.S. 123 agreements automatically renew without presentment to Congress. Again, this will occur unless Congress acts to limit the practice. Given the Vietnam deal is hardly urgent, it would be best to have the executive withdraw it until this is fixed.

Third, the executive is creating a precedent with the Vietnam deal that will make it virtually impossible to resist Saudi, Turkish, and South Korean calls to reprocess or enrich. The executive is negotiating with Iran and South Korea over enrichment and reprocessing. The Vietnam deal is a kind of mini Indian nuclear deal. But it undermines the gold standard on proliferation conditions contained in the UAE and Taiwanese agreements sets a poor prece-

dent on both fronts. Unless Congress overrules industry's current veto on legislating on these matters, expect more hand wringing, nail biting, and Iran-like crises to emerge.

Two additional notes, industry and the State Department argue that if Congress votes on agreements that don't meet tough nonproliferation conditions, the agreements are dead on arrival with a loss of U.S. business and jobs. But in pushing for lowest common denominator agreements, State has its priorities backwards, I would argue. Our Government should be trying to convince other suppliers to raise their nonproliferation standards which I might add are all too similar to our own, but like our own, too low. The U.S. can do this, but it needs to take the initiative.

Finally, although it is hardly sound to give up important security positions because of promised jobs, it is ridiculous to do so when such promises are hugely exaggerated. India, we were told, was a \$100-billion nuclear market for the U.S. Nine years after that deal was announced though no U.S. reactors have been sold. Yet, by exempting India from restrictive NPT rules, we did great harm to that treaty and to our nonproliferation efforts globally.

The GAO recently noted that the U.S. doesn't track America's actual nuclear exports. The committee should look into this and demand real numbers on exports of 123 controlled goods. On these matters, Congress should not be sold a bill of goods. Thank you.

[The prepared statement of Mr. Sokolski follows:]

**Will Congress Oversee US Nuclear Cooperation?**

Testimony

By

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Presented before a Hearing

“The Future of International Civilian Nuclear Cooperation”

Of the House Committee on Foreign Affairs

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July 10, 2014

Mr. Royce, Mr. Engel, members of the Committee, I want to thank you for holding this hearing. The principles behind US nuclear export and control policies, nonproliferation, and our diplomacy efforts to reduce the spread of enrichment and reprocessing activities have been matters of keen interest for several years.<sup>1</sup> Generally, these matters have been discussed in the context of promoting nuclear power's further expansion overseas, of increasing the number of jobs or of concluding nuclear agreements and cooperation initiatives more generally. All of these considerations are important. They are not, however, the primary lens that should be used for weighing these matters.

I've served in the US Senate as military legislative aide to a senior member of the Senate Armed Services Committee, in the Pentagon as a deputy assistant secretary-level official responsible for nuclear proliferation matters, as a member of two Congressionally-mandated commissions on strategic weapons proliferation threats, as a former consultant on proliferation issues to the CIA and the Commission on Strategic Posture of the US, and as a DoD contractor with a Pentagon office that details future threat assessments directly to the Secretary of Defense. In each of these positions, my key focus has been on clarifying the national and international security implications of the further spread of dual-use nuclear technology.

These security concerns should be the first business of our government. Certainly, the most profound contributions Congress has made to promoting and controlling truly peaceful foreign nuclear activities were premised on putting US national security first. This was true in 1946 when Congress created the Atomic Energy Commission, in 1978 when it passed the Nuclear Nonproliferation Act, in the 1990s when it conditioned the Nuclear Agreed Framework with North Korea, and today as it considers legislation relating to our nuclear negotiations with Iran.

That said, the last time Congress revamped the Atomic Energy Act significantly was over 35 years ago. That overhaul, finalized in 1978, followed Taiwanese and South Korean efforts to acquire nuclear weapons and India's explosion of a "peaceful" nuclear explosive. India's bomb used US civilian nuclear technology and materials in violation of India's peaceful end-use pledges to the US. Given these events, Congress demanded that any future US nuclear deals with states that, like India (which did not have all of its nuclear facilities under IAEA safeguards and were not members of the NPT), could only come into force with a Congressional joint resolution of approval.

That was three and a half decades ago. Since then, Iraq used its safeguarded "peaceful" nuclear program to develop a nuclear weapons option; India and Pakistan broke their pledges (including several to the US) not to develop nuclear weapons or to test; North Korea developed a covert enrichment program, in violation of the Agreed Framework, and withdrew from the NPT even as it imported and perfected US light water reactor technology; Syria and Libya both violated their IAEA safeguards agreements and nearly completed an enrichment plant (in Libya's case) and a plutonium production reactor (in Syria's) covertly; and Iran imported foreign and US nuclear assistance (which began in 1957) under IAEA safeguards, developed a nuclear weapons option by enriching uranium claiming it is peaceful and now is negotiating to keep as much of its nuclear program as it can.

Most recently, and in light of the concerns that other states might inch closer to making bombs by enriching or reprocessing, the US insisted that the UAE and Taiwan forswear engaging in these nuclear activities in their nuclear cooperative agreements with the US. It now is trying to persuade South Korea to do the same.

This is a good deal of history – more than enough to suggest that there is a clear need for Congress to adjust again what kinds of agreements should be expedited under the Atomic Energy Act and which should require a Congressional joint resolution.

In trying to determine the specifics of any such adjustment, three general points are worth keeping in mind:

1. *One should resist arguments that further Congressional involvement in reviewing and approving nuclear deals is either unnecessary or unhelpful.* Nuclear industry's supporters and our own government negotiators clearly prefer that no additional Congressional review or voting be allowed. They argued against the Nuclear Nonproliferation Act (NNPA) of 1978 using the very same arguments they are now using for any additional Congressional involvement in nuclear deal making.<sup>2</sup> Passage of the NNPA, though, was critical to raise US nonproliferation standards and impose controls over the export of dual-use nuclear goods. This, in turn, made it possible for the US to persuade all of the members of the international Nuclear Suppliers Group (NSG) to adopt similar restraints on their own exports. Without NSG adoption of these controls, the Proliferation Security Initiative would be unable to track the fulsome list of nuclear goods it does with so many other states. This would clearly be against our national security interests. Similarly, if as our government claims, we want other nuclear suppliers to promote the Gold Standard, we must be willing to set an example. Establishing a stronger international presumption against ever more states enriching uranium and reprocessing weapons-usable plutonium certainly is unlikely unless Congress makes it clear to the Executive that if it brings new nuclear cooperative agreements to the Hill that don't meet the Gold Standard, they will not come into force until Congress votes to approve them because both Houses are persuaded that they are in the nation's security interest. Delay in voting on these matters should not be allowed.
  
2. *Congressional review of nuclear deals ought to be considered beyond what has already been proposed in the House.* Congress is currently frustrated by its inability to engage the Executive over what the final shape of a nuclear agreement with Iran might look like. It was equally frustrated a decade ago regarding the implementation of the nuclear Agreed Framework with North Korea. Congresswoman Ileana Ros-Lehtinen and Congressman Brad Sherman recently reintroduced draft legislation H.R. 3677 that the House Foreign Affairs Committee first approved back in 2011. It addresses a number of needed changes to the Atomic Energy Act of 1954. What it does not consider, however, is amending the act so that any nuclear understanding that the Executive might reach with a state that is in violation of existing United Nations resolutions relating to suspect nuclear activities, IAEA safeguards agreements or the NPT needs to be approved by a joint resolution of Congress before it can come into force. The rationale for such a provision would be the same as for voting on nuclear cooperative agreements with states that fail to meet key nonproliferation criteria: Such agreements and their long-term national security implications should be treated not as executive agreements or as minor understandings that need only sit before Congress a number of legislative days before automatically coming into force. Instead, they should be treated as being as important as a treaty or, at the very least, as being at least as important as a law.<sup>3</sup> Certainly, the national security implications of the US-Iran nuclear cooperative agreement of 1957 (which Congress did not even bother to hold a hearing on) now dwarfs the importance of benign trade agreements that Congress routinely votes upon. Finally, it

would be useful to amend the Atomic Energy Act to require the Executive to routinely assess what the IAEA's ability is to prevent military diversions of the declared materials and activities it must safeguard and to detect undeclared covert nuclear efforts and materials. This would be in line with the recommendations of the Congressional Commission on the Prevention of WMD Proliferation and Terrorism and the most recent Defense Science Board report on monitoring nuclear threats.<sup>4</sup> These assessments should be shared with Congress and the IAEA. Additional routine assessments should be made of what our own intelligence system can detect. Without this baseline information, there is no way to know whether the risks of nuclear proliferation are growing or are under control.

3. *The primary point of departure for considering any revisions to the act should be security.* Any business the US engages in can only be considered to be good business if it is safe. If not, it's not just bad business, it's dangerous. We learned this after conducting nuclear commerce under lax conditions with India in the 1960s. We learned it after sharing reactor technology with North Korea with no routine IAEA safeguards in place under the Agreed Framework. We certainly are learning it now with Iran. If we do not take proper care, we may come to learn it with others including South Korea, Japan, Turkey, the UAE, and Saudi Arabia. The most recent Defense Science Board study on nuclear monitoring warns us all that the proliferation threat will be far more challenging in the future than it ever has been in the past. All of this recommends that we take our nuclear dealings and their potential security implications more seriously. We say we want South Korea not to enrich or reprocess. Yet, we have encouraged Japan to do so even now that its nuclear fleet is unlikely ever to be more than half of its pre-9/11 size. Worse, the State Department believes the US should not bother taking the option of renewing its agreement with Japan even though we are insisting on doing so with our other key Asian ally, South Korea. This not only is insulting to Seoul, but reckless. If Japan ever decided to open its large reprocessing plant at Rokkasho, it would be producing roughly 2,000 bombs' worth of nuclear weapons-usable plutonium a year. This would almost certainly prompt South Korea to initiate nuclear enrichment or reprocessing of their own as hedge or weapons option. And China? What would it do in response? We don't know but whatever it might choose to do would likely challenge not only Japan's and South Korea's security, but our own treaty commitment to defend our Asian allies. For all these reasons, Congress should demand that our government encourage Japan to review its nuclear plans openly by calling for renegotiation of our nuclear cooperative agreement with them. We may not choose to change any of the terms of the current agreement but we should do all we can to encourage Japan to use the negotiations to clarify their own plans. More Congressional review, not less will help assure the best policies are pursued.

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1. This hearing was first requested nearly two years ago. See letter from Senator Richard Lugar to Senator John Kerry, February 10, 2012 available at [http://www.npolicy.org/article\\_file/Letter\\_from\\_Senator\\_Lugar\\_to\\_Senator\\_Kerry.pdf](http://www.npolicy.org/article_file/Letter_from_Senator_Lugar_to_Senator_Kerry.pdf)

2. See Jodi Lieberman, "Nonproliferation, Congress, and Nuclear Trade: Plus ça change, plus c'est la même chose," *CSIS Policy Perspectives* (Washington, DC: CSIS November 15, 2011), available at [http://csis.org/files/publication/111116\\_nonproliferation\\_congress\\_and\\_nucleartrade.pdf](http://csis.org/files/publication/111116_nonproliferation_congress_and_nucleartrade.pdf).

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3. U.S. Senate Committee on Foreign Relations, *Treaties and Other International Agreements the Role of the United States Senate: A Study Prepared for the Senate Foreign Relations Committee*, (Washington, DC: Committee Print, January 2001), pp. 24-25. Available at <http://www.gpo.gov/fdsys/pkg/CPRT-106SPRT66922/html/CPRT-106SPRT66922.htm>.

4. See Bob Graham, et. al., *World at Risk*, (New York, NY: Vintage Books, 2008), pp. xx. Also see 44-46, 49-50 and U.S. Department of Defense Science Board, *Task Force Report: Assessment of Nuclear Monitoring and Verification Technologies*, January 2014, available at <http://www.acq.osd.mil/dsb/reports/NuclearMonitoringAndVerificationTechnologies.pdf>.

Mr. ROYCE. Thank you, Mr. Sokolski.

**STATEMENT OF MR. DANIEL S. LIPMAN, EXECUTIVE DIRECTOR, SUPPLIER PROGRAMS, NUCLEAR ENERGY INSTITUTE**

Mr. LIPMAN. Thank you, Mr. Chairman, Ranking Member Sherman, distinguished members. Happy birthday, Henry.

I have been in this business now for four decades and never before, never before in four decades have I seen our industry so heavily dependent and engaged in the global nuclear market. I know you may know that we are building new plants here in the United States in Tennessee, in South Carolina, and in Georgia, but that is five plants, but there are more than 67 plants currently under construction, all of which are outside the United States. So this is a heavily global market. Participation in this market can have a significant impact in advancing a number of U.S. interests.

As Henry mentioned, there certainly is job creation. We know from exports to China that close to 20,000 jobs have been created in about 15 states simply from that export. But for me as a nuclear professional, the thing I worry about and I wake up worrying about in the morning is nuclear safety. In the post-Fukushima world, I think Mr. Sherman referenced, nuclear safety certainly is a national security issue. And it is my view that American technology, particularly the latest reactor designs currently on offer in the market, offer significant nuclear safety benefits, along with the operating processes and procedures that come with it.

Our technology—and by the way, our regulator with whom the industry does not always have a friendly relationship, is certainly the envy of the world.

A third area of U.S. interest which has been touched upon and will be a theme today is that U.S. participation in markets outside the United States advances our nonproliferation objectives. We have the strongest, nonproliferation controls in our civil nuclear cooperation agreements than any other country.

One question here then is where this market is outside the United States? Are we better off with America engaged in it or not? Do we make the world's nuclear operating fleets safer and more proliferation resistant if we participate or if we don't participate? And by the way, as was indicated earlier, this market is not ripe for the taking by U.S. companies.

There is a lot of international competition out there. And that was referenced earlier. If we aren't going to be in these markets, I assure you our competitors will and they are. So what do we need? What are the issues here as far as the industry is concerned? First, I think you would look at this as a handful of policy tools and issues of importance to us. One-twenty-three agreements, of course, and we will talk about that today, but we also need an efficient, predictable, and reliable export control process that is currently managed out of the Department of Energy.

Other countries have to agree to, and this was mentioned earlier, nuclear liability regimes that protect companies from undo harm.

And next, this is somewhat politically sensitive, these exports require trade finance, and reauthorization of the Export Import Bank is something our industry strongly supports. We also need better Federal coordination within the Federal bureaucracy and signifi-



cant progress in the last couple of years has made that better, in our opinion, with the appointment of someone in the White House. But she is only one person. And finally, these deals are big, and they need advocacy at the highest levels of government. The China deal would not have happened had the previous administration not been personally engaged.

And finally, we know that the geostrategic situation where Russia, who is engaged in the Ukraine and in Crimea, underlines the importance of energy in this competitive world. Nuclear energy has its part. Nuclear energy plays an important role not only in electrification, but as part of U.S. policy, U.S. foreign policy just as our digital industries, aerospace, oil and gas and other industries. So with that, I thank you for the opportunity to testify, chairman, and I look forward to responding to your questions.

[The prepared statement of Mr. Lipman follows:]

**Testimony for the Record**

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Nuclear Energy Institute**

**Committee on Foreign Affairs  
U.S. House of Representatives  
July 10, 2014**

Chairman Royce and Ranking Member Engel, thank you for the opportunity to testify today on this important issue. I am Daniel Lipman, executive director for policy development and supplier programs at the Nuclear Energy Institute<sup>1</sup> (NEI). Our 350 members represent all aspects of peaceful nuclear technology, from nuclear power plant operators and reactor vendors, to major architect/engineering firms, to fuel suppliers and component manufacturers, to educational and research organizations. On behalf of our members, we appreciate the opportunity to provide testimony on the future of international civilian nuclear cooperation to the House Foreign Affairs Committee.

**Industry View on International Civilian Nuclear Cooperation**

U.S. nuclear cooperation with and commercial engagement in other countries' new and expanding nuclear power programs advance global nuclear safety, security and nonproliferation. U.S. commercial involvement ensures the highest possible levels of nuclear power plant safety and reliability, maintains U.S. leadership in nuclear energy technology and strengthens U.S. influence over global nuclear nonproliferation policy and practices. Noted national security experts agree that "one of our nation's most powerful tools for guaranteeing that countries acquiring this [nuclear] technology continue to use it exclusively for peaceful purposes is to ensure that the U.S. commercial nuclear industry continues to play a leading role in the international civil nuclear marketplace."<sup>2</sup>

In order to create American jobs and support critical U.S. foreign policy interests, the United States must be fully engaged in the global expansion of nuclear energy already underway. The U.S. nuclear energy industry:

- Supports efforts to limit the spread of uranium enrichment and used fuel reprocessing (E&R) technologies consistent with current U.S. policy. The United States has a broad portfolio of bilateral and multilateral policy instruments that can be used to advance this policy, including: Nuclear Suppliers Group guidelines, assurances of fuel supply,

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<sup>1</sup> The Nuclear Energy Institute is responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including regulatory, financial, technical and legislative issues. NEI members include all companies licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

<sup>2</sup> April 25, 2013, letter to President Obama from Senator William S. Cohen, Dr. James Schlesinger, Admiral Michael Mullen, Dr. John Hamre, General Brent Scowcroft, General James Jones, Senator Pete Domenici and Ms. Susan Eisenhower (attached).

multilateral guarantees of fuel supply and used fuel disposition, bilateral commitments, and other assurances required by the Atomic Energy Act.

- Opposes inflexible preconditions to U.S. nuclear cooperation with potential partners, especially nontraditional preconditions that potential partners refuse to accept and other supplier nations do not require. Each bilateral relationship is unique and complex. Whether and how E&R provisions should be included in a Section 123 agreement, beyond what is already in practice and in statute, should reflect the unique circumstances of each bilateral relationship. Pragmatism should continue to guide the United States as it negotiates Section 123 agreements.

- Supports prompt negotiation of new and renewal bilateral agreements for peaceful nuclear energy cooperation. These agreements are essential for substantial U.S. nuclear exports. We are concerned that the Republic of Korea (ROK) agreement has required a temporary extension to avoid a lapse. We also note that agreements with Norway and Thailand were allowed to expire this year without renewal.

Prompt negotiation of 123 agreements will allow Congress the necessary time to conduct deliberative and effective oversight. It will also avoid the uncertainty created by the “just in time” nature of new and renewal agreements that, according to foreign customers, casts doubt on the U.S. as a reliable supplier nation.

- Supports a proactive approach for the negotiation of Section 123 agreements with nations with new or expanding peaceful nuclear energy programs. It is in the U.S. national security, nonproliferation, nuclear safety and economic interest to secure agreements early and with a broad set of partners rather than to sit idly by as these nations partner with other nuclear suppliers. Without agreements in force, we forfeit exports, jobs and commercial benefits, and we will fail to influence these programs in terms of their nuclear safety, security and nonproliferation norms.
- Supports federal policies and programs that enhance the competitiveness of U.S. nuclear suppliers in the global market. These include the prompt reauthorization of the U.S. Export-Import Bank with sufficient lending authority and duration to support nuclear exports, entry into force of the Convention on Supplementary Compensation for Nuclear Damage to ensure a predictable global liability regime, and the modernization of export controls under 10 CFR 810 to ensure that they are predictable, transparent and efficient.
- Supports continuing to enhance federal government coordination on international civilian nuclear cooperation. Many of the foreign suppliers that compete in the global market today enjoy their governments’ significant and seamless support. Continuing to improve U.S. government coordination, both within the executive branch and between the executive and legislative branches, is important to ensure a level playing field for U.S. exporters.

**The Global Nuclear Market – Reduced U.S. Influence**

Today, there are 72 new nuclear power stations under construction worldwide, of which five are under construction in the United States. An additional 172 are in the licensing and advanced planning stages and virtually all of these plants will be built abroad where the demand for reliable, affordable and clean baseload electricity is growing. Electricity from nuclear energy will help developing economies expand and lift hundreds of millions from poverty while having a minimal impact on the environment. For developed economies, nuclear energy is widely recognized as a reliable source of generation that provides significant electricity supplies without emitting greenhouse gases during operation. As we saw during the polar vortex earlier this year, nuclear energy plays a critical role in providing stable and reliable energy during extreme weather events. But with this growing nuclear market comes growing competition from other nuclear supplier nations, which can now provide a full range of products and services.

More than 60 percent of the world's 435 operating reactors are based on technology developed in the United States. Although major components such as ultra-large forgings and reactor pressure vessels are no longer manufactured in the United States, the U.S. nuclear industry continues to manufacture a wide range of equipment, components and fuel for nuclear power plants around the world. U.S. firms also supply the global market with high-value services, including site evaluation, engineering and construction, fuel supply and transport, expertise in plant operation, decommissioning and more. After a nuclear power plant is constructed, U.S. firms can remain engaged throughout its life, which can last half a century or more, thus having a physical presence at nuclear facilities and influence over safe operational practice.

With the world's largest civilian nuclear energy program, the U.S. industry is recognized for reliability, safety and operational excellence. U.S. firms are making major investments in technology development to continue their tradition of innovation. These investments include development of small modular reactors, advanced technologies for uranium enrichment, more advanced large reactors with improved safety features and advanced manufacturing techniques to improve quality and reduce costs. In addition, the U.S. government is investing in research and development in critical areas that will continue to advance innovation. For example, the U.S. Department of Energy has made major investments in advanced simulation technology for light water reactors, research into accident-tolerant fuels, and the licensing and commercialization of small modular reactors. Coupled with the globally recognized "gold-standard" regulator, the U.S. Nuclear Regulatory Commission, many nations place a high value on cooperation with the U.S. as they develop or expand their civilian nuclear energy programs.

Over the past two decades, new supplier nations have entered the growing global nuclear market, and multi-national partnerships and consortia have been formed to develop nuclear energy facilities. According to a 2010 GAO report, "while the value of U.S. exports of nuclear reactors, major components and minor components have increased, the U.S. share of global exports

declined slightly” from 1994 to 2008.<sup>3</sup> Over the same period, the U.S. share in the fuel market declined sharply from one-third to one-tenth of the market.

The growth of nuclear suppliers overseas has increased competition for U.S. firms. International competitors often began as suppliers to their domestic markets and over time expanded their offerings to the global market. For example, France’s AREVA and Russia’s Rosatom have steadily increased their presence in the global market. Although 12 of the reactors under construction today are U.S. designs, four are French and 16 are Russian.<sup>4</sup> One of the newest entrants in the global nuclear market is the Republic of Korea. In December 2009, Emirates Nuclear Energy Corporation awarded a multi-billion dollar contract to a Korea Electric Power Corporation-led consortium to build the first two nuclear power plants in the United Arab Emirates (UAE). In addition, there has been an expansion of indigenous technologies developed for domestic markets. For example, 20 of the 72 nuclear plants under construction globally are Chinese reactors being built in China.<sup>5</sup>

As additional reactors are brought into service, a growing portion of the global nuclear market is nuclear fuel: uranium, conversion, enrichment and fuel fabrication. Over the past 20 years, economically attractive supplies of nuclear fuel have become available from an increasing number of supplier nations. Australia holds the most extensive identified resources, at 31 percent of the world’s total. In recent years, Kazakhstan has emerged at the world’s largest uranium producer, producing over 38 percent of global primary production in 2013. Conversion, enrichment and fabrication of fuel also operate as a wide-ranging international commercial market.

### **Section 123 Agreements Ensure U.S. Nonproliferation Aims**

Section 123 agreements provide critical nonproliferation benefits. These include significant commitments to safeguard materials, to prevent material diversion for non-peaceful purposes, and to provide adequate security for materials. The agreements provide for U.S. consent rights over the enrichment, reprocessing and retransfer of U.S. materials. This means that obligations are attached to these materials, which include stringent nonproliferation assurances that these materials will not contribute to weapons programs.

Within this framework, Section 123 agreements ensure that U.S. partners agree to rigorous nonproliferation and nuclear security requirements as a prerequisite to nuclear cooperation with the United States. The nine U.S. requirements include prior U.S. consent for any enrichment or reprocessing of U.S. materials and, in post-Nuclear Non-Proliferation Act agreements, consent for reprocessing of nuclear fuel that has been used in a U.S.-supplied reactor.

U.S. nuclear energy cooperation is an essential element of the Nuclear Nonproliferation Treaty, which forms the basis of the global nonproliferation regime. Countries commit not to pursue

<sup>3</sup> “Global Nuclear Commerce: Governmentwide Strategy Could Help Increase Commercial Benefits From U.S. Nuclear Cooperation Agreements with Other Countries”, United States Government Accountability Office Report to the Committee on Foreign Affairs, House of Representatives, November 2010.

<sup>4</sup> International Atomic Energy Agency, 2014.

<sup>5</sup> Ibid.

nuclear weapons and, in exchange, are guaranteed support for their right to develop civil nuclear power and other peaceful uses of nuclear energy, subject to international supervision. The United States has relied on this framework for decades to advance its global nuclear nonproliferation agenda.

#### **Limiting Enrichment and Reprocessing (E&R)**

The nuclear industry supports efforts to limit the spread of E&R consistent with current U.S. policy. The United States currently has in force 21 nuclear cooperation agreements covering 48 countries, Taiwan and the IAEA. All agreements negotiated since the Nuclear Non-Proliferation Act of 1978 provide for U.S. consent rights for enrichment or reprocessing of U.S.-flagged materials.

A unilateral and inflexible requirement that potential trading partner countries forswear E&R as a condition for a Section 123 agreement will in some cases have the perverse effect of undermining U.S. nonproliferation interests by significantly reducing the number of countries willing to engage in civil nuclear commerce with the United States.

Other nuclear suppliers – like Russia, France, Japan and South Korea – stand ready to engage in nuclear commerce with other countries, whether or not those countries have concluded a 123 agreement with the United States. As a result, the effect in some cases of refusing to conclude 123 agreements with countries that are unwilling to renounce E&R would be to encourage them to do business with other suppliers, thereby forgoing the economic and national security benefits of commercial nuclear engagement.

When a country is willing, in the context of a Section 123 agreement with the United States, to renounce E&R, the United States should include that commitment in the Section 123 agreement. But when a country, which otherwise demonstrates its intent to develop an exclusively peaceful commercial nuclear energy program, makes clear that it is unwilling to renounce E&R in a bilateral agreement with the United States, it would be self-defeating to forgo the nonproliferation and other benefits to the United States of concluding a Section 123 agreement with that country.

Industry is pleased that Taiwan and UAE have committed not to develop E&R, but we believe it would be unrealistic to assume that the considerations that led these two governments to renounce E&R will apply in all cases.

#### **Section 123 Agreements of Current Interest**

NEI and our members are grateful to this Committee for the approval of an extension of the current Section 123 agreement with the Republic of Korea and support for renewal agreements with Taiwan and the International Atomic Energy Agency (IAEA). We also thank Ranking Member Engel and Rep. Kinzinger for their resolution to support the Vietnam agreement. Each of these agreements has significant potential benefits for U.S. exports and U.S. jobs. For every \$1 billion in exports, between 5,000 and 10,000 U.S. jobs are created or sustained.

- **Republic of Korea.** South Korea is the world's fourth-largest generator of nuclear energy and a major global supplier in its own right. Nineteen of South Korea's 23 operating plants – and all of South Korea's power plants under construction, on order or planned – are based on U.S. technology.<sup>6</sup> South Korea's licensing of U.S. technologies and export of U.S. components, fuel and services have earned billions for U.S. suppliers. Significant U.S. content in the Korean APR-1400 power plant and other U.S.-South Korea supply relationships has already earned U.S. suppliers more than a \$2 billion role in the U.A.E. project. That project alone is supporting thousands of jobs across 17 states.<sup>7</sup>
- **Vietnam.** To support its rapid economic development, Vietnam is implementing an ambitious plan to develop up to 10,000 megawatts of nuclear generating capacity by 2030, with the first reactors coming on line in the next decade. Russia and Japan have secured agreements to develop nuclear energy projects in Vietnam. Absent a Section 123 agreement with Vietnam, U.S. firms have been sidelined. Industry estimates that the remaining market opportunity could result in \$10 billion-\$20 billion in U.S. nuclear exports. According to Department of Commerce estimates, the Vietnam nuclear energy market could create more than 50,000 high-paying U.S. jobs.

Vietnam has worked closely with the United States and the international community to develop a responsible and transparent nuclear energy program, including cooperation with the U.S. Nuclear Regulatory Commission to lay the foundation for a regulatory infrastructure. Vietnam has also acceded to important nuclear security and nonproliferation treaties. These include: the Nuclear Non-Proliferation Treaty in 1982, the Comprehensive Nuclear Test Ban Treaty in 2006, and completion of a comprehensive safeguards agreement with the International Atomic Energy Agency in 1990. In addition, Vietnam signed the Additional Protocol in 2007, which entered into force in 2012.

- **China.** With 20 nuclear reactors in operation and an additional 28 under construction, China is the world's largest market for nuclear power plants, equipment and technology and will account for a third of all nuclear infrastructure constructed between 2012 and 2032 when it is slated to become the world's largest generator of nuclear power. U.S. companies have won major tenders in China that have created billions in U.S. exports and supported tens of thousands of U.S. jobs. In addition, U.S. and Chinese companies have established cooperative arrangements for research and commercial product development. U.S. nuclear cooperation with China advances U.S. interests in nuclear safety. China is deploying a fleet of advanced Westinghouse AP1000 power plants, ensuring deployment of the only Generation III+ reactor to receive Design Certification from the U.S. Nuclear Regulatory Commission. Currently, there are four Westinghouse AP1000 nuclear units under construction at two sites in China. Negotiation for follow-on scope has begun.

## Conclusion

NEI believes that the global expansion of nuclear energy infrastructure provides the United States a unique opportunity to meet several national imperatives at the same time: (1) increasing U.S. influence over nuclear nonproliferation policy and practices around the world; (2) ensuring

<sup>6</sup>“Nuclear Power in South Korea.” World Nuclear Association, December 2012.

<sup>7</sup> Ex-Im Bank News Release, September 7, 2012.

the highest possible levels of nuclear power plant safety and reliability around the world, by exporting U.S. advanced reactor designs and America's world-class operational expertise; (3) maintaining U.S. leadership in nuclear energy technology; and, (4) creating tens of thousands of jobs and maintaining a healthy manufacturing base for nuclear energy technology and services.

To maintain U.S. influence over global nonproliferation policy and international nuclear safety, the U.S. commercial nuclear energy sector must participate in the rapidly expanding global market for nuclear energy technologies (435 commercial nuclear reactors in operation around the world, 72 under construction, 172 planned or on order). If U.S. exporters were able to capture 25 percent of the global market – estimated at \$500 billion to \$750 billion over the next 10 years – this would create (or sustain) up to 185,000 high-paying American jobs.

The U.S. nuclear industry is competitive, but we must be allowed to compete. This requires policies that promote international civilian nuclear cooperation. The industry:

- Supports efforts to limit the spread of uranium enrichment and used fuel reprocessing (E&R) technologies consistent with current U.S. policy.
- Opposes inflexible preconditions to U.S. nuclear cooperation potential partners will not accept and that other supplier nations do not impose. Pragmatism should continue to guide the United States as it negotiates Section 123 agreements.
- Supports prompt negotiation of new and renewal bilateral agreements for peaceful nuclear energy cooperation. These agreements are essential for meaningful U.S. nuclear exports.
- Supports a proactive approach for the negotiation of Section 123 agreements with nations with new or expanding peaceful nuclear energy programs, including the ROK, Vietnam and China. It is in the U.S. national security, nonproliferation, nuclear safety and economic interest to secure agreements early and with a broad set of partners rather than to sit idly by as these nations partner with other nuclear suppliers. Without agreements in force, we forfeit exports, jobs and commercial benefits, and we will fail to influence these programs in terms of their nuclear safety, security and nonproliferation norms.
- Supports policies that level the competitive playing field for U.S. exporters including reauthorization of the Export-Import Bank, bringing the Convention on Supplementary Compensation for Nuclear Damages into force, and modernization of export controls under 10 CFR 810.

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Mr. ROYCE. Thank you, Mr. Lipman.

Mr. CONNOLLY. Mr. Chairman? Mr. Chairman, before the speaker speaks, I just wanted to say especially to my colleague from Florida, Sandy Spector and I go way back. We worked in the Senate together, you may not know, for the Senate Foreign Relations. So I welcome you, Sandy, back to Congress.

Mr. ROYCE. And Gerry gave him the nickname. But it is good. Mr. Spector, we will go to you.

**STATEMENT OF MR. LEONARD S. SPECTOR, EXECUTIVE DIRECTOR, WASHINGTON, DC, OFFICE, JAMES MARTIN CENTER FOR NONPROLIFERATION STUDIES**

Mr. SPECTOR. Thank you, Mr. Chairman and other members of the committee and Ranking Member Sherman.

I want to concentrate on the Vietnam Agreement looking at several of the issues that have already been mentioned. As a matter of policy, I have strongly supported U.S. efforts for many years to discourage the development of foreign enrichment and reprocessing capabilities. Given the desire of many states to sign a nuclear cooperation agreement with us for the part of approval, the seal of approval that it gives, these agreements provide the opportunity to negotiate restrictions on the development of enrichment and reprocessing with partner countries.

The 2009 agreement with the UAE, of course, is considered ideal in its terms because it gave a blanket renunciation of any reprocessing or enrichment on its territory in perpetuity, certainly for the duration of our agreement. But we have a lesser kind of undertaking with Vietnam at this point. The language in the agreement is really in the opening section, the preamble, which is not a binding part of the agreement. It is just hortatory and descriptive. It refers back to a Memorandum of Understanding between the United States and Vietnam in which Vietnam agreed that it was not its intention to reprocess or enrich and that it was its intention to use international fuel cycle services to support its program which are very good statements, but these are nonbinding and, of course, they are reflective of an intention only; so we are long way away from the gold standard of the UAE agreement or the Taiwan agreement.

On the other hand, we have something. We do have a Memorandum of Understanding. We do have the reference to it in the agreement, and when you compare that to where we were to start with of all of our other agreements, this is a real step forward. Other agreements only covered the enrichment or reprocessing of American provided material or material created with American exports, i.e., reactors or fuel. The Vietnam agreement speaks to a much broader limitation, which would cover all fuel irrespective of what country it might have come from, all reactors, and so forth. So in that sense, it is a very positive step forward. But to reiterate, also a very big step short of what we may have hoped for.

Nonetheless, when you take together the partial standard here, what might be called the silver standard as a colleague of mine, Miles Pomper, has characterized it, and you couple that with a pretty decent record by the Vietnamese on the nonproliferation front in terms of the agreements that it has signed, the treaties

that it has signed, and in terms of its absence, as far as I can tell, of involvement in the Iranian program, it is not usually linked, I have not seen it linked with any of the illicit trade that is supporting the Iranian program. And, in general terms, the program in Vietnam is so early in its development that there are many, many years ahead before they could possibly advance to a stage that we might be concerned about.

And so I would say the silver standard is a satisfactory and acceptable approach in this context on this particular matter in the agreement. It is not ideal, but it does give us something to work with, and I think it is a reflection that the Vietnamese recognize that to enrich and reprocess really at any time in the future would be a politically-charged development that would raise national security concerns in many quarters. I think that shadow is very positive.

Regarding the Additional Protocol, they have one, so that is not an issue. What we need to look at, however, is the 5-year automatic extensions. When you couple that automatic extension with the lack of the gold standard on enrichment and reprocessing, it basically means that if their attentions change over the course of the next 30 years, we really have no way to come back to them and demand sort of a renegotiation or to demand changes in their behavior. The automatic extension deprives the Congress and the United States, more generally, of a ready approach to deal with some of these questions. Rather, we would have to take the extraordinary step of declaring an agreement to be terminated, which I think we would always be very reluctant to do because of the negative implication it would cast on our partner country.

At the conclusion of my remarks, I note a number of regulatory issues; questions about the independence and effectiveness of safety regulation in Vietnam; questions about the independence of regulators because of the nature of the Vietnamese Government as a dictatorship; and also the question of the lack of strategic trade controls, which basically means Vietnam does not have the ability to comply with crucial U.N. Security Council resolutions. Thank you very much for the opportunity to testify.

[The prepared statement of Mr. Spector follows:]



**James Martin Center for  
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Monterey Institute of International Studies  
*A graduate school of Middlebury College*

## **The Future of International Civil Nuclear Cooperation**

**Testimony**

**of**

**Leonard S. Spector**

**James Martin Center for Nonproliferation Studies**

**Monterey Institute of International Studies**

**Before**

**the**

**Committee on Foreign Affairs**

**U.S. House of Representatives**

**July 10, 2014**

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### **The Future of International Civil Nuclear Cooperation<sup>1</sup>**

Chairman Royce, Ranking Minority Member Faleomavaega, and Members of the Committee, thank you for the opportunity to testify today on the Future of International Civil Nuclear Cooperation.

Pursuant to guidance from the Committee's staff, I will concentrate on the pending U.S.-Vietnam Agreement for Cooperation in the Peaceful Uses of Nuclear Energy. The Agreement has been drafted pursuant to Section 123 of the U.S. Atomic Energy Act and is often referred to informally as a "123 Agreement." Of particular importance for the Committee's deliberations is the treatment of three issues in the Agreement:

- The possible future enrichment of uranium or reprocessing of spent fuel by Vietnam (which could permit the production of nuclear-weapon-usable material);
- Vietnam's acceptance of enhanced International Atomic Energy Agency (IAEA) inspections over the country's nuclear activities by the signing of an Additional Protocol to Vietnam's Comprehensive Safeguards Agreement with the IAEA; and
- The duration of the 123 Agreement, which after 30 years would be automatically extended for successive five-year periods unless either party, upon six months' notice, elected to terminate the accord.

The Committee must also give attention, I believe, to a number of other matters regarding the context in which the Agreement will be implemented, a context that will be shaped by the nature of the Vietnamese government and its implementation of measures external to the Agreement concerning the control of nuclear materials and equipment.

#### **The Agreement: Enrichment and Reprocessing, Additional Protocol, Duration**

U.S. policy, which I have strongly supported for many years, is to discourage the development of foreign enrichment and reprocessing capabilities. Given the desire of many states to sign a nuclear cooperation agreement with the United States, these agreements provide the opportunity to negotiate restrictions on the development of enrichment and reprocessing capabilities in partner countries.

Our 2009 agreement for cooperation in the peaceful uses of nuclear energy with the United Arab Emirates (UAE) contains the ideal undertaking on this issue from the U.S. standpoint. In the agreement the UAE formally guaranteed, without qualification, not to engage in enrichment or reprocessing within its borders, a guarantee that extended not only to U.S.-origin nuclear material (and material produced through its use) but to all nuclear material from any source. The UAE also undertook to bring into force an Additional Protocol to its Comprehensive Safeguards Agreement with the IAEA, a pledge that it fulfilled in 2010. This combination has become known as the Gold Standard for new or renewed U.S. 123 agreements. Even though those two undertakings are not required at this time under Section 123, the UAE agreement so fully encompasses the most powerful international nonproliferation restraints on civil nuclear energy that it has become a paradigm against which all subsequent agreements proposed by the United States or any other nuclear supplier country are inevitably judged. Neither the Obama Administration, nor any other

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<sup>1</sup> This testimony is given in my personal capacity and does not necessarily represent the views of the James Martin Center or its parent institutions. The James Martin Center does not take institutional positions on matters of public policy.

state has made both components of the Gold Standard a mandatory requirement for new or renewed agreements for civil nuclear cooperation, although Japan has conditioned civil nuclear transfers on recipients' implementation of an Additional Protocol.<sup>2</sup>

*Enrichment and reprocessing.* The U.S.-Vietnam 123 Agreement does not contain a comparable blanket restriction on enrichment or reprocessing. It provides, as required by Section 123 that no U.S.-origin material (or material produced through use of U.S. nuclear exports) will be enriched or reprocessed "unless the parties agree," effectively giving the United States the right to veto such activities, but leaves open the door to Vietnam's engaging in enrichment or reprocessing of material of non-U.S. origin.<sup>3</sup> Vietnam has, however, affirmed, in a Memorandum of Understanding (MOU) with the United States of March 30, 2010, that it does not intend to seek enrichment or reprocessing capabilities, but instead will rely on "existing international markets for nuclear fuel services, rather than acquiring sensitive nuclear technologies...."<sup>4</sup> This declaration is reaffirmed in the Preamble to the U.S.-Vietnam 123 Agreement, a portion of the agreement that is descriptive rather than binding.

Unlike the UAE guarantee, the MOU does not contain a clear commitment by Vietnam not to engage in enrichment or reprocessing within its borders, but only expresses Vietnam's current intention to obtain fuel services for its reactors from external sources. Nor does the declaration, include any commitment as to its duration. Thus the MOU falls well short of the "Gold Standard" on this issue.

Nonetheless, when compared to the requirements of Section 123 and to most past U.S. 123 agreements, the Vietnamese declaration is a significant step forward, because it extends beyond restrictions on U.S.-origin material to cover Vietnam's entire fuel cycle, with a presumption of restraint, i.e., that it will not include sensitive facilities. Although it is non-binding, it clearly reflects Vietnam's appreciation that engaging in enrichment or reprocessing would be a politically charged development that would raise national security concerns in many quarters.

Although the details of the U.S.-Vietnam negotiations are not publicly known, my understanding is that the United States pressed to obtain language in the Agreement comparable to that in the UAE accord, but was unable to gain Vietnam's acceptance of this restriction. Thus, although the current Agreement falls short of the Gold Standard, as my James Martin Center colleague Miles Pomper has suggested, the U.S.-Vietnam Agreement nevertheless advances enrichment and reprocessing controls from the previous baseline to an intermediate level, which he has termed, the *Silver Standard*.

Given Vietnam's relatively strong record on nonproliferation as highlighted in the Nuclear Proliferation Assessment Statement accompanying the submission of the Agreement for Congressional consideration and the overall security environment in Southeast Asia, with certain safeguards suggested below, the Silver Standard can provide an adequate basis for endorsing this aspect of the Agreement.

*Additional Protocol.* The second component of the Gold Standard – the requirement that the cooperating state have in force an Additional Protocol to its Comprehensive Safeguards Agreement

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<sup>2</sup> The Japanese condition means that this requirement will apply to any nuclear power reactor sale involving the principal U.S. reactor vendors, since they are now combined with Japanese firms, General Electric with Hitachi and Westinghouse with The Toshiba Group.

<sup>3</sup> U.S.-Vietnam Agreement for Cooperation in the Peaceful Uses of Atomic Energy, Article 6.1.

<sup>4</sup> Nuclear Proliferation Assessment Statement accompanying the submission of the U.S.-Vietnam Agreement in the Peaceful Uses of Nuclear Energy, p. 6.

with the IAEA – is not currently required by U.S. law and, I believe, has not been declared to be a mandatory requirement for U.S. 123 agreements as a matter of U.S. policy. In the current case, the issue is moot, however, because Vietnam has had an Additional Protocol in force since September 17, 2012.

*Automatic five-year extensions.* A troubling aspect of the pending 123 Agreement, however, is its provision for automatic extensions for five-year periods after its initial term of 30 years – the third major issue of concern to the Committee.

Historical practice was for 123 agreements to terminate automatically after 30 years, requiring formal renegotiation and renewal, which brought the agreement before Congress prior to its entry into force and provided the occasion for updating agreements to incorporate changes in U.S. law or policy. Requiring formal *termination* of an agreement that would otherwise be extended automatically in order to create the opportunity for such updating makes what had been a routine process into one that is exceptional and that would give the appearance that something is amiss regarding the partner country's cooperation. This places an undue burden on the United States.

The issue is exacerbated in the case of the Vietnam Agreement because the automatic renewal arrangement must be considered in conjunction with Vietnam's declining to provide a blanket renunciation of enrichment and reprocessing and, instead, affirming only its "intention" not to develop such sensitive fuel cycle facilities. Should its intention change in the course of 30 years, the United States would be forced to threaten termination of the 123 Agreement to gain leverage on the matter. Without the automatic renewal provision, however, the burden would be on Vietnam to satisfy any U.S. concerns in order to obtain the continuation of the agreement.

It is possible for Congress to address this matter in a number of ways. It could, for example, adopt an internal housekeeping rule that required a hearing 12-15 months prior to the end of the Agreement's initial 30-year term at which time the Executive Branch could be required to show why the Agreement should not be terminated to allow, for example, the inclusion of certain amendments to its provisions at the time of the subsequent renewal. If Congress believed termination and renewal were required, it could press the Executive Branch to take this step or enact legislation requiring it, possibly via a joint resolution adopted through expedited procedures. Another approach would be to deny the Nuclear Regulatory Commission the authority to issue licenses under any agreement that was more than 30 years old, except as authorized by a joint resolution of Congress, which might provide licensing authority on a country-by-country basis for a period judged appropriate at that time.

Given the long lead times for the construction of nuclear power plants and the likelihood that such facilities will operate for 30 to 50 years, one can understand why reactor vendors and operators wish to have confidence that the legal basis for the continued cooperation needed to operate these facilities will not be interrupted by the delay of an agreement renewal. But I believe if one of the measures I have suggested were adopted, we could provide such confidence through informal means without sacrificing a robust review process.

#### **Regulatory Context**

As noted in the Nuclear Proliferation Assessment Statement accompanying the Vietnam 123 Agreement, Vietnam has reasonably strong nonproliferation credentials.

*Lack of strategic trade controls.* Among other positive steps, it has enacted export controls over nuclear-specific goods as part of its Nuclear Energy Law of 2008. It has not, however, adopted a

strategic trade control law, calling into question whether it has the legal authority to control dual-use nuclear goods, currently a primary target of illicit procurement efforts by Iran and North Korea.

Although one does *not* see Vietnam linked to such illicit procurement efforts in media reports, the absence of strategic trade controls means that Vietnam may be unable to comply with the requirements of UN Security Council resolutions that impose embargoes on transfers of nuclear dual-use goods, among other commodities, to both countries.

*Compliance with UNSC Resolution 1540.* Lack of a strategic trade control law also means that Vietnam is not in compliance with UNSCR 1540, which requires states to adopt such measures. In this regard, it should also be noted that Vietnam does not release data on its compliance with UNSCR 1540. It is one of only a handful of countries whose 1540 implementation matrix is not shown on the 1540 Committee's website and available for public scrutiny.

*Regulatory independence.* Separately, it may be appropriate to question the extent to which the country's nuclear regulatory authority will have the independence or inclination to enforce safety and security standards effectively. Among lower middle income states rated by the World Justice Report, Vietnam ranks 20 out of 24 in "Regulatory Enforcement" and 20 out of 24 in "Constraints on Government Power," a reflection, no doubt, of its form of government, a one-party Communist dictatorship.<sup>5</sup>

These various regulatory issues need to be monitored and can be addressed via the U.S. nuclear export licensing process. Although improvement in these areas is not a requirement of the licensing process as set out in the Atomic Energy Act or the Export Administration Regulations, the Committee should press the Administration to ensure that progress is made before the Executive Branch provides guidance to the NRC supporting issuance of any future license for the export of nuclear reactors, major components, or fuel to Vietnam and before the Departments of Commerce and Energy authorize transfers of nuclear dual-use goods or nuclear technology, respectively, to that country.

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<sup>5</sup> Vietnam also ranked 13 of 15 countries in its region on these measures. See "Rankings by Income," and "Rankings by Region," World Justice Project website, [http://worldjusticeproject.org/sites/default/files/files/tables\\_methodology.pdf](http://worldjusticeproject.org/sites/default/files/files/tables_methodology.pdf)

Mr. ROYCE. Thank you, Mr. Spector. We have been joined by the ranking member. He was at a briefing on Iran this morning. But at this time I think it would be perfectly appropriate if he would like to make his opening statement. Mr. Eliot Engel of New York.

Mr. ENGEL. Thank you, Mr. Chairman. Thank you for holding this very timely hearing. I want to thank the witnesses for their testimony and I look forward to their answering our questions. This is interplay, obviously, between two crucial issues: The fight against the proliferation of nuclear weapons and the increasing global cooperation of civilian nuclear energy. We face a challenge today and a challenging question: How can we achieve our non-proliferation goals while commercial industry energy technology is now readily available in the global marketplace?

In recent years, the U.S. has selectively pursued the so-called gold standard, the legally binding pledge by countries receiving U.S. civilian nuclear technology that they will not pursue domestic enrichment or reprocessing capability. This provision was included in the nuclear cooperation agreement with the UAE, but France and Russia, our main competitors in the global market for civilian nuclear technology do not require no enrichment stipulation from their customers. Countries that purchase technology from these nations are free to operate enrichment facilities that might be used to produce low or medium enriched uranium for power plants or research reactors. This technology obviously could also produce weapons grade material.

The U.S. now faces some difficult choices. We want to prevent the further spread of sensitive enrichment and reprocessing technologies, but if we continue to insist on no enrichment requirements, other governments are more likely to look to France or Russia to supply essentially the same nuclear technology, so it is a lose-lose scenario. American companies won't get the projects and the U.S. Government will have far less visibility into the nuclear programs of other nations.

The stakes are enormous. Today, 434 civilian nuclear power reactors are operating in 29 countries; 73 are under construction; 172 reactors are on order or planned; and 309 have been proposed and these figures don't include the hundreds of reactors for research, medical isotope production, or other civilian applications. The U.S. cannot be left on the sidelines as more countries enter the nuclear marketplace.

In a perfect world, I would want all of our nuclear cooperation agreements to include the gold standard, but in practice, such a policy would isolate the U.S. and give a clear advantage to our competitors. We have been given a paradox to continue fighting nuclear proliferation. We need to be flexible in negotiating our civilian nuclear cooperation agreements. This approach is reflective of the nuclear cooperation agreement with Vietnam, which I support. That agreement stipulates that Vietnam will purchase nuclear fuel from the commercial market, but it does not include a formal commitment to forego enrichment or reprocessing in the future. So I hope in our questions to our distinguished panel, they can help us work through the policy dilemmas of nuclear cooperation. And I thank you, Mr. Chairman, for holding this hearing.



Mr. ROYCE. Thank you, Mr. Engel. I will go now to my questions. I start with my first for Mr. Sokolski. The Obama administration recently concluded the 3-year review of its policy regarding nuclear cooperation agreements. The decision was to not require other countries to forego acquiring E&R capability as a condition, as you know we have been discussing for nuclear cooperation. This standard, which was included in the 123 agreement with the UAE and with Taiwan, is known as the gold standard. So is the gold standard dead?

And the administration agreed up front in its negotiations with Iran that Iran would be able to continue to enrich uranium. How can this dangerous technology be conceded to a state-sponsor of terrorism?

Mr. SOKOLSKI. I guess the short answer is the fat lady is not yet on stage. We have not finished negotiating with Iran. It could come up as a cropper. We could be holding hearings for another year talking about a deal, which may not be finished.

Mr. ROYCE. As Eliot shared with me this morning. We could be passing the Royce-Engel bill.

Mr. SOKOLSKI. So that is point one. Point two is saying you want to go case-by-case is a very expensive, long, drawn out way of saying we don't know what to do. Now you should demand more of our Government than that. That is no policy at all.

Finally, a very important point, the hard yards are ahead of us. Vietnam, heck, they are not even building their first Russian reactor. They won't even start for another 6 years. So it is easy to kind of avert your gaze for the short-term. Saudi Arabia and South Korea, does Japan start reprocessing? What does that have to do with China? Those things are going to keep you up at night and I don't see any way around pushing the button for a standard because the suppliers currently pretty much have the same standards, it is just they are very loose. They are like ours. If we don't up the ante and push on the other suppliers to raise theirs, we will know where we are headed.

Mr. ROYCE. Let me get to that question then and for you and other members of the panel, this will be my final question. Russia constructed and is supplying fuel for the Bashir reactor. That is concerning, but so is the fact that they are talking about building eight more, right? Eight more facilities even though Iran almost certainly has a clandestine nuclear weapons program. So why don't other supplying countries, such as Russia or France, impose similar conditions in their nuclear cooperation agreements? Don't they think that preventing the spread of E&R is important? Let us discuss that.

Has the U.S. attempted to persuade other countries to adopt these restrictions? I mean what have we done in that dialogue? And if not, why haven't we? Has it succeeded at all where we have tried? What leverage do we have on those countries? And then lastly, how significant is the negative impact on the competitiveness of the U.S. companies that imposing this requirement of 123 agreements may cause? Are there specific examples that you can point to? So if I could hear from the panel on my questions there.

Mr. SOKOLSKI. I think the leverage point right now is ironically the safety point that was raised by the witness from NEI. The

French are very upset with the shabby construction of their reactors in China and are afraid it is going to ruin their brand. By the way, this should be a concern for Westinghouse as well. They have not spoken up. They need to. If you do, this is a lever you go with into renewing the agreement because they do need help on more safety work and we need to be doubling down.

If there is going to be a future for nuclear power design in America, they better not blow up. We can work with the French on this. The same thing can be done with the Russians. Why? We have suspended nuclear cooperation with them. We don't talk candidly enough about the Russian safety problem. This committee, other committees ought to press to get our agencies to start talking about that process.

Mr. ROYCE. You mean restart the—

Mr. SOKOLSKI. Well, not restart. Get our agencies to be as candid as the French are about how poor the safety standards of places like China and Russia are. I think if we had more publicity on that, their product line would not be doing as well. You are not going to compete against those countries on price point or financing even with that said. So you are going to have to push to be more candid about what their safety problems are. Then you have leverage.

Mr. ROYCE. And how can we get that into the record of this committee hearing now that we have surfaced that information?

Mr. SOKOLSKI. Hold a hearing. It is the old way. It works.

Mr. ROYCE. Mr. Lipman,

Mr. LIPMAN. Thank you, Mr. Chairman. Let me address the latter part of your question first. It is really the area of my competence. I do not think there is a lot of leverage. I think insofar as governments and particularly their state-owned enterprises, to go out into the marketplace and pursue opportunities, there are widely differing standards. In the case of the French, in particular, they have a commercial fuel reprocessing business, an enrichment business and they push that. We don't do that in the United States. Our American companies are not involved in fuel cycle activities.

And I think the impact and to be very, very clear, the industry is not against the gold standard. The industry is against universal application of one size fits all policy. That is what our problem is. And when there is universal application of a standard, when countries operate in different regions, they have varying areas of expertise, as Henry noted in their nuclear power programs domestically. A one size fits all policy is just not workable and it excludes American companies from providing the technology that I think Henry was referring to that would better serve U.S. interests.

Mr. ROYCE. I am out of time. Let me just defer to the ranking member. Go ahead.

Mr. ENGEL. Mr. Spector, let me ask you. In my opening statement, I laid out what I see as a central dilemma for the United States. If we insist on a no enrichment requirement, there are two consequences: We don't have good visibility into a country's nuclear program and our nuclear companies lose market share and become less viable commercially. Do you agree this is a problem, the main problem?

Mr. SPECTOR. It is certainly a drawback to trying to pursue—

Mr. ENGEL. Can you push the microphone down a little closer to you?

Mr. SPECTOR. It is certainly a drawback as we try to advance the gold standard which we must do. This set of arguments has a familiar ring. If one goes back to the current law, which I guess I was involved in drafting, the same argument was made that it would be dangerous, especially for American commercial interests, to insist that every state have full-scope safeguards, that is, that it had placed all of its nuclear facilities and equipment under International Atomic Energy Agency inspection. Nobody had that rule at the time. By 1992, all suppliers had adopted the rule, and along the way we had many other states that supported it, Canada, Sweden, and others.

We are in the same mode now. We know what we want to do. We would like to suppress enrichment and reprocessing to the maximum extent. We have a mechanism for doing that and we have to confront the commercial negativity in some respects, but it is worth appreciating that there are only six or so principal reactor vendors around the world that are really competing with each other.

We have controls over our own and probably over the Japanese since they are in partnership. The French and the Russians stand to benefit from this rule, because it would drive partner states into using fuel cycle services, where they are very prominent. And so they have a self interest that may be supporting a rule like this if we can really press for it.

Canada, I would say is in a different status—it is a friend of the United States and I think would go along. And I think we could actually make some progress if we did a head to head set of negotiations to try to make this the rule. So I do appreciate the points that have been made about the challenges that we might have, but I think the goal is worthwhile. And I think we can probably make progress if we really press the point forward.

Mr. ENGEL. So as a practical matter, do any of you see countries accepting the no enrichment requirement in order to obtain civilian nuclear technology and for countries that refuse to agree to no enrichment are likely to build civilian reactors? Are there any countries that you see as proliferation risks? Mr. Sokolski?

Mr. SOKOLSKI. Look, part of our problem is we try to predict what is going to happen 30 years in advance. And we get it wrong over and over again. So let's just be democratic here and say almost any country that is not a mutual security pact ally of the United States could possibly cause problems. I will go further. You know, if South Korea gets nuclear weapons, it is a problem even though it is an ally. It is very, very hard to know which country is going to be a problem. Vietnam 30 years from now could very well be a problem. Certainly, we didn't think Iran was going to have nuclear weapons 30 years ago. So I think the first point is they are all problems. That is the reason why you need a single rule.

Second of all, I think voting on agreements is a little different than demanding that all agreements be exactly the same. I think if we are unwilling to use this deliberative body to debate and analyze what is correct, then we have given up on self-government on

this issue set and you should just send it back to the executive and say it is their fault if anything goes wrong.

Mr. ENGEL. Mr. Lipman, let me ask you this. There are 172 reactors that are planned to be built. Can you tell us the competitive position of our U.S. companies which are mainly Westinghouse and GE? And I want to also ask you about China and their nuclear market. They have 57 reactors planned and another 118 in the proposed stages. So if you could tell us what the state of play is in that market, where the U.S. companies stand in that?

Mr. LIPMAN. Yes, ranking member. Let me start with the first part of your question on competition. Sandy's count was six. There are about ten nuclear reactor vendors out there because in the last few years, we have seen the rise of Korean competition and more Russian competition. There are three Japanese vendors as well as AREVA. And by the way, the Chinese are not far behind, to answer part of the second question. They will be in the export markets. So the bottom line is it is a very competitive market out there and each of these competitors brings different tools, different levels of state sponsorship and different ancillary deals, be it the military or other sorts of commercial concessions to the party. So it is very competitive. There is not U.S. dominance.

GE and Westinghouse, however, have indicated that they can win against these competitors. The win in China in 2007, and I will segue my answer to the second part of your question, ranking member, was a win against the Russians and the French. So we can win. We can compete and we can win, but only if there is a level playing field. We are Americans. We like to compete, but we want a level playing field.

As to the Chinese program, sir, I lived in China for 4 years and I can tell you that the environmental situation in China is such, it has only gotten worse since I have lived there. Like the United States, the population is largely in the east and coal is in the north and in the west. A lot of the rail stock is used to transport coal. So they are going very heavily into nuclear technology. The first tranche of units that they bought were a little bit from here, a little bit from there, and then they settled on Westinghouse AP 1000 technology as a basis, but not the sole basis for their program going forward.

It is my understanding that the second set of reactors is currently up for bid and that will be negotiated sole source with Westinghouse. So it gets to the point, frankly, that my colleague Henry made which is yes, you have to look forward 30 years. That is exactly why you want American technology in there, because when you are in, and especially when you are in in the beginning, you get follow-on work. You have participation in the nuclear program and you have a view of what is going on in the country.

My view at the time when I was negotiating the China contract, sir, was if we don't win, we are on in the outside looking in for decades. Thank you, sir.

Mr. ENGEL. Thank you.

Mr. ROYCE. We better go to Ileana Ros-Lehtinen, chairwoman of the Middle East subcommittee.

Ms. ROS-LEHTINEN. Thank you so much, Mr. Chairman. Thank you for this hearing and thank you to our witnesses.

Throughout the past 6 months, there has been much discussion here in Congress about the role of this legislative body regarding nuclear agreements. The Obama administration's misguided policy toward Iran is a game changer and could potentially spark an arms race in the countries in the world's most unstable and dangerous region already.

I disagree with the administration's insistence on taking our 123 agreements on a case-by-case approach, rather than holding each country equally to the gold standard. Why are we holding countries in the Middle East to different standards than in Europe or in Asia? We should be holding each country to the very strictest of standards to ensure that maximum safeguards are in place.

If Congress has the ability to vote up or down on a free trade agreement why not on a nuclear agreement? That is why earlier this year I reintroduced alongside with my colleague, Brad Sherman, H.R. 3766, which reforms the Atomic Energy Act of 1954 to provide greater congressional oversight of nuclear agreements with foreign countries and protect against the threat of nuclear proliferation. Let us not forget about the U.S.-Russia nuclear cooperation agreement which was previously withdrawn by the Bush administration in 2008. Why? Because the President could not certify under the Iran, North Korea, and Syria Nonproliferation Act that Russia was not providing nuclear missile in advance conventional weapons to Iran. This is important to know because we cannot examine these agreements in a vacuum.

When these 123 agreements are proposed, we must take into account our foreign policy and national security interests, as well as a country's human rights record. And we must hold each and every country to those same standards that we set, which brings us to the 123 proposed agreement with Vietnam. I strongly oppose the agreement. Allowing Vietnam to enrich undermines our objectives in other areas and in the Middle East where allies such as the UAE and Jordan are held to the gold standard. Vietnam has an abysmal human rights record and the practice of human trafficking is rampant and there are severe restrictions against religious freedom.

Congress must be empowered in its oversight responsibility and must ensure that such agreements not only protect our interests, but help guard against the rising threat of nuclear proliferation. When Brad and I introduced the bill, NEI immediately opposed it, stating that the bill risked national security and that it will cost U.S. jobs. Some of these same claims were made about the Colombian Free Trade Agreement, which was initially signed in 2006, that if we didn't sign immediately we would lose U.S. jobs. But after 5 years of congressional input and enhancement to approve the agreement, the idea of costing jobs did not prevent Congress from making the bill better because in the end expediency is not the objective. The objective is to create an agreement in which the U.S. benefits. And in the case of a nuclear agreement, U.S. national security should be the first priority.

Then there is the claim that the bill would undermine U.S. national security because it would lack a commercial presence on the ground, but that did not do us any good in Russia. We have a 123 agreement with Russia which I opposed, but that hasn't stopped

the Russians from supporting and providing sensitive materials and technology to the Iranian and Syrian regimes.

And finally, there is the narrative that the U.S. would lose commercial business, that these countries will go to turn to other nations to fulfill their nuclear needs. Well, let us take a look at our foreign military sales program. It might take some time to get through the process, that is true, but our military technology and equipment is the best. And these countries that follow the process that we have in place because they know that they are getting the best quality when they buy from us. The same could be said about our nuclear know-how.

Nuclear technology is not something you want to cut corners on. You want the best. I believe that these countries will stay with American companies because they know what they can get for us. Congress should already have oversight responsibility over these sensitive agreements. Congress must have a final say in any agreement that includes enrichment and it must be able to have an up and down vote.

Mr. Chairman, when Congress will finally have a say over these nuclear agreements, we will ask why haven't we always done so? It makes common sense. It makes perfect sense. Thank you, Mr. Chairman.

Mr. ROYCE. We thank you very much, Ileana. We will go now to Mr. Brad Sherman, who is the ranking member on the Terrorism and Nonproliferation Subcommittee.

Mr. SHERMAN. Further support of our bill, Ms. Ros-Lehtinen, I will point out that Congress has demonstrated the ability to vote on and pass cooperation agreements with both India and the renewal of the Korea 123 agreement and I point out that our bill, I think, is probably in industry's interest though they may not focus on this because it says if you don't want to vote, have to have an up or down vote in Congress, you need a standard that has adequate liability protection for our companies. And I have been very disappointed with the Indian deal for a number of factors, but especially the fact that India has not given us adequate liability protection. We haven't built a single reactor there or even started one.

Now Mr. Sokolski, we have got a proposal for a French-built plant for the production of weapons-grade uranium derived from spent fuel from U.S.-origin reactors. How many bombs does China have now? And how many more could they create in the next 10 years just from this reprocessing plant, plutonium, excuse me?

Mr. SOKOLSKI. The problem is we don't know how many weapons they have. The respected opinions of most analysts and I think our Government is that they have no more than perhaps 200, maybe 300 weapons.

Mr. SHERMAN. And if this French plant were built, it would take years, it would provide plutonium sufficient for—

Mr. SOKOLSKI. Well, if you have eight reactors of the AP size which is about 1100 megawatts, it will produce 1600 kilograms of weapons of useable plutonium. That plutonium, you divide by four, that is the DOE number. So that is 400 bombs per year.

Mr. SHERMAN. 400 bombs per year?

Mr. SOKOLSKI. Now that is assuming you use crude bomb design.

Mr. SHERMAN. So we are talking about them deriving enough plutonium every year to create as many bombs as they currently have in stock?

Mr. SOKOLSKI. Here is the good news. The Chinese are pretty savvy. They don't like wasting money unnecessarily. They are haggling over price. They are looking at the Japanese and the South Koreans and what others are doing. If they don't see them reprocess, watch this program slip. We should be leaning on everyone in that region to not recycle, including the Chinese and avoid this uncertainty.

Now many people will say oh, well, it is not weapons-grade and this and that. In private, I can lay out sort of the design things that we have learned from the labs that make it very clear this stuff is very usable, very usable for weapons. And so it is something you do not want to encourage.

Mr. SHERMAN. What does China think of us having a nuclear cooperation agreement with Vietnam? And can we cooperate with China on nonproliferation policy or nuclear policy both with an eye toward the fact that their own 123 agreement needs to be renewed in 2015 and they may want to have some input into whether we enter into the Vietnam agreement?

Mr. SOKOLSKI. I am holding a series of seminars with Chinese nuclear experts. I am actually flying some in at the end of this month. That topic has not come up. We will make sure it does. But that said, I think the Chinese are sensitive to what is going on in the region. And I think that they assume for the moment that Vietnam isn't a problem. But in the long run, they are at odds. They are at odds. And they would be concerned.

I think most important, the Chinese have come on record saying they are very concerned about what Japan might do when reprocessing. By the way, that is an agreement that is in perpetuity that should have been renegotiated for 2018. No one is pushing for that. I think you should. And the reason why is the force of debate in Japan, not so much here about what Japan ought to be doing. Because if they open up that plant, that is going to be a hornet's nest in the Far East, in China, South Korea, God knows where else. And so we have a stake in seeing them at least have a public debate about that. We have shut that down by having an agreement.

Ms. ROS-LEHTINEN [presiding]. Thank you, Mr. Sherman.

Mr. SHERMAN. One final comment. I noticed that the Vietnam agreement says that they intend to provide international suppliers with fuels. Every year I issue a statement indicating that I intend to lose weight. I yield back.

Ms. ROS-LEHTINEN. Thank you. Judge Poe from Texas is recognized.

Mr. POE. Well, don't issue that statement each year. Thank you, Madam Chair. There is the issue of human rights. I want to hear from each one of you. Do you think the issue of human rights is something we should even be talking about in this 123 agreement or is that a separate issue that the United States needs to deal with, not just Vietnam, but other countries?

Mr. SOKOLSKI, we will start with you and Mr. Lipman.

Mr. SOKOLSKI. My nonprofit stuck its neck out to really raise fundamental questions about the North Korean Nuclear Coopera-

tive Agreement that we entered into. It is called the Agreed Framework. It wasn't a 123. It was technically and from a security standpoint very, very risky. All through that effort I took as many opportunities as I could to raise the question of human rights because ultimately contracts, and you want iron-clad contracts with this kind of technology, have to do with trust. So the idea that you would separate the way the government abuses or treats its own citizens because it has a trust with its own citizenry that you would separate that from something so important as an agreement on this kind of sensitive technology did not make sense to me. And so I think we are seeing this clearly in the case of Iran. And we are seeing it at various levels with our dealings even on the chemical issue with Syria. It has got to be part of the deal.

Mr. POE. Mr. Lipman.

Mr. LIPMAN. Judge, certainly Congress should raise this issue if it is of concern as it should be to all Americans who share the values of this country. However, it has no part in a 123 agreement in our opinion. What we push for is engagement. Engagement across industries generally, and of course, the nuclear industry in particular as a way of promulgating American values with countries in which we interact. But they should not be linked. One should not be conditioned on the other, Judge.

Mr. POE. Mr. Spector?

Mr. SPECTOR. I think I would take into account a fairly wide range of issues. Certainly, in a cover memorandum that is accompanying a document like that and you know that there must have been one like it that circulated in the administration. All of the major elements of our relationship with Vietnam need to be taken into account, not in the text of the agreement, but in the context of whether we want to go forward with this.

And I would say there are certain elements that cross over. One is rule of law. Another is independence of enforcement personnel and regulators. That is not quite as vivid or visceral as the human rights problem, but I think if you want to look at the full spectrum, and of course, we didn't look at our relationship with Vietnam vis-à-vis China which is another underlying national security concern. So I think you don't want to limit this too precisely. A lot of these issues need to be weighed in the balance.

Mr. POE. Thank you. Let me talk about term limits. I didn't mean to startle my colleagues here. Not term limits for Members of Congress, but for contracts. Do you think, gentlemen, there should be a term limit for these contracts? Should there be no end in sight? Should we make it 30 years, 50 years? Should we solidify the deal for a time certain? It is kind of a yes or no and how long.

Mr. SOKOLSKI. This goes to your human rights question. If you distrust, you need to do more verification, therefore you want more frequent renegotiation. If you trust, you need less.

Mr. POE. All right. Mr. Lipman?

Mr. LIPMAN. Judge, the industry has no quarrel with a 30-year limitation. What we do want though is predictability. We want these agreements, the negotiation of these agreements to begin early and not to be in a situation where we are up against the gun, either in competitive space or because an agreement is ready to run out. The term to us is to some degree immaterial.



Mr. POE. Mr. Spector?

Mr. SPECTOR. I would stick with the 30-year limit as well. I think you do want things so that the agreements do come back before Congress. You do want the automatic opportunity to upgrade the agreements. And at the same time you need to give some certainty over a fairly long period to the industry because these plants take 10 years to build and will operate for 30 to 50 years. You have to find a balance there, so I think these automatic extensions are not the way to go.

Mr. POE. All right, thank you, Madam Chair.

Ms. ROS-LEHTINEN. Thank you. Thank you, Judge Poe. Dr. Bera is recognized.

Mr. BERA. Thank you, Madam Chair. I want to revisit an issue that my colleague from California, Mr. Sherman, brought up, the Indian civil nuclear deal that was negotiated and signed in 2008. Obviously, it hasn't transpired the way we certainly would have liked to for a variety of issues, but particularly with liability issues, which seems to be unique to India. And it is not just our companies that are somewhat reluctant, GE and Westinghouse, but certainly the French and Russian companies that have much better protections. Our industries are private and certainly have got exposed.

With a new administration coming into India with Prime Minister Modi certainly making overtures to want to increase trade, one; wanting to build India's infrastructure and expand its economy, and I think within the past month there has been some movement in terms of signing agreements with the IAEA. I would be curious on a couple of things. Maybe, Mr. Lipman, you can answer this. How large is the Indian market? And what next steps with the prime minister visiting Washington, DC, in September, would you like to see for us to really open up the market?

Mr. LIPMAN. Thank you, Dr. Bera. First of all, I can say categorically that to U.S. reactor vendors and EPC organizations like Bechtel and Fluor and so forth, India is a top market prospect. I mean this is a country that has significant technical talent with very outstanding backgrounds in structural engineering and heavy manufacturing that complement the U.S. industry very, very well.

I will say in terms of positive developments, and I know there has been some, I guess, in earlier remarks disappointment, I might say, that somehow the Indian market hasn't materialized after the very important political hoops that this country has had to—and this branch has had to jump through in order to make it a reality. These are long-term deals. They take a long time to negotiate, okay? But both reactor vendors either have now or in the last stages of negotiating early works agreement. So what does that mean? That is the engineering and technical work that goes on before reactor sales consummate.

However, to your point, Dr. Bera, there will not be nuclear deals in India unless and until this civil nuclear liability issue is resolved, and I think like you, Dr. Bera, am heartened that the Modi administration is beginning to come to terms with reform of liability. That would truly open up that market to U.S. reactor vendors in a big way. Thank you, sir.

Mr. BERA. Mr. Sokolski, are there any concerns that India will not sign the nonproliferation treaty as we move forward with the marketplace?

Mr. SOKOLSKI. The Iranians love that deal. They bring it up when they negotiate. The South Koreans carp about it. It is a thorn in the side of anyone trying to prevent proliferation. You better get something for it. We have it.

Now we were talking about reactors back in 2005. I think the liability problems given Bhopal and the history and the emerging public cry for both less corruption with the contracts and concern about public safety, it is a long bet. I don't know that it is a bet against the house, but I would be looking for other ways to promote trade and engagement with India and the new government. I would not lean heavily on this and that has always been the case. And there are many areas that make more sense to focus on.

Mr. BERA. Bringing it back to Mr. Lipman, how large is the Indian market?

Mr. LIPMAN. Their plans are to put out up to 50 nuclear reactors over the coming 30 years. That is a plan. But there are currently agreements in place and reactor deals that have been consummated with the Russians. At Kudankulam, there are operating reactors of Russian design and there is a new set of units that have just been consummated with the Russians, plus as was mentioned earlier, the French are in there. We need this civil nuclear liability protection. I am certain that American companies just will not put their companies at risk.

And what is interesting, it is not just American companies that get hurt. My view is so do Indian companies get hurt. Now why is that? I think there are many American companies that would like to leverage. The fact is that they are English speaking, highly technically trained, very capable engineers and manufacturers in the country of India. But they are not going to partner with them until this liability issue is put behind us. So to me, India represents in some ways and I disagree with Henry on this, that India represents a phenomenal partnership opportunity for American nuclear companies.

Ms. ROS-LEHTINEN. Thank you so much. Thank you, Dr. Bera. And now we turn to one of our subcommittee chairs, Mr. Rohrabacher of California.

Mr. ROHRABACHER. Thank you very much, Madam Chairman, and I appreciate the leadership that you and Chairman Royce have exemplified especially by this hearing. I have some deep concerns about what I have heard today. And it doesn't necessarily come from you, but it comes from the fact that I am also vice chairman of the Science Committee. I have spent a lot of time dealing with nuclear reactors and the technological aspect of this discussion.

Mr. Lipman, the Russians are at 172 reactors you say are perhaps on the way to being built. Are any of them non-lightwater reactors? Lightwater reactors are 50- and 60-year-old technology. And they are dangerous as we have seen in Japan. Do we not now have the capability to build safe reactors whether they are Thorium based, maybe a small module nuclear reactor, pebble-bed reactors, high temperature gas reactors, all of which do not have this same potential of creating a disaster? Am I wrong with this other

information I am getting on the Science Committee that we are being fed that we are capable of building a better reactor that is not such a danger?

Mr. LIPMAN. Chairman, I certainly don't share your view on that. First, almost all the plants that are planned for construction indeed are lightwater reactors.

Mr. ROHRBACHER. Right.

Mr. LIPMAN. The other technologies that you accurately represented are technologies that simply aren't commercially available today.

Mr. ROHRBACHER. They aren't available today because your industry has not invested in it. We have had a disaster in Japan and how much more has your industry then decided to put into development some of these alternatives that we have that had Japan had those technologies, they wouldn't be facing this radioactive crisis that they are in.

Mr. LIPMAN. So with respect, chairman, it is our industry that is investing in these new technologies, B&W and NuScale and Westinghouse are developing small modular reactors. TerraPower in Seattle is investing in the traveling wave reactor which I think you are referring to. But those technologies, sir, are in the offing.

And with respect to the Fukushima accident which you appropriately represent, one need only look at the reactors for sale on the international market from American vendors right now, GE and Westinghouse. They are designed for exactly that type of accident.

Mr. ROHRBACHER. Let me just note that for less than \$2 billion investment, we could have one of those other type of reactors on the market. We could have invested in it. Had we invested in that 20 years ago or 15 years ago when these reactors were possible. And had we had a pebble base reactor system in Japan, there wouldn't be a nuclear crisis there right now. I mean I realize what people think of our industry and what our industry has done. I am not anti-nuclear, as you can see. I want us to build nuclear reactors, but we have not kept up. The industry has basically been willing to sell old technology rather than invest in what is necessary to build these things. For example, we have high temperature gas cool reactors that it would be impossible then for there to be the type of leak that we have in Japan under the same circumstances.

This is very disturbing. And also let me ask this, Mr. Lipman, and again, I am pro-nuclear reactor. I think nuclear energy offers a great alternative, but aren't we also talking about these new reactors had we invested in them? This idea of reprocessing wouldn't be on the table. It is my understanding that there is not plutonium left over from these new reactors. We have to invest in something that would be safer and would not lead a plutonium threat of having nuclear weapons being made from the by-product.

I will just have to say that as much as I respect the development of the technology in your industry, I think that your industry has been, along with our Government, been irresponsible in not putting the money into the development of safer reactors that would leave the world safer from nuclear weapons as well as nuclear leaks.

Ms. ROS-LEHTINEN. Thank you so much, Mr. Rohrabacher. And I am pleased to recognize Mr. Connolly. Thanks for sharing that personal biographical fact with me. I did not know that.

Mr. CONNOLLY. I knew you would want to know. Thank you, Madam Chairman.

By the way, Mr. Sokolski, my colleague from California, his point about the need to invest in new technologies and the fact that by not having done so in a timely manner perhaps unwittingly we are actually expanding the proliferation threat. Would you agree with that?

Mr. SOKOLSKI. There is a firm actually in your district, I think, or near, Linden Blue is someone I regularly meet with. On paper, they have some wonderful things. By the way, that is General Atomics and they actually don't need Price Anderson they say if they can ever get going.

I think the problem oddly is that the firms we keep talking about as American—Westinghouse, by the way, do you know who owns Westinghouse Nuclear mostly, 87 percent? Foreign countries, mostly Japan. These are not your average American companies. They don't manufacture. That manufacturing is done overseas for the key nuclear qualified components. This is to a lesser extent, but still significantly true of General Electric.

So the innovation you are talking about is for a multi-national corporate entity that is largely Korean, Japanese, American, but American last. So you know, you are going to have to work this by talking with these other countries, not just American firms because they own the companies.

Mr. CONNOLLY. Okay, but the point is if Mr. Rohrabacher is correct, that there are constantly new technologies that actually eliminate the problem of what to do with plutonium or what you can do with plutonium.

Mr. SOKOLSKI. Reduce it.

Mr. CONNOLLY. Well—

Mr. SOKOLSKI. Not eliminate it, reduce it.

Mr. CONNOLLY. But surely if such technology were commercially available wouldn't the United States want to promote it? The witness is shaking his head for the record.

Mr. SOKOLSKI. How shall I put it. Everyone wants to promote different forms of energy. They just don't want to pay for it.

Mr. CONNOLLY. Okay.

Mr. SOKOLSKI. My favorite is power from moon beams but it is very expensive. And so the point here is you want to leverage R&D to find out if something works and let the people go to banks and figure out if they can make a buck using the technology. And the market has spoken. On a lot of these reactors, the reason they are sticking with the light water reactor is that they don't want to take any additional risk and they would rather stick with the risks they know than the risks they don't know.

Mr. CONNOLLY. Fair point. All right, Mr. Spector, the chairman, my friend from Florida, Ileana Ros-Lehtinen said she is sponsoring a bill with Brad Sherman and the premise of that bill is we shouldn't differentiate. We need one uniform gold standard and we should be strict about it and enforce it in all 123 agreements, ev-

erybody. If I heard your testimony correctly that is not exactly your point of view?

Mr. SPECTOR. I would say my testimony has to deal with an actual agreement that is in front of us. And I would say when you take all the factors into account, you would say this agreement is what we have to live with. But what do we want to do going forward? And there, I think, it is time to adopt a tougher standard. And as I said earlier, I think—

Mr. CONNOLLY. Excuse me, but the point here isn't just a tough standard. It is one standard that is tough, but one for all.

Mr. SPECTOR. I think I was supporting that going forward.

Mr. CONNOLLY. Okay.

Mr. SPECTOR. But we have to deal with this particular agreement, which is in front of us and which will come into effect in another 90 days or whatever it may be. And I would say there you don't want to reject to the agreement, start from scratch, and go through a very traumatic situation. I think we can tolerate this one.

Mr. CONNOLLY. Two more questions real quickly because my time is running out. Mr. Sokolski was calling down moonbeam power. Again, the chairman pointed out, Vietnam is under this agreement is allowed to enrich. Why? And second question, doesn't that undermine policies elsewhere especially in the Middle East where we don't want them doing that?

Mr. SPECTOR. Well, I think you are correct that the possibility was reserved by the Vietnamese, but they did step forward and attempted containment, and spoke about their plan not to do so, and their plan to rely exclusively on outside sources of fuel and services.

I agree that is not an iron-clad guarantee. And it is made worse in this agreement because of the fact that the agreement won't automatically terminate and have to be renewed. It is going to be renewed automatically. So I would not speak with enthusiasm about this agreement. I would speak as tolerable, barely getting over the—

Mr. CONNOLLY. The second question, though Mr. Spector, was doesn't it, not intentionally, couldn't it contribute to undermining policy elsewhere? That was the chairman's point.

Mr. SPECTOR. Absolutely. I completely agree.

Ms. ROS-LEHTINEN. Thank you very much, Mr. Connolly, but we are out of time. And we will turn to one of our subcommittee chairs, Mr. Chabot of Ohio.

Mr. CHABOT. Thank you, Madam Chair. And the so-called 123 agreements are an important tool for advancing U.S. nonproliferation policy and for impeding the spread of uranium enrichment capabilities and fuel reprocessing around the world. Last year, the Asian Subcommittee that I chair held a joint hearing to examine the extension of the 123 agreement with South Korea and I strongly support the extension of the on-going agreement and support its renewal because it not only provides a regional ally in South Korea with a domestic supply of energy, but also creates American jobs in those sectors that supply South Korea with the components it needs to maintain the power supply for its economy.

A couple of questions. First, how much importance does the Government of the Republic of Korea assign to the successful renewal of the 123 agreement. And then second, what are the risks, if the U.S. and South Korea are unable to reach an acceptable outcome regarding agreement or disagreement and the other sense of the impact that there could be if we were unable to reach an agreement on the U.S. nuclear industry? Mr. Lipman?

Mr. LIPMAN. Thank you, Mr. Chabot. I will limit my answer to sort of the industrial impacts of what you discussed. You talked about the job creation associated with nuclear power generally, but very specifically with the Republic of Korea, American companies partner with the Koreans in other markets. There are deals where American companies are in the lead and the Koreans are sub-contractors, but there are deals such as the one in the United Arab Emirates where the Koreans are in the lead and there is significant job creation. And these 123 agreements are critical. That is why American unions, in particular, are very supportive of 123 agreements because their membership receives significant benefit from the export.

The Koreans utilize American technology, older American technology. And so having the export controls survive and be applied into markets into which Koreans wish to operate is something that is very important. So the 123 agreement is important to us in the industry, not just for industrial cooperation and job creation, but also for the continued exercise and control over U.S. technologies as Koreans go into other markets. So we support the timely completion during this 2-year extension period. Thank you.

Mr. CHABOT. Thank you. Mr. Lipman, let me follow up on a different country here. Regarding the U.S.-China 123 agreement which expires next year, I believe, you briefly discussed the importance of renewing this agreement, both for the U.S. exports and American jobs. I was wondering if you or any of the other fellow panelists could discuss the risks associated with the U.S.-China cooperation agreement with regard to the theft of foreign technology and China's relationship with, for example, Pakistan, North Korea, and Iran. I will start with you, Mr. Lipman. I have got 1 minute and 20 seconds for all three of you.

Mr. LIPMAN. If you have that little time, I would say the risk is in not renewing the agreement because you want this agreement. You want those proliferation controls in place. You want those industrial relationships in place and you want the continued ability to have eyes on the Chinese nuclear program and also to reap any economic benefits that come from it. Thank you.

Mr. SOKOLSKI. We are leveraged there because they are having trouble getting these machines built properly according to the French and I suspect in the U.S. case, too. But more important, the know-how is something they bought. They own enough of the design now that they are working with Westinghouse and our Department of Energy to build these things not only there, but to export them. So the business model is a little bit more than the U.S. in the case of Westinghouse. They are playing both ends of the game. So I would sort of be worried about corruption and what could be sold to other countries. They are under investigation in

China, the leaders of the nuclear industry are indicted for corruption. We don't know what they might sell.

Mr. CHABOT. I note my time has expired, Madam Chair.

Ms. ROS-LEHTINEN. Thank you so much. We will allow him to respond. Mr. SPECTOR.

Mr. SPECTOR. I would say if you go back to the history of the U.S.-China agreement it turned on exports from China that we were not happy with. These are missiles to Pakistan and a lot of other undesirable exports. They are continuing. Not precisely the same ones, but Iran has been a beneficiary of much technology that has come through China for its missile program and also its nuclear program. There is a \$5-million bounty on a Chinese businessman, Karl Lee, because of these activities. I believe this is going to be a major issue when their agreement comes up for renewal.

Ms. ROS-LEHTINEN. Thank you very much, Mr. Chabot. Mr. Lowenthal.

Mr. LOWENTHAL. Thank you, Madam Chair, and I want to follow up on an issue that you originally raised and I think Congressman Poe touched on. And I would really like if anybody on the panel can kind of allay my concerns at this moment. They are more concerns than they are questions.

I have heard and I think what is in the agreement that it is not the ideal. It is not the standard potentially that many members would want and I understand that and hearing in general from the panel. It still makes sense though to move forward even though it may not be the gold standard or at least the consensus I am hearing.

But I am also concerned as what I said before what is not in the agreement, what is outside of the agreement and that is you know, Vietnam has one of the worst records of human rights violations in all of Southeast Asia and possibly in the world. And you know, here and even yesterday we had a hearing, I have spoken out against Vietnam's inclusion in the Trans-Pacific Partnership until they improve their human rights record, until they demonstrate that they are a country that values the ability of people to engage in activities, to come together, to worship as they so choose, not to be imprisoned. And yet, is this not the same issue? What can we do? We already have this agreement. We know that Vietnam is a terrible violator of human rights. We are now asked to support or not to support the agreement that has been negotiated. And yet, I have these real concerns that we are now rewarding again bad behavior.

Mr. SOKOLSKI. I think you have a bit more of a choice. You know, ultimately the barriers to blocking a deal are just almost insurmountable. You need two-thirds vote in both houses. But if you should demand that this thing be delayed until certain things were taken care of, I have every confidence that they would delay it. And the reason why is there is no reason to rush. The talks industry needs to have are not going to be held up because they don't have a 123 in place. They will talk if they think it is coming. And they have plenty of time to talk because they are not even building their first reactor for another 6 years.

We have done this in the case of the UAE deal, the Russian deal. We did it actually just recently with the South Korean deal. I cer-

tainly share your puzzlement as to why you wouldn't ask for this. You might be told forget it, but not to ask? It seems odd. By the way, I am one of the people that thinks you shouldn't go ahead with this deal. Maybe the others are okay with it. I am not okay. I side with Ms. Ros-Lehtinen.

Mr. LOWENTHAL. Is there any way? You know, once we go forward, we have no leverage. Is there any leverage we have here? I am not saying put it in the deal. You are saying as a precondition. What leverage do we have?

Mr. SPECTOR. The one tool that is available and takes legislation is to put a freeze on licensing so that the agreement sits in place, but nothing can travel under it and it can't be implemented. This was done with China, and I think they were on hold for quite a number of years because of the exports I mentioned earlier. It is not elegant and it is not easy to do, but it is a tool that is available. And there are vehicles that have been used by the Congress to advance certain goals in the nonproliferation area. This is a related area such as various, must-have legislation where riders are put on or amendments, or what have you. So there are some tools available if the depth of concern is widespread.

Mr. LOWENTHAL. Thank you. And I yield back.

Ms. ROS-LEHTINEN. Thank you so much, Mr. Lowenthal. And we will turn to Mr. Kinzinger.

Mr. KINZINGER. Thank you, Madam Chair, and I appreciate the committee holding this hearing and for all of you being here.

Mr. Sokolski, I want to remind you at the very beginning here, you have taken a shots at Westinghouse. I am not going to give you an opportunity to respond, but I would like to remind you that that is an American company and they have a lot of employees in Pennsylvania and in my district there is a lot of companies that supply Westinghouse. So whatever the beef you have seems to be with them, you can expound at a later time, but I just wanted to remind you that that is an American company.

In terms of—I am speaking still, so in terms of a couple of opening points, let me just say we need to go forward with the U.S.-Vietnam 123 agreement. Ranking Member Engel and I have signaled our support for that. And I would also like to express my support for the U.S.-South Korea 123 agreement. For 60 years, this has been one of our greatest allies in a very important part of the world and the Republic of Korea, in fact, has brought a lot of stability to the world, security, and prosperity.

I am going to have the opportunity to visit Korea in a few months and talk about these issues and I am looking forward to it, but I would like to say that that is something that is very important to move forward on. And it is also interesting to me that the sticking point, the issue of enriching and reprocessing and things along that line, we are basically giving that to Iran, by the way. I have had discussions with folks in the administration, none of whom have said that there is going to be no right to enrichment of uranium up to a certain level. So it is almost a given now that our greatest enemy in the Middle East, of which we actually have engaged directly and indirectly with through Iraq and everywhere else, is going to have this right that we are denying to our allies. So that, to me, is something that is going to be very shocking and



something telling and something I think we need to have a real grown-up adult discussion on.

Mr. Lipman, I am going to shift gears a little bit here and ask you a couple of questions. Is the U.S. still the dominant player in the nuclear export market? If so, why? And if not, why?

Mr. LIPMAN. Thank you, Congressman. And thank you also for straightening out the facts that Westinghouse is an American company. And I can assure you that in these nuclear exports the overwhelming majority, the vast amount of value in these nuclear exports is made right here in the U.S.A. in states like South Carolina, Pennsylvania, New Hampshire, and so forth. So thank you for clearing that up.

I mentioned earlier we are certainly not the dominant player. There are, I mentioned earlier, about ten nuclear reactor vendors globally. That is a situation that has transpired in the last, just the last few years. And it is extremely competitive out there. Where we do not have these agreements in place, competitors will fill that void. Of that there is no question.

Now why is that? Your question is well, why is that? Well, some of them are state-owned enterprises, so the Government of Russia owns Rosatom which in turn owns Atomstroyexport which is the main competitor American companies face from Russia. AREVA is wholly owned by the French Government. Korea Electric Power Company is similarly owned by the Korean Government and so forth and so on. Even CANDU is a Crown Corporation. U.S. industry is private, largely, and somewhat fragmented.

Also, the level of commercial diplomacy is quite different, Congressman. It is very typical that when heads of state of these other countries travel in their entourage are the nuclear guys and the radar guys and the defense guys and so forth and so on. We don't do business that way. And that is okay. That is not our way. And I don't think anybody in the industry would change that. But we are finding now a very tough competitive environment and one in which the Russians, for example, offer to take your spent fuel back. We don't do that. They offer extremely concessionary finance. We may not get our Ex-Im Bank renewed.

Thirdly, there is significant trade advocacy that we don't receive. So it is a tough environment out there. We are not asking to have our hands held, but we are asking for a competitive level playing field so we can do business.

Mr. KINZINGER. I think you made a great point about Ex-Im. It is very important for multiple reasons and I think that is something that is very important. I have four nuclear power plants in my district and I would frankly hate to get to a point where we have Russians and French coming in and servicing them because we lost our own industry.

And just lastly, well, 8 seconds, how important are foreign markets to the U.S. nuclear industry?

Mr. LIPMAN. They are more important than ever before and they are in markets that are nontraditional. They are in places like, and we better get comfortable with places like Southeast Asia, South Asia, Eastern Europe. We haven't talked about Eastern Europe, but Eastern Europeans are keen to get away from the Russians and their grip on gas, and in places in the Middle East. So we are

in a situation in which we compete in nontraditional markets against state-owned enterprises and the need for trade finance and advocacy and a level playing field is greater than ever before. Thank you.

Mr. KINZINGER. And I yield back.

Mr. CHABOT [presiding]. Thank the gentleman, his time has expired. The gentleman from Texas, Mr. Weber, is recognized for 5 minutes.

Mr. WEBER. Thank you, Mr. Chairman. Mr. Lipman, I think you said that there are ten global companies that supply reactors, build and supply reactors? What would you say is the overall world marketplace for the amount of volume of sales? Is it \$200 billion? What is it?

Mr. LIPMAN. I want to say the number that sticks in my mind is about \$750 billion.

Mr. WEBER. \$750 billion. Do you know what percent mostly U.S. manufacturers, I guess including Westinghouse, what percent of that market share U.S. manufacturers own?

Mr. LIPMAN. So let us break it down a little bit. So there are new reactor sales, but there is also plenty of sales in nuclear fuel and services and spare parts and things like that.

Mr. WEBER. I am talking total. Thank you for making that distinction.

Mr. LIPMAN. Yes, sir. And so I would say that in the fuel market, maybe we have 10 to 15 percent of that market. And I think in the new reactor market it is looking a lot better and it will look better if we get these 123s and other policy tools that I mentioned earlier in place. We have a much better chance that major reactor sales I think than the competitive situation would warrant. But I will get those details and submit to the record the accurate figures, sir.

Mr. WEBER. Any idea how many jobs that represents in this country?

Mr. LIPMAN. By the way, NEI is undertaking an effort to count them down to the district level if we can, down to the ZIP Code, if we can. But we know from the—

Mr. WEBER. Send me the numbers for my district, please?

Mr. LIPMAN. Yes, sir. We know from the China export that somewhere between 15,000 and 18,000 jobs were created or maintained from just that one export of four units, sir.

Mr. WEBER. Okay. And I am not a nuclear expert. When I was a state rep I had a nuclear plant, South Texas nuclear plant in Bay City in my district and got to tour it and watch it first hand, look at it first hand. Why is reprocessing of spent fuel such a bad thing? Is it just because it leaves material laying around for weapons? Is that your only concern?

Mr. LIPMAN. I will answer and I will certainly defer to the experts here. And by the way, I lived in Brazoria County for 5 years.

Mr. WEBER. We are still taking applications if you want to come back.

Mr. LIPMAN. Thank you, sir. It was a great place to live. Look, you said it, reprocessing makes available plutonium, separation can make available, depending on the process, separated plutonium which can be diverted for inappropriate uses and that is a major concern.

Mr. WEBER. Okay, thank you. That is what I thought. Mr. Spector, you talked about an export agreement or an agreement delaying licensing which wasn't elegant, there was a way to do it. And I think you mentioned that China it was discovered that was going to export missiles, so we held up an agreement. Can you go back to that?

Mr. SPECTOR. I have to get my dates right. My recollection was that an agreement was inked and we were ready to go forward with it, as they gradually accepted more and more export control rules such as agreeing to the export control rules of the missile technology control regime in particular, but other ones as well. And because they didn't stop the actual exports, the agreement was intact, but nothing happened under it.

Mr. WEBER. Let me play the devil's advocate. Why was it a problem for China to export missiles, missile technology?

Mr. SPECTOR. Well, I think in the particular case we were very concerned that these missiles would be armed with nuclear weapons. This was going to Pakistan, especially. Since that time the missiles have gone to Iran and a lot of missile equipment, so this is a continuing problem.

Mr. WEBER. So we are concerned that those missiles would be used to destroy civilians, its cities and used in a very aggressive military fashion.

Mr. SPECTOR. Conceivably, it is contrary to our efforts to suppress this kind of capability around the world.

Mr. WEBER. But you said that you didn't think that human rights violations needed to be part of the agreement, so we are concerned that missiles would kill hundreds or thousands of people, but we are not concerned that they are killing individuals?

Mr. SPECTOR. I think I actually said something a little different which was in the four corners of the agreement, the actual wording, probably not, missiles or human rights.

Mr. WEBER. Maybe a preclusion leading up to that.

Mr. SPECTOR. That is correct or a freezing of the negotiation. This is what happened with the United Arab Emirates agreement when concerns about leakage of technology through Dubai into Iran surfaced. And Congress actually was responsible for sort of changing the terms of that agreement.

Mr. CHABOT. The gentleman's time has expired.

Mr. WEBER. Thank you, Chairman.

Mr. CHABOT. Thank you. The gentleman from Florida, Mr. Yoho is recognized for 5 minutes.

Mr. YOHO. Thank you, Mr. Chairman. I appreciate you gentlemen being here and I look forward to your answers on this and the information you have already given has been great.

Mr. Sokolski, you were saying that by not going forward, you would not go forward with the 123 agreement with Vietnam. What would you recommend in replacement of that?

Mr. SOKOLSKI. I would be in no rush to get it wrong. Take your time if you are going to get it wrong. You should pressure the administration to at least give you the procedural authority to look at this thing in 30 years.

Mr. YOHO. I agree.

Mr. SOKOLSKI. I would ask for that much at least. I think you are going to have some fancy footwork here to persuade the South Koreans if you go ahead with this thing, but maybe this committee can do it, an able chairman of a subcommittee and that is going to require doubling down on that and perhaps delaying the Iran deal.

Mr. YOHO. Well, for a superpower, we need to act like one and I think we need to negotiate harder. The 123 agreement I see they seem messy and for a country like South Korea, that is an ally, in the beginning of the agreement it looks like it worked well. But now they are giving us pushback because they have an excess amount of plutonium that they say we need the capability of reprocessing this. You guys aren't helping us, so there is resistance and we have to do the 2-year extension because we couldn't come into an agreement.

And then we look at what is going on with China. We had the agreement, but however, since China's proliferation record is very poor including building nuclear reactors in Pakistan, refusing to curb illegal sales, as you brought up, and smuggling Chinese companies by Chinese companies of banned nuclear-related material to Iran and other countries, we get involved in these complicated agreements. And what I have seen is there is just no checks and balances to monitor them, but it makes us feel good because we can say we have a 123 agreement, we are great. But in the meantime, slight of hand, they are doing this.

And I guess what I would like in the two, almost 3 minutes I have left, how can we make—well, first of all, should we enter into these kind of agreements especially if we are not the major player? We are competing against government entities, state owned and operated and what I understand about China is when they come in, it is not a Chinese company. It is the Chinese Government. It is their military, it is their secret service, it is all that as a package. You get the package. And so that concerns me because we are having companies like Westinghouse dealing as a company with forcing governments. You just can't compete that way.

So how can we move forward, number one? Should we move forward with this kind of agreement? And if we do, how do we make a 123 type of agreement more workable to accomplish the goal of eliminating the amount of spent fuel that is reprocessed in nuclear proliferation?

We will start with you, Mr. Sokolski.

Mr. SOKOLSKI. I think the simple thing is they demand more of our diplomats and they lean more heavily on the handful of suppliers. There may be lots of companies, but there are only a few countries. We know who they are. They are France, Korea, Japan, and Russia; China coming up. There are leverage points. I talked with people who in the government say well, we haven't asked or we asked, but we didn't make any linkage to anything that they might be concerned about. We have got to change that.

Mr. YOHO. Mr. Lipman, because I have one more question.

Mr. LIPMAN. You did an accurate job characterizing, I think, the environment in which we face. But you are being very future oriented here and I would say one of the biggest tools, you talked about eliminating the amount or reducing the amount of fuel that

could be diverted or reprocessed and the material diverted, one thing we don't do which we could do is take spent fuel back into this country.

Mr. YOHO. We have got the technology to reuse that. It has just not been approved or we haven't allowed that, right?

Mr. LIPMAN. Well, right now we do not allow by law to take back spent fuel for fuel we sell to other countries.

Mr. YOHO. It could be reprocessed as energy, right?

Mr. LIPMAN. We don't have commercial reprocessing in this country, but we have the technology that could do it.

Mr. YOHO. I am running out of time. Mr. Spector, I want you to get your weigh in on that.

Mr. SPECTOR. I think Henry made a point that we have other leverage with these various countries. That is what you would use during the course of these agreements. It could be economic sanctions or export controls, licenses that are held back and so forth. The agreement carries on, but you can apply leverage in a lot of different ways to try to make sure it is properly adhered to.

Mr. YOHO. And what I see is with the debacle with what we do with Iran, a future country to negotiate with us on a 123 agreement after they saw us do with Iran, they are going to say we want the same deal you gave Iran. And I think it has crippled us tremendously. I yield back. Thank you.

Mr. CHABOT. I thank the gentleman, his time has expired. The gentleman from Pennsylvania, Mr. Perry is recognized for 5 minutes.

Mr. PERRY. Thank you, Mr. Chairman. Mr. Lipman, we will start with you. Regarding China's nuclear industry, we expect it to expand a reasonable amount over the next few decades. I am just wondering about the opportunities it will create for the U.S. nuclear industry because we want to build as much and do as much as we can in our districts and in the United States. It is a business that is important to us. But are we creating a competitor by undercutting ourselves by providing it with nuclear? What are we looking for and what is the middle ground there?

Mr. LIPMAN. Right, and that is a very critical, competitive issue that any company that wants to do business in China needs to face. When I had to face that decision at the time I ran that new reactors business for Westinghouse, the solution to that is you sell the technology, but you have to continue to innovate. If you do not innovate, you will create another competitor. You are creating another competitor, but the key to maintaining leadership is to continue to out innovate your partners, number one.

Number two, with respect to having a relationship with the Chinese nuclear industry, they are smart folks. They have got technology that is of interest to us, too, in civilian space, okay, in the civilian area. So we learn from each other. Reactors under construction today in America are benefitting from lessons learned from reactor construction in China. It is happening right now in Georgia and South Carolina. So these are relationships that are important. They are job creating. They support all kinds of political objectives and working together is the solution in my opinion, Congressman.

Mr. PERRY. All right, so moving on then and I want to get some of the other gentlemen into the discussion with the 123 agreement expiring in 2015 other than spent fuel situation which apparently needs to be addressed, at least allowing us the opportunity to do something, not making a prohibition. I am not saying we have to do something, but what else needs to be changed to increase our opportunities and our security in that regard from your standpoint? And then Mr. Spector and Mr. Sokolski, it would be great to hear from you on that as well.

Mr. LIPMAN. So I am clear, Congressman, increase opportunities for U.S. companies.

Mr. PERRY. Westinghouse, there is a company in the district I represent which builds casks, those kind of folks.

Mr. LIPMAN. Yes, okay, listen, I mentioned in my opening statement a number of policy solutions. I think having 123 agreements in place, I think having an export control process that works, I think liability protection is important, Export Import finance is important and generally, a pro-nuclear trade policy. Those will create opportunities where American companies can thrive against this very tough international competition in this basically international market now.

Mr. SPECTOR. I would say at the moment the closest related area of concern has to do with exports from China and their inability to suppress certain individuals from engaging in these activities. This is going to North Korea and to Iran. That has to be on the table as we discuss this renewal of an agreement, because it is a very closely-related area. But there are other issues. Human rights issues in China, for example. There is plenty on the table and the question I think is to decide how much of that we want to bring into the conversation and which ones we hold for another occasion.

Mr. PERRY. So without reaching too far, I would agree with you to a certain extent, but if we can't get to human rights issues with China, but we can get to ranking them in with some of the proliferation around the other rogue nations, so to the speak, maybe that is more important if that is what we can get out of the deal. It is my opinion that maybe that is what we should focus on.

Mr. SPECTOR. There might be other higher-level discussions where you want to bring the human rights issue up.

Mr. SOKOLSKI. I think you have got to focus on safety because what you have done is just as we had seen Westinghouse sell all of its designs to France and created a French competitor, that you are doing it now with regard to China. I really urge the committee to get more knowledgeable and hold some hearings on exactly what the difference between technology transfers and how important that is to the industry and if you go to their Web site they talk about technology transfers. That is not controlled by 123 agreements.

The amount of things that we sell, manufacture here of these projects is not very great. But the leverage has to do with the know-how. And I think that if you want to have the maximum amount of engagement in their industry, you better press hard on being more candid about the safety problems in China.

Mr. CHABOT. The gentleman's time has expired.

Mr. PERRY. Thank you.

Mr. CHABOT. Gentleman yields back. On behalf of the chairman of the committee, we would like to thank the panel for their very helpful testimony here this morning. Members will have 5 days to revise statements or submit written questions and if there is no further business to come before the committee, we are adjourned. Thank you.

[Whereupon, at 11:47 a.m., the committee was adjourned.]





# APPENDIX

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MATERIAL SUBMITTED FOR THE RECORD

**FULL COMMITTEE HEARING NOTICE**  
**COMMITTEE ON FOREIGN AFFAIRS**  
U.S. HOUSE OF REPRESENTATIVES  
WASHINGTON, DC 20515-6128

**Edward R. Royce (R-CA), Chairman**

July 10, 2014

**TO: MEMBERS OF THE COMMITTEE ON FOREIGN AFFAIRS**

You are respectfully requested to attend an OPEN hearing of the Committee on Foreign Affairs, to be held in Room 2172 of the Rayburn House Office Building (and available live on the Committee website at <http://www.ForeignAffairs.house.gov>):

**DATE:** Thursday, July 10, 2014  
**TIME:** 9:45 a.m.  
**SUBJECT:** The Future of International Civilian Nuclear Cooperation  
**WITNESSES:** Mr. Henry D. Sokolski  
Executive Director  
Nonproliferation Policy Education Center  
  
Mr. Daniel S. Lipman  
Executive Director  
Supplier Programs  
Nuclear Energy Institute  
  
Mr. Leonard S. Spector  
Executive Director  
Washington, DC, Office  
James Martin Center for Nonproliferation Studies

**By Direction of the Chairman**

*The Committee on Foreign Affairs seeks to make its facilities accessible to persons with disabilities. If you are in need of special accommodations, please call 202/225-5021 at least four business days in advance of the event, whenever practicable. Questions with regard to special accommodations in general (including availability of Committee materials in alternative formats and assistive listening devices) may be directed to the Committee.*



COMMITTEE ON FOREIGN AFFAIRS  
MINUTES OF FULL COMMITTEE HEARING

Day Thursday Date 07/10/14 Room 2172

Starting Time 9:43 a.m. Ending Time 11:47 a.m.

Recesses 0 ( to ) ( to ) ( to ) ( to ) ( to ) ( to )

Presiding Member(s)

*Edward R. Royce, Chairman  
Rep. Heona Ros-Lehtinen, Rep. Steve Chabot*

Check all of the following that apply:

Open Session

Electronically Recorded (taped)

Executive (closed) Session

Stenographic Record

Televised

TITLE OF HEARING:

*The Future of International Civilian Nuclear Cooperation*

COMMITTEE MEMBERS PRESENT:

*See Attendance Sheet.*

NON-COMMITTEE MEMBERS PRESENT:

*None.*

HEARING WITNESSES: Same as meeting notice attached? Yes  No


*(If "no", please list below and include title, agency, department, or organization.)*

STATEMENTS FOR THE RECORD: *(List any statements submitted for the record.)*

*Connolly*

TIME SCHEDULED TO RECONVENE \_\_\_\_\_

OR  
TIME ADJOURNED 11:47 a.m.



Edward Burrier, Deputy Staff Director

**HOUSE COMMITTEE ON FOREIGN AFFAIRS**  
*FULL COMMITTEE HEARING*

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**Statement for the Record***Submitted by Mr. Connolly of Virginia*

The House Foreign Affairs Committee has engaged the issue of nonproliferation on several fronts, from countering the nuclear ambitions of North Korea and Iran to evaluating the foundations of the United States' nonproliferation policy. Today, we will discuss international civilian nuclear cooperation, its impact on U.S. nonproliferation strategy and how regulating civilian nuclear cooperation can promote the safe transmission of nuclear technology, equipment and material.

In the U.S., civilian nuclear cooperation falls under the jurisdiction of the Atomic Energy Act of 1954 (AEA) and subsequent amendments to include the Nuclear Nonproliferation Act of 1978 (NNA). 1954 and 1978 represented two very different eras in the history of the United States' approach to nuclear technology at home and abroad. In 1978, Congress passed the NNA to put further requirements on the export of nuclear technology as civilian nuclear cooperation between countries, multilateral institutions and private industry became part of the leading edge of nuclear proliferation. Under the NNA, Section 123 of the AEA, which requires that this type of activity be conducted under a bilateral agreement, was bolstered to place additional requirements on civilian nuclear cooperation. Bilateral Civilian Nuclear Cooperation Agreements or "123 agreements" establish the structure in which U.S. civilian nuclear cooperation can occur. 123 agreements also certify that nonproliferation criteria are met by bilateral trade or cooperation arrangements that involve nuclear technology, equipment or material.

This is a pertinent issue for this Committee as 123 agreements require Congressional review to become law. Before an agreement reaches Congress, it is negotiated by the State Department with technical assistance from the Department of Energy and concurrence from the Nuclear Regulatory Agency. Once negotiated and recommended for approval by the Secretaries of State and Energy, the Agreement is submitted to the President. Upon certification from the President that entering into such an agreement for nuclear trade is not inimical to the security of the United States, the agreement is submitted to the Senate Foreign Relations Committee and House Committee on Foreign Affairs for a 90-day Congressional review period. Inaction by Congress or the passage of joint resolution of approval makes the agreement law. If the President is seeking exemptions to the nonproliferation criteria, a joint resolution of approval must be passed for the agreement to become law.

The Congressional review period can be a valuable opportunity for Congress to ensure that 123 agreements reflect the foreign policy goals of the United States and that the prospect of nuclear civilian cooperation with the U.S. incentivizes countries to uphold shared values. Earlier this year, both the Taiwan and International Atomic Energy Agency 123 agreements were renewed. The Vietnam 123 agreement is currently in the second phase of its 90 day Congressional review period. My colleagues, Ranking Member Engel and Representative Kinzinger have introduced H. J. Res. 116 in approval of the agreement, while others insist on strengthened enrichment restrictions and maintain reservations about entering into an agreement with a Vietnamese regime guilty of significant human rights abuses.

The Administration has promoted the agreement as a shot in the arm to a less than robust civilian nuclear technology sector in the U.S., citing that Vietnam plans to build 4 new reactors that will potentially include U.S. technology.

Each new 123 agreement has the potential to set a precedent for the requirements we place on allies in future agreements. Several agreements will come due for renewal in the next few years, including the Republic of Korea (ROK) 123 agreement. A lapse or termination of exporting nuclear technology to ROK would be an

unfortunate development for a close economic relationship that includes a recently completed free trade agreement. Congress must be careful not to be overly prescriptive and withhold from the Administration the latitude to negotiate future agreements that safeguard both nuclear security and energy opportunities. I look forward to hearing from our witnesses as they provide insight into how Congress can balance nonproliferation concerns with the promotion of nuclear commercial activity.



MATERIAL SUBMITTED FOR THE RECORD BY MR. HENRY D. SOKOLSKI, EXECUTIVE DIRECTOR, NONPROLIFERATION POLICY EDUCATION CENTER

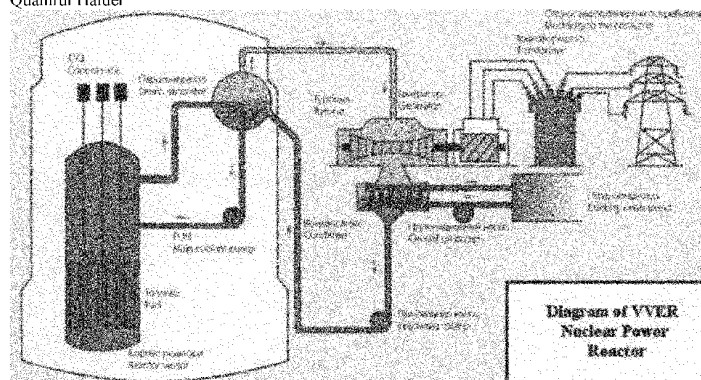
## The Daily Star

P-ED

Published: Wednesday, June 12, 2013

### **How safe are the Russian civilian nuclear reactors?**

Quamrul Haider



The Russian state-owned nuclear power company Rosatom has an all-in-one bargain package for third-world countries seeking to build nuclear power plants. It is known as BOO—"build, own, [and] operate" power plants for 60 years or BOOT—the T being for "transfer." Under one of these models, Rosatom will build a two-unit power plant with VVER-1000 model reactors at Rooppur. These water-cooled, water-moderated, pressurized water reactors were first introduced in the 1980s and are now operating mostly in Russia and former Soviet Republics.

Several articles have been published expressing deep concern and raising questions about the wisdom of building a power plant in a densely populated deltaic country prone to severe flooding and natural disasters. While reactors are designed to be safe both during operation and in the event of any malfunction or accident, no industrial activity can be certified as 100 percent risk-free. Examples are the nuclear accidents at Three Mile Island (1979), at Chernobyl (1986), and at Fukushima (2011).

In January of this year, power plants at Beloyarsk, Kola, Kursk, Rostov, and Kalinin had emergency shutdowns (scrams), emergency repairs, and power reductions. The cause of the incidents has been

documented by Rosatom and Rosenergoatom Concern, a Russian company that deals with the construction, operation, and decommissioning of reactors. They are summarized below:

Beloyarsk: In order to remedy a number of abnormal findings regarding the functioning of the equipment, the plant operated at 76 percent output for three months.

Kola: There was a scram of Unit 1 (VVER-440) following a transformer failure.

Kursk: An increase in moisture was detected in the RBMK-1000 reactor in Unit 3. It was shut down for unplanned repairs.

Rostov: After just 2 years in operation, a VVER-1000 reactor at Unit 2 “experienced glitches of one sort or another.” The generator underwent a power cut “with subsequent power shedding at the Unit.”

Kalinin: There was trouble with the turbogenerator that led to a reactor scram. “Activation of the automatic protection system occurred due to a disconnection of the generator from the grid.”

These incidents involving VVER and RBMK model reactors do not speak well for Russian-built reactors. They clearly demonstrate that unscheduled shutdowns and/or repairs are common occurrences. Fortunately, none resulted in any significant release of radiation. But they do serve as a precursor to more serious accidents that could happen in the future.

The question to ask now is: Are Russian reactors really safe? The answer is an emphatic NO. Russian reactors are beset with numerous safety related issues.

According to a 2011 report written by Rosatom, the agency that will build the reactors at Rooppur, inspections of plants near Finland have revealed numerous serious shortcomings concerning the safety of the Russian reactors. The shockingly candid report was prepared for then-President Dimitry Medvedev as part of the safety study of Russian reactors done after the nuclear accident at Fukushima in March of 2011. It was acquired by the Bellona Foundation, an international environmental NGO based in Oslo, Norway and leaked to the Norwegian newspaper Aftenposten.

The Rosatom report notes that the Russian plants are woefully under-prepared for both natural and man-made disasters. It also warns of the plants' inadequate reserve cooling systems. In addition, the report expressed serious reservations about the reactors' capability of remaining safe for extended periods of time if cooling systems fail. Should this happen, there is no guarantee that the power backup systems will be effective.

These reports are a damning indictment of the Russian reactor industry, contrary to Russia's rosy assessment that its reactors are safe.

The Fukushima nuclear accidents in 2011 have completely changed the nuclear landscape. In the aftermath of the accidents, many nuclear nations decided to phase out their power plants in the next 10 to



20 years. United States cancelled most of the power plants planned for the future after the Three Mile Island accident in 1979; the rest were scrapped following the Fukushima events. Research in American and European laboratories is now underway to determine if nuclear reactors based on the fusion process that powers the Sun can be developed for generation of energy to power our future.

Why then, would Bangladesh want to build nuclear power plants when many industrialized nations are shying away? Is the government aware that with a population density of about 3000 per square mile, a nuclear power plant is going to put the citizens in grievous harm's way?

As per the Bellona Foundation's paper, "The Economics of the Russian Nuclear Power Industry," the Russian nuclear industry operates in an environment fraught with corruption. Could it, therefore, be a case of Russia exporting unsafe reactors to Bangladesh to make questionable profit under the pretext of BOO or BOOT?

The Russians have the technology, resources, know-how, and experience to handle nuclear accidents in their own backyard. Bangladesh doesn't. Apart from the immediate damage that will be caused, the effects of nuclear accidents in Bangladesh resulting from technical failure, human error, or malevolence, no matter how small, would be vast and beyond the imagination of most of us. The radiation released would continue to affect the citizens all over the country and particularly those living around Rooppur for tens of thousands of years. Only those who cherish delusions about the nuclear future will deny the risks of nuclear fission's destructive power. There can be no greater or more frightening burden for the people to bear than a Sword of Damocles hanging over their head. Not only must they live in continual fear that nuclear reactors may get out of control in their lifetime, but also with the shadow of radiation poisoning looming over their long-term future.

**The writer is Professor in the Department of Physics and Engineering Physics, Fordham University, New York.**

**West Hawaii Today**

Posted June 20, 2014 1:03am

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**CHINA REGULATORS 'OVERWHELMED' AS REACTOR BUILDING STEAMS AHEAD**

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By Tara Patel and Benjamin Haas

Bloomberg News

HONG KONG — China is moving quickly to become the first country to operate the world's most powerful atomic reactor even as France's nuclear regulator says communication and cooperation on safety measures with its Chinese counterparts are lacking.

In the coastal city of Taishan, 100 miles from the financial hub of Hong Kong, Chinese builders are entering the final construction stages for two state-of-the-art European Pressurized Reactors (EPR). Each will produce about twice as much electricity as the average reactor worldwide.

France has a lot riding on a smooth roll out of China's EPRs. The country is home to Areva, which developed the next-generation reactor, and utility Electricite de France, which oversees the project. The two companies, controlled by the French state, need a safe, trouble-free debut in China to ensure a future for their biggest new product in a generation. And French authorities have not hidden their concerns.

"It's not always easy to know what is happening at the Taishan site," Stephane Pailler, head of international relations at France's Autorite de Surete Nucleaire regulator, said in an interview. "We don't have a regular relationship with the Chinese on EPR control like we have with the Finnish," said Pailler referring to another EPR plant under construction in Finland.

Calls and faxes to China's National Nuclear Safety Administration regulator seeking comment went unanswered. China General Nuclear Power Corp., the atomic operator that is building the reactor with the French, didn't respond to queries.

The first indications of French unease came when Philippe Jamet, one of the regulator's five governing commissioners, testified before French Parliament in February.

"Unfortunately, collaboration isn't at a level we would wish it to be" with China, Jamet said. "One of the explanations for the difficulties in our relations is that the Chinese safety authorities lack means. They are overwhelmed."

Then, in March, EDF's internal safety inspector Jean Tandonnet published his annual report to the utility's chief executive that detailed a mid-2013 visit to the Taishan building site. He wrote that "the state of conservation" of large components like pumps and steam generators at Taishan "was not at an adequate level" and was "far"

from the standards of the two other EPR plants, one in Finland and the other in Flamanville, France. Tandonnet urged corrective measures and wrote that studies “are under way on tsunami and flooding risks.”

Tandonnet’s report notwithstanding, Herve Machenaud, EDF senior executive vice-president in charge of generation said EDF is satisfied with China’s safety procedures. In China, “there is real, independent control that works at least as well as in most countries,” Machenaud said.

At Areva, Chief Operating Officer Philippe Knoche said China’s regulator “is extremely demanding,” in an interview.

Some 28 reactors of various models are currently under construction in China. That’s more building than any other nation on the planet, and the country hasn’t reported a serious nuclear accident in the 22 years it has operated nuclear plants for commercial use.

Still, the international nuclear industry and its regulators have remained skittish following the 2011 Fukushima meltdown in Japan. In that catastrophe, radiation spread well beyond Tokyo, 135 miles from the wrecked power plant, in a disaster that rallied regulators worldwide to be more vigilant.

And in a rare public comment about safety concerns, China’s own State Council Research Office three years ago warned that the development of the country’s power plants may be accelerating too quickly.

“If the current momentum of development continues, if too many nuclear power projects are started too quickly, it could jeopardize the healthy, long-term development of nuclear power,” Fan Bi, a deputy director at the State Council Research Office, wrote in an article for Outlook Magazine, published by the official Xinhua news agency, two months before the Fukushima disaster.

China General, the country’s biggest atomic operator is forging ahead with EDF. It will begin critical tests on the most advanced of the 1,650-megawatt Taishan EPRs before start-up in 2015, Machenaud said last month. Fuel will be loaded and the plant will “undoubtedly” start up before the European models, he said in the interview, the first time an executive has publicly described the plan.

While Pailler said the ASN doesn’t have specific “worries” about safety at Taishan, the French regulator’s comments go beyond the diplomatic language generally used by atomic authorities when speaking about other countries. European regulators mostly “steer a line” between stating concerns clearly and softening language to ensure continued engagement with local authorities, said Tony Roulstone, an atomic engineer who directs the University of Cambridge’s nuclear energy masters program in the U.K.

The French regulatory agency has published hundreds of letters, reports and references on its own website about the Flamanville EPR, in Normandy. It has carried out 140 inspections since 2007 on building quality such as concrete, welding and cables, a regulatory spokeswoman said. Other probes were carried out on equipment suppliers, storage and design. The authority has ordered at least two construction halts after finding faults.

By contrast, the Chinese regulator’s website contains relatively little information about safety issues. The most recent post on Taishan is a 2009 report on the start of cement work at the reactor referring to “problems left over from early-stage construction.” It said all current work was up to standards, without elaborating. In total just nine posts on the website mention Taishan, and many are blank apart from the title.

Critics of China's nuclear safety regime, including Albert Lai, chairman of The Professional Commons, a Hong Kong think tank, says that lack of information risks eroding confidence in safety controls in what's set to be a 14-fold increase of atomic capacity by 2030.

"The workings of China's atomic safety authority are a "total black box," said Lai. "China has no transparency whatsoever."

### Russia's Nuclear Reactors Could Take over the World, Safe or Not

The federation is aggressively selling reactors to countries with little nuclear experience, raising safety concerns

Sep 17, 2013 |By Eve Conant <<http://www.scientificamerican.com/author/eve-conant>>

For any country that may be considering acquiring its first nuclear reactor, Russia's annual ATOMEXPO offers a seemingly simple solution. At a recent event, thousands of people from around the world flocked to a giant, czarist-era exhibition hall. A visitor could hear vendors such as Rolls-Royce talk about steam generators, watch reporters interview experts for a Russian nuclear-themed television program or pick up a "Miss Atom" calendar featuring the year's prettiest Russian nuclear workers.

The real action, though, was at a multilevel booth for Rosatom, Russia's state-owned nuclear company, which exuded a Steve Jobs vibe of pure whiteness and know-how. That was where "newcomers," as the Russians fondly call them, from nations that do not have nuclear power plants heard about options and signed cooperation agreements for Rosatom to build or even operate reactors for them. At one point, photographers snapped shots of Nigerian nuclear officials as they clinked champagne flutes with Rosatom chief Sergey Kirienko, celebrating their baby steps toward joining Russia's growing roster of clients, including Turkey and Vietnam. Rosatom has already finished reactors in China and India. In July, Finland chose the company over French and Japanese competitors for its next reactor.

The big show was all part of a Kremlin-backed \$55-billion plan to make Russia a leading global supplier of nuclear power. Already the country intends to build roughly 40 new reactors at home, and it expects as many as 80 orders from other countries by 2030. Included are facilities that would generate power and desalinate water, of particular interest in the Middle East. The expansion comes as Germany is abandoning nuclear power, the U.S. industry is struggling and Japan is in the midst of soul-searching about its post-Fukushima intentions. President Vladimir Putin has called the build-out "a rebirth, a renaissance" of Russia's nuclear technology.

Rosatom is eyeing British and American markets, too—it owns uranium mines in Wyoming and supplies about half of the fuel used in U.S. reactors, according to the World Nuclear Association. But for now it is primarily targeting developing nations and countries that had close ties to the former Soviet Union. For some of these newcomers, Rosatom has a unique offer: it can be a one-stop nuclear shop. It will provide fuel and will permanently take back the spent fuel from its reactors—eliminating the need for some countries to build geologic waste repositories. That service, offered by no other country, "is a tremendous marketing advantage for the Russians," says Alan Hanson, who recently joined the Massachusetts Institute of Technology after 27 years as an executive at Areva, Rosatom's French competitor.

Russia is sweetening the deal by providing scholarships to young men and women from client nations to study in Russia and obtain degrees in "nuclear power plants and facilities." And because an average reactor costs at least \$3 billion, Russia is offering the first ever rent-a-reactor program in which Rosatom builds and runs reactors on foreign soil.

Many of the world's nuclear experts are concerned that Russia is galloping ahead too fast. They worry that Rosatom is willing to do business with any nation, which could lead to the proliferation of nuclear material or know-how. Rosatom has had discussions with countries that the West considers dictatorships, such as Myanmar (Burma) and Belarus. And just this past July the president of Iran—a country mired in fresh U.S. sanctions over its nuclear ambitions—visited the Kremlin to ask Putin for more reactors beyond the one Russia already built.

Russian officials balk at the criticism and are enthusiastically casting a wide net. Kirill Komarov, a Rosatom executive tasked with overseas expansion, told reporters at a press conference in June 2012, "There is no country in which we will not be interested to build a plant."

Experts also worry that Russia's nuclear leaders do not place a top priority on safety. Although safety features are prominent in new designs, "the government owns and funds both the designer and the independent safety review. It was this arrangement in Japan that has been recently flagged as contributing to issues in the Fukushima accident," says Susan Voss, president of the Santa Fe consulting firm Global Nuclear Network Analysis and formerly a scientist working on reactor design at Los Alamos National Laboratory.

Rosatom spokesman Sergey Novikov insists that the federal supervisor, Rostechnadzor, "is absolutely independent." Russia says that all the reactor technologies Rosatom is promoting have the most modern safety features. But some Western experts remain dubious about how protective those features truly are.

#### Fast and Furious

Russia is already the world leader in developing one controversial option: fast-breeder reactors. More typical reactors in use worldwide consume enriched uranium fuel and generate waste that remains highly radioactive for thousands of years. Breeder reactors essentially recycle fuel. As the enriched uranium burns in the core, it generates neutrons, which collide with low-grade uranium (that cannot function as a fuel) in a blanket around that core, turning the uranium into, or "breeding," plutonium. The reactor can later consume that plutonium (it still generates highly radioactive waste). Breeder reactors can produce 10 to 100 times more energy from a set amount of uranium than the more standard varieties—boiling-water and pressurized-water reactors—can.

The U.S. built experimental breeder technology in the 1970s and 1980s but abandoned it—in part because abundant uranium supplies were cheap but also because the design heightens the chance for proliferation of weapons-grade uranium and plutonium. It "can provide cover for a weapons program," says Frank N. von Hippel, a physicist at Princeton University and former assistant director for national security at the White House Office of Science and Technology Policy. Voss adds that fast reactors give a country "a direct source of weapons-usable plutonium."

What is more, accidents can be very difficult to handle because the core is immersed in liquid-sodium coolant, in contrast to the water used to keep more standard reactors from overheating. Workers cannot just pop the lid to get to troubled areas because "sodium catches fire if exposed to air or water. And we live in a world of air and water," von Hippel explains. The Russians struggled through several fires to learn how to better control the technology, but von Hippel says another safety issue looms: a meltdown could lead to a small explosion that could "blow the top off a reactor" and widely disperse radioactive products such as plutonium, uranium, cesium and iodine.

Today the Russian BN-600, housed near Yekaterinburg, is the world's only commercially operating breeder reactor. Its workers are immensely proud that it has been operating for 30 years, 10 years longer than expected.

A Rosatom subsidiary, OKBM Afrikantov, has designed a BN-800 facility, now being built, and a BN-1200; the numbers in the reactor names give the power capacity, in megawatts (1,000 MW is a large reactor). The BN-800 can be modified to run on plutonium from retired nuclear weapons. A U.S.-Russia nonproliferation agreement stipulates that the BN-800 will be used to consume some of the stockpiles of Russia's weapons-grade plutonium. The BN-1200, however, is designed to produce plutonium for fuel, according to Leonid Bolshov, director of the Nuclear Safety Institute at the Russian Academy of Sciences.

Despite international hand-wringing, Rosatom has a long-term Advanced Nuclear Technologies Federal Program that envisions shifting a significant portion of its resources to breeder reactors by about 2050. The goal is a nuclear industry where all fuel is reprocessed, not dumped in unpopular storage sites. "We will have a closed fuel cycle; we have to," says Vladimir Galushkin, a passionate international coordinator at OKBM Afrikantov. "There is no other path."

#### Floating Nukes

The second controversial technology Russia is pursuing is the small modular reactor. It is a scaled-down version of the classic pressurized-water reactor. The small Russian models include spin-offs from old Soviet nuclear-powered submarines and icebreakers. They are much cheaper than the typical mammoth reactor, and they can be prefabricated to arrive at remote locations that might lack strong construction standards or a trained workforce. The drawbacks: they produce only 300 to 500 MW, and critics contend that mass production would scatter reactor risks more widely. Still, one Russian specialist, Dmitri Stazura, told me at a wind-whipped nuclear construction site in southern Russia that “mass production is a real possibility.” He was particularly excited about the VBER, a 300-MW model that will first be built for remote areas of Kazakhstan.

At the same time, Russia is trying to shoehorn its breeder-reactor technology into a mini reactor called BREST. The design uses molten lead as the coolant, which is much less reactive to air and water than sodium is. Of course, lead is a known toxic substance, “but most industries know how to deal with it,” says Kevan Weaver, director of technology development at TerraPower in Bellevue, Wash., which is developing its own fast mini reactors. “The Russians do have the most experience,” Weaver explains. They have used their reactors in at least seven submarines and have built two onshore prototypes. TerraPower tests its prototypes in a Russian facility in Dimitrograd.\*

The potential spread of many fast small reactors worries groups such as Bellona, an international environmental organization in Oslo that tracks the Russian nuclear industry. Russia has arrested and jailed nuclear whistle-blowers, including one of Bellona's contributors, a Russian ex-navy officer accused of treason. Bellona has detailed nuclear accidents on Soviet submarines and says that four subs are lying dead on the ocean floor, their reactors still presenting a hazard.

What concerns Bellona environmental researcher Igor Kudrik lately, however, is Russia's desire to mass-produce mini reactors that can float. The country's first floating plant, the Akademik Lomonosov, is partially built and is scheduled to begin operating in 2016. The idea is to have easily maneuverable 35-MW reactors that could be towed to difficult-to-access regions or energy-intensive ventures such as desalination plants, with cables running to land to distribute power.

The U.S. toyed with the idea in the 1970s but considered it too dangerous, with a high potential for contaminating entire marine food chains. “I also can't imagine that floating nuclear reactors don't pose particular security risks when it comes to terrorists,” says Sharon Squassoni, director of the Proliferation Prevention Program at the Center for Strategic and International Studies in Washington, D.C. Kudrik adds that remote locations would not have the people or gear needed to handle an accident or an incoming tsunami: “This is not a diesel generator that you can fix on your knee and restart.” Nevertheless, China, Algeria, Indonesia, Namibia and others have expressed interest.

Bolshov downplays the concerns. He notes that the plants would be placed at the shoreline. “I do not see any difference between an at-shore and onshore plant” from a security standpoint, Bolshov says. In addition to boosting exports, the floating reactors could help Russia dominate the exploitation of the Arctic's offshore petroleum reserves as climate change makes more regions accessible for drilling.

#### A Safer Option

Although Russia is promoting its exotic breeders and floating mini nukes, it is most aggressively hawking its latest generation of pressurized-water reactors, known as VVERs. The infamous reactors that melted down in Chernobyl in 1986 also relied on pressurized water to make steam, which turns a turbine to create electricity. But VVERs have a fundamentally different design and are housed in a containment building; the Soviet Union did not build such structures around the Chernobyl reactors because they were huge.

VVERs differ from those old models and from Western designs in several ways. For instance, they have horizontal steam generators, which Western experts agree are more accessible for maintenance. Russian fuel pellets also have holes in their centers, which provide better cooling for safety, according to Vladimir Artisyuk, vice rector for science and foreign affairs at the Central Institute for Continuing Education and Training in Obninsk. The biggest advances are passive safety features—systems intended to shut a reactor down without human intervention, even if the plant loses backup electricity from the outside power grid. Among the features are water tanks that can flood the core using just gravity. The reactor can also be cooled with air. “In Fukushima, this one system would have saved them,” chief engineer Viktor Vagner claims proudly at the site of two reactors under construction near Russia’s southern border.

Rosatom’s passive safety systems have already been built into India’s Kudankulam reactors, and they are making the VVER a popular choice. Rosatom is building, or has signed contracts for, 19 VVERs outside of Russia. New Western designs, such as Westinghouse’s AP1000 pressurized-water reactor, include similar features, and most experts interviewed for this story say they do not see any significant differences in safety between the Western and Russian models. One American consultant, who helps Eastern European countries assess Russian options and does not want his name used, says, “The Russians are definitely up to snuff, and it’s nice to be able to say that.”

Good design does not preclude the possibility of bad construction, however. “There are still lingering concerns over the quality of their manufacturing of parts and components, construction quality and vendor support in the longer term once the reactor is up and running,” the consultant says. Bolshov counters that Rosatom is watching those issues carefully: “Rosatom has made serious investments to have competition among manufacturers for better quality and price.”

Another reason the VVERs are considered safe is a feature meant to prevent a Chernobyl-style accident. In the days after Chernobyl exploded, the Soviet Union tasked Bolshov, then a working physicist, with somehow figuring out how to contain Chernobyl’s melting reactor core. He devised a makeshift platform of snakelike pipes cooled with water, covered with a thin graphite layer and stuffed between two one-meter-thick concrete layers. “It was done as a sandwich,” Bolshov says. Heroic coal miners dug underneath the fuming reactor and inserted the platform to “catch” the molten core before it sunk into the earth and hit the water table.

In the end, Bolshov’s creation did not have to fight the sinking core, which solidified just two meters short of the sandwich. Yet the close call paved the road for Russia’s modern “core catchers”: bowl-shaped vessels cooled by water and made of steel, iron and aluminum oxides, built directly under all of Russia’s new pressurized-water reactors. Core catchers are already buried 4.5 meters below the two VVER-1200s going up in southern Russia.

Russia views the core catcher as vital. France’s Areva design also includes one. Some experts have argued that core catchers would not have made a difference at Fukushima. But several of the plant’s reactor cores “slumped” into the concrete underneath, as von Hippel describes it, prompting him to conclude: “A core catcher is a good idea.”

M.I.T.’s Hanson and others argue, though, that the larger goal of safety engineers should be minimizing possible damage so much that core catchers are superfluous. “The public and the reactor owners will never buy the argument that a reactor is safe because it has a core catcher. Once the core is destroyed, the reactor is a total waste, and controlling the molten material after the fact does not eliminate off-site doses” of radiation, Hanson says. Westinghouse has adopted that approach; spokesperson Scott Shaw says the company’s new AP1000 does not need a core catcher. If the core were to begin melting, an operator could flood the space around the reactor vessel with water held in tanks, for up to 72 hours.

Proliferation of Worry



Rosatom's VVER plants come with another innovation, one related to cash. The company will build Turkey's first reactors—four VVER-1200s—under a unique “build-own-operate” deal akin to a 60-year rental. It is the first time the arrangement has been used for a nuclear plant anywhere in the world, but Rosatom hopes the arrangement will catch on. “This is very attractive for newcomers,” Rosatom's Novikov says.

This rental plan, yet another part of Russia's effort to widen access to nuclear technology, worries proliferation watchers, particularly when it comes to the Middle East. Russia has completed Iran's only reactor, a VVER-1000, and has trained Iranian technicians in nuclear energy. The West fears that Iran is using its knowledge to develop clandestine weapons.

“It's hard not to look at the interest in civilian nuclear reactors in Turkey and other countries in the region as part of a hedging strategy,” says Eric Edelman, former U.S. ambassador to Turkey. Although nuclear reactors are a far cry from nuclear weapons, expertise in nuclear technology and access to the nuclear fuel cycle, he says, “still opens the door for a more proliferated Middle East.” Henry Sokolski, executive director of the Washington, D.C.-based Nonproliferation Policy Education Center, agrees that training could potentially be used for nefarious purposes. “I don't care how proliferation-proof the hardware is—the training isn't.”

Some naysayers also claim that reactors could be run to generate plutonium. Yet “plutonium from a pressurized-water reactor is isotopically wrong for bombs,” says Robert Kelley, a former program manager for nuclear intelligence at Los Alamos National Laboratory and a former International Atomic Energy Agency inspector. “It doesn't bother me in the slightest that Russia is selling pressurized-water reactors.” The real problem, he says, would be with enriching or reprocessing nuclear fuel, ramping it up to weapons-grade material.

By agreeing to take back and permanently store nuclear waste, “Russia is providing something very worthwhile from a nonproliferation perspective,” von Hippel says. And “the Russians are good at keeping in compliance with regulations,” says Hanson, who leads an M.I.T. program on the developing world's desire for nuclear energy. He would rather see worrisome nations opt for Russia's one-stop-shopping approach to nuclear development than conduct nuclear projects on their own.

#### The Next Generation ... of People

Whether Russian training of foreign nuclear workers raises concern or not, it is vital to preventing reactor accidents, many of which are caused in whole or in part by human-operator error. “Even small reactors require training people up in a big, big way,” Sokolski says.

Russia has been training newcomers in Obninsk, a two-hour drive from Moscow. New dorms and classrooms are being added here to old ones to handle a flood of foreigners expected in the coming years. Far from home, the first of some 600 Turkish students who will study here—baby-faced and hopeful—sip tea and look to their bright futures as their country's first nuclear workers.

“Thank God there's Skype” to break the tedium, 21-year-old Gökc,ehan Tosun says in a coffee shop near her dorm. Next to her is Olgun Köse, practicing his English, a relief after months of grueling Russian lessons. “We've seen much cold, we've seen minus 35 degrees,” he says, his eyes widening at the memory of his first Russian winter. Yet with guaranteed careers and good salaries ahead, they are the envy of their friends.

Later that night some of the Turks will play in a band, Rockkuyu, after Turkey's Akkuyu nuclear project. Köse talks of how oil is “finished,” how solar is too expensive, and how nuclear energy is green, “fast and beautiful.” The students believe the new reactors will give Turkey, and themselves, entrée into a scientifically advanced and sustainable future. “Turkey will grow up,” Köse says.

And Russia will be right there to help them.

\*Erratum: This paragraph incorrectly states that TerraPower is developing its own fast mini reactors. It is developing fast reactors that are not considered "mini." It also erroneously reports the company uses a Russian facility in Dimitrovgrad to test its prototypes. Rather, TerraPower tests nuclear materials there.

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