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IMPLICATIONS OF A U.S.-SAUDI ARABIA NUCLEAR COOPERATION AGREEMENT FOR THE MIDDLE EAST

HEARING

BEFORE THE

SUBCOMMITTEE ON
THE MIDDLE EAST AND NORTH AFRICA

OF THE

COMMITTEE ON FOREIGN AFFAIRS
HOUSE OF REPRESENTATIVES

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IMPLICATIONS OF A U.S.-SAUDI ARABIA NUCLEAR COOPERATION AGREEMENT FOR THE MIDDLE EAST

WEDNESDAY, MARCH 21, 2018

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON THE MIDDLE EAST AND NORTH AFRICA,
COMMITTEE ON FOREIGN AFFAIRS,
Washington, DC.

The committee met, pursuant to notice, at 2:00 p.m., in room 2172 Rayburn House Office Building, Hon. Ileana Ros-Lehtinen (chairman of the subcommittee) presiding.

Ms. ROS-LEHTINEN. The subcommittee will come to order.

Thank you so much to our panelists, thank you to the audience and, most especially, thank you to our—to the members of our subcommittee and some visitors that we might—we might have join our subcommittee today.

And after recognizing myself and my good friend, the ranking member, Mr. Deutch, for 5 minutes each for our opening statements, I will then recognize other members seeking recognition for 1 minute.

We will then hear from our witnesses and without objection, ladies and gentlemen, your written statements will be made a part of the record and members have 5 days to insert statements and questions for the record, subject to the length limitation in the rules.

The chair now recognizes herself for 5 minutes.

Just last week in an interview aired on CBS News, the crown prince of Saudi Arabia stated, "But without a doubt, if Iran developed a nuclear bomb, we would follow suit as soon as possible."

This interview aired just days after Energy Secretary Rick Perry flew to London to discuss a 123, or nuclear cooperation agreement, with senior Saudi officials.

Saudi Arabia is planning to build two nuclear reactors along the Persian Gulf in the near future with plans to expand to at least 16 reactors across the country.

But what should alarm us all is Saudi Arabia's insistence that it be allowed to have enrichment and reprocessing capabilities and statements about acquiring a nuclear weapon.

The crown prince's interview just last week is reason enough to have the administration pump the brakes on the negotiations and insist that there will be no 123 Agreement that includes enriching and reprocessing.

Unfortunately, from the little we do know from the administration, it is looking at this deal in terms of economics and in terms of commerce, and national security implications only register as a minor issue, if at all.

I am not completely opposed to the Saudi—to Saudi Arabia having a peaceful nuclear program. But the idea of Saudi Arabia having a nuclear program with the ability to enrich is a major national security concern.

There are security risks to consider. As we all know, the Middle East is a region that's constantly ensnared in conflict and instability or on the verge of conflict and instability.

We don't need to look further than on Saudi Arabia's own borders where the kingdom is leading a coalition against the Iranian-backed Houthis in Yemen.

The Houthis already targeted Riyadh's airport in a missile attack. Hezbollah is amassing its presence in Yemen and you can be sure that any nuclear infrastructure that goes up will be a target as well.

There are also proliferation risks to consider and the precedent that we may set if we allow Saudi Arabia to enrich, as other countries in the region will want similar capabilities.

When we negotiated the UAE 123 Agreement, our partners in the UAE voluntarily agreed to renounce enrichment and reprocessing capabilities and technologies.

This was a watershed agreement and has become what we now know as the gold standard. The previous administration abandoned the pursuit of the gold standard for all nuclear cooperation agreements after the UAE deal and it appears that the current administration, sadly, is following suit.

And that is why yesterday I joined our colleague from California, Mr. Sherman, in sending a letter to the administration urging it to pursue nothing short of the gold standard in its negotiations with the Saudis.

Without those assurances, we feel it would be necessary to oppose the agreement. There are too many concerns. There is no justification for our friends in Saudi Arabia to have enrichment and reprocessing capabilities.

Unfortunately, the way that the current system is set up, as you know, it is rigged in favor of the administration—any administration—getting its 123 agreements approved no matter what.

When the administration submits its agreement to Congress for our review period, we have hearings and we debate the merits of the agreement.

But then the only way that Congress can block the proposals is by passing a joint resolution of disapproval. Not only would Congress need a majority of votes for the disapproval, we would need a large enough majority in order to override the President's veto.

And that is not how it should work. These are agreements that have great national security implications, we should all have robust debate.

All of these deals should be thoroughly vetted and then, if there is no gold standard, Congress should have to vote to approve the proposal and say in the affirmative we agree with the President—yes, this is a good deal.

And that is why Brad and I, along with Judge Poe and Ranking Member Keating of our Nonproliferation Subcommittee introduced a bill today that would amend this process.

It's called the Nuclear Cooperation Reform Act. We want to amend the Atomic Energy Act. That's the underlying law that governs these 123 Agreements and the approval procedures so that Congress reasserts our proper oversight role.

Our bill would force a vote of approval on any 123 Agreement that falls short of the gold standard, and that's the way it should be. We should not allow these agreements to come into force passively and we should not cede our authority to oversee and approve these agreements to the executive branch.

I look forward to hearing from our witnesses on this plan, and with that, I very much look forward to the statement—opening statements from our ranking member, Mr. Deutch of Florida.

Mr. DEUTCH. Thank you, Madam Chairman.

Thanks for calling today's hearing. Thanks for our witnesses. For many members, today is an opportunity to explore both the positives and negatives of a nuclear cooperation agreement with Saudi Arabia.

We look forward to a productive discussion about this important subject. We, in the United States Congress, are strongly committed to ensuring only responsible and peaceful use of nuclear technology around the world and preventing the proliferation of nuclear weapons technology.

We also understand the role energy security plays in the prospects for long-term stability in the Middle East. As such, the United States has demonstrated high standards for nuclear agreements in past negotiations.

The U.S. agreement that paved the way for the United Arab Emirates to begin its nuclear energy program has been praised as upholding the gold standard of 123 Agreements for its prohibition on enrichment and reprocessing.

As more Middle East nations seek to diversify their energy portfolios and limit their reliance on fossil fuels, we now must ask ourselves if the gold standard is the bar that the United States must always uphold.

I believe in working to boost the U.S. economy but not at the expense of our commitment to good decision making on sharing our nuclear technology.

Saudi Arabia is a strong ally in the Middle East and has consistently shared U.S. priorities to counter terrorism and limit the spread of dangerous Iranian-backed groups and militant ideology.

The kingdom, however, continues to lag on several fronts including human rights, governmental and business transparency, and military deficiencies.

Its government, military, and private sector see large influx—a large influx of funding but still suffers from mismanagement and inefficiencies stemming from the reliance on patronage, corruption, and nepotism.

Promotions based off lineage rather than expertise, corruption and other bad practices will continue, I am afraid, to limit Saudi Arabia from thriving and growing.

Reform is happening, albeit slowly, and we should be supportive of the steps the government has taken to address some of these shortcomings. Shakeups or trying to remove corruption and make industries and ministries more efficient.

The reforms have touched high levels of Saudi Arabia's government, military, and private sector including concentrated efforts to root out corruption and graft at Aramco before a highly-anticipated public offering that aims to build investor confidence and address criticism of widespread corruption and a lack of transparency at the company.

Only time and transparency will tell if these reforms will see Saudi Arabia make honest efforts to turn its back on bad practices. But we continue to be hopeful and we continue to watch the rapid pace of reforms, especially as the changes may have important implications on the country's stability and ability to safely manage something as important as nuclear technology.

This comes at a time when nuclear technology is an increasingly important factor in Middle East relations and the battle for influence between Iran and Saudi Arabia.

Past discussions with the kingdom fell short when Riyadh dismissed core aspects of the gold standard agreement with the UAE, mainly centering on its priority to retain the right to enrich uranium.

Concessions to Saudi Arabia could threaten the UAE deal and set the bar for future nuclear technology negotiations.

Conversely, the United States maintaining a hard line on this matter could conceivably push Riyadh to sign a nuclear deal with one of the other countries it gets in discussions with, the most concerning being Russia or China, both of which have lax standards, quality, and restrictions.

Russia or China being the signatory on a nuclear deal would also increase those nations' sway in this key region with our key ally, potentially limiting American influence.

The future of Saudi Arabia's nuclear program also has important implications on the Joint Comprehensive Plan of Action with Iran, which limits uranium enrichment but only for a set period of time.

The U.S. attempting to restrict Saudi enrichment may be viewed as unfair in light of Iran potentially having the ability to restart this technology if it continues to adhere to the tenets of the plan.

Now, I have long raised serious concerns about the sunsets in the JCPOA. But we have to draw some distinctions. The key difference is that Iran was already enriching uranium and the goal was to prevent Iran's enrichment program from building up its stockpile of highly enriched uranium that is necessary for a nuclear weapon.

Saudi Arabia will be building this ability anew. Obviously, uranium enrichment is no small factor and its implications for a nuclear weapons program are extremely concerning.

And while Riyadh assures the world that it only wants peaceful nuclear technology to boost and diversify its energy sector, the country also is on record saying if it believes Iran is building a nuclear weapon it will quickly follow suit.

Last week, the Crown Prince stated, as the chair already pointed out, Saudi Arabia does not want to acquire a nuclear bomb but

without a doubt if Iran developed a nuclear bomb we will follow suit as soon as possible.

The fact that there are ample enriched uranium reserves on a global market that would be a higher quality and cheaper for Saudi Arabia to import rather than try to initiate its own enrichment capability leads me to think the catalyst for wanting this technology is to maintain parity with Iran rather than for energy uses.

The potential boosts for the U.S. economy and renewal of the U.S. nuclear industry are indeed desirable. But it hasn't been made clear what we can feasibly expect.

It's worth discussion today about how much funding it would take to revive the industry, given the amount of government funds most other countries that produce nuclear technology put into their industries.

The risks are high and will absolutely set a precedent that will follow us for decades to come. We don't take this decision lightly and I am very grateful to our panel. I hope for a productive discussion that may illuminate some of these key gaps.

Thank you, Madam Chair.

Ms. ROS-LEHTINEN. Excellent points. Thank you so much, Mr. Deutch.

And now I am going to recognize the members. Mr. Chabot of Ohio.

Mr. CHABOT. Thank you, Madam Chair, for holding this important hearing today and I'll be very brief so that we can get to the witnesses.

Whenever we discuss the transfer of nuclear technologies there is always cause for concern and, unfortunately, the conversation we are having today would be completely different without a resurgent Iran.

The Saudis have to deal with an Iran bent on dominance for the foreseeable future. President Obama's Iran deal provided Tehran with the cash to expand its influence throughout the Middle East and since the JCPOA was agreed to, we have seen the mullahs develop ballistic missiles and fight proxy wars throughout the region, and on and on.

Worse, the JCPOA makes it a virtual certainty that Iran will develop a nuclear weapon. Iran's nuclear ambitions raise the specter that other nations will be forced to follow suit, Saudi Arabia in particular.

So, Madam Chair, thank you for calling this distinguished panel here today at this very critical time, and I yield back.

Ms. ROS-LEHTINEN. You are so right.

Thank you so much, Mr. Chabot.

And Ms. Frankel of Florida.

Ms. FRANKEL. Thank you, Madam Chair. Thank you to the ranking member. Thank you both for your very articulate thoughtful comments.

I just want to start by saying that we need to do everything possible to prevent nuclear proliferation. Even a country that we think are our friends, you just never know whose hands these weapons will fall into at a later date.

What worries me is that we have a President who wrote this book, "The Art of the Deal," who believes that success is based

upon how much money you make and I think there is some thinking in the administration's part that our participation in this agreement could reap billions of dollars for the U.S. economy.

I know everyone here thinks there is much more at stake than that. Mr. Deutch raised, I thought, an interesting dilemma, which is, you know, damned if you do, damned if you don't, because if it was just up to us and we said no, we are not going to get into this agreement with you and that was the end of it, I think that would be easy.

My concern is and what I'd like to hear from you is what happens if we don't have an agreement and we just leave it for the Saudis to go and make one with Russia or China. I think that's the big dilemma here.

Anyway, thank you for being here and I look forward to your testimony.

Ms. ROS-LEHTINEN. Good points, Lois. Thank you so much.

Mr. Wilson of South Carolina.

Mr. WILSON. Thank you, Chairwoman Ileana Ros-Lehtinen, for convening this important hearing.

I applaud the Trump administration for their aggressive advocacy on behalf of the U.S. nuclear technology in Saudi Arabia.

The energy landscape in Saudi Arabia and the entire Gulf Cooperation Council region is shifting dramatically with a strong interest in renewable energy and particularly nuclear power.

The facts are clear. Saudi Arabia will construct civilian nuclear reactors. The only remaining question is who will build them.

I believe the commercial interests and national security interests are intertwined, with suppliers of this technology gaining decades of influence over regional energy security and nonproliferation standards.

Sadly, the American nuclear industry has experienced setbacks at home with only two reactors under construction at Plant Vogtle, adjacent to the district I represent in Georgia. The United States should be doing everything in its power to find new and emerging markets for its nuclear technology.

Later today I am grateful to introduce a resolution with Congressman Don Norcross of New Jersey aimed at promoting a comprehensive U.S. strategy to engage in the developing energy market across the entire Gulf Cooperation Council region, especially with regard to nuclear power.

This will include aggressive negotiation of peaceful nuclear cooperation agreements with the remaining GCC countries just as the administration is now doing with Saudi Arabia.

I yield back. Thank you.

Ms. ROS-LEHTINEN. Thank you very much, Mr. Wilson.

Mr. Sherman of California.

Mr. SHERMAN. Thank you for holding these hearings and allowing me to participate.

We already have a gold standard template for 123 Agreements or nuclear cooperation agreements. We have one with the United Arab Emirates, signed in 2009, which prevents reprocessing and enrichment.

Saudi Arabia also wants a nuclear cooperation agreement with us, yet they balked at the idea of such restrictions. We need a gold standard agreement.

Yesterday, I joined with the chair of this committee in writing a letter to the secretary of energy on this issue, urging that we press for a prohibition of enrichment and reprocessing in the nuclear cooperation agreement. Today I join with the chairwoman, Congressman Ted Poe, and Congressman Bill Keating, the respective chairman and ranking member of the subcommittee on nonproliferation in introducing the Nuclear Cooperation Reform Act of 2018, to provide stronger congressional influence in the process of agreeing to nuclear cooperation agreements and requiring an affirmative vote of Congress before we enter an agreement that does not meet the gold standard.

Two points I want to make about Saudi Arabia. First, just because they are anti-Iran does not mean they are a Jeffersonian democracy. And second, even if you find MBS, who's here in Washington, to be utterly charming or pro-American, remember that the Shah seemed utterly charming and pro-American or at least pro-American back in 1978 and 1979, and all the weapons under his control are now in the control of the Islamic Republic.

So we need to be careful and not allow Saudi Arabia to develop a nuclear weapon just because we are worried about the nuclear program in Iran, and I yield back.

Ms. ROS-LEHTINEN. Thank you so much, Mr. Chairman.

And seeing no other requests for time, I am proud to introduce our witnesses.

First, we are delighted to welcome back a good friend, Henry Sokolski, executive director of the Nonproliferation Policy Education Center.

Prior to this, Mr. Sokolski served as Deputy for Nonproliferation Policy in the Office of the Secretary of Defense, and before that he worked in the Secretary of Defense's Office of Net Assessment on strategic weapons proliferation issues.

Thank you for being here with us again, Henry, and we look forward to your testimony.

Next, we are delighted to also welcome back a good friend, Mr. William Tobey, senior fellow to the Belfer Center for Science and International Affairs and director of the U.S.-Russia initiative to prevent nuclear terrorism.

Previously, Mr. Tobey served as Deputy Administrator for Defense Nuclear Nonproliferation at the National Nuclear Security Administration.

Mr. Tobey also served on the National Security Council staff under three Presidents and we look forward to your testimony as well, Mr. Tobey.

And finally, we are delighted to welcome Ms. Sharon Squassoni, research professor of practice and international affairs at the Institute for International Science and Technology Policy at the George Washington University.

Prior to this position, Ms. Squassoni directed the Proliferation Prevention Program at the Center for Strategic and International Studies in Washington, DC.

She has also served at the State Department and in the Congressional Research Service. Great to have you here, Ms. Squassoni.

We thank all of our witnesses for braving the weather and agreeing to see this hearing through despite the snow. So we greatly appreciate your commitment to this important matter.

And as I had said, your written statements will be made a part of the record. Please feel free to summarize, and we will begin with Mr. Sokolski.

Probably move that microphone a little closer. Thank you.

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

Mr. SOKOLSKI. Thank you very much for holding this hearing and showing your true grit in sticking to your flight plan, getting us all here despite our whining and complaints.

This, I understand from my staff, is the thirteenth time I have appeared before you to testify on nuclear policy issues.

Ms. ROS-LEHTINEN. You have got to make it interesting, like Elizabeth Taylor said to her fifteenth husband.

Mr. SOKOLSKI. Well, I'd like to. [Laughter.]

Yes. Well, I do rhyme a lot. I apologize for that.

I think it's a providential number at this time. I am counting on it. This is even not the first time I've testified about the legislation that you have pushed.

In this regard, I want to say that it's been a privilege to work with you and your staff on so many of these issues since 1995. Your willingness to take these issues on actually keeps my faith in this institution.

Actually, it helps me to get up in the morning and not be discouraged, and I say that about your example. I hope I haven't overdone it. But you can tell I actually think this.

So I want to ask permission to put four items into the record.

Ms. ROS-LEHTINEN. Without objection.

Mr. SOKOLSKI. Okay. I am not going to go over detailed, footnoted, rather detailed testimony but to emphasize three points.

First, I would plead with all the members here not to buy the prevailing narrative regarding the proposed nuclear deal with the Saudis. The U.S. has leverage. It should use it.

Second, after the Crown Prince's performance on "60 Minutes," the key concern about the deal ought not to be to what extent it does or does not promote American nuclear exports, but whether it green lights Riyadh's desire to get a bomb.

Third, H.R. 5357, the Nuclear Cooperation Reform Act, which demands a congressional vote of approval for nuclear cooperative agreements that fail to have the gold standard with regard to WPT nonweapon states is long, long overdue.

I'll focus the balance of my time, if I may, on that narrative, which, roughly, is the Saudis must have nuclear power because they are running out of fossil fuels. We are all going to get rich selling them as many as 16 reactors—American reactors—but that if we insist on the gold standard and don't rush to get congressional approval of an agreement that would be more permissive of enriching and reprocessing, our best friend in the Gulf will bolt, buy from the Russians and Chinese, and we will lose influence.

The truth is the Saudis don't need nuclear power to meet their energy and environmental goals, much less to enrich uranium or reprocess spent fuel. Their neighbor, the UAE, announced that it will not be building any more nuclear power plants but instead will invest in cheaper, quicker, nonnuclear energy sources.

Ms. Frankel, I can just say to you the odds of Riyadh buying Russian are about as likely as them buying it from the Iranians because, effectively, they are that close and I don't think we have to worry about that. Nor do I think the Chinese or French products for a variety of reasons, offer any attraction. I think it's going to be South Korean if it's going to be anything.

As for getting rich, few now believe the Saudis will be buying 16 reactors. The Nuclear Energy Institute's own recent analysis now allows that by 2040, at most, the Saudis might build eight and perhaps as few as four, while others supporting a non-gold standard Saudi deal have even allowed that we'd be lucky if they build even one.

The last point is something to focus on. If, as the Crown Prince made clear in the "60 Minutes" performance that Saudi Arabia is intent on getting a bomb as soon as possible, he could do so by using one or both of the two 100-megawatt electrical South Korean research reactors that he has already bought and does not require a 123 on. This system would afford, roughly, six times the plutonium production capacity of Israel or India or North Korea when they started off.

It would be a sufficient bomb starter kit either for the production of plutonium or to serve as a cover to procure what would be needed to enrich or reprocess.

The takeaway here is that we need to get the Saudis to accept the gold standard, even if they don't buy American. Otherwise, we risk leaving the door open for them to get the bomb.

One last comment—some argue that one bomb will neutralize another bomb—that a Saudi bomb will neutralize an Iranian bomb—that one plus one equals zero.

That's fuzzy math. Where I come from, one plus one equals two and in the Middle East it quickly turns into a much higher number.

Thank you very much.

[The prepared statement of Mr. Sokolski follows:]

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Keeping the Middle East from Becoming a Nuclear Wild, Wild West

Testimony

By

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Presented before

A Hearing of

The House Foreign Affairs Subcommittee on the Middle East and North Africa

Implications of a U.S.-Saudi Arabia Nuclear Cooperation Agreement for the Middle East

House Rayburn Office Building 2172

March 21, 2018

The following is divided into three sections. The first is a testimony overview. The second is a rundown of why Congress should be wary of any US nuclear deal with Riyadh that fails to ban Saudi enrichment and reprocessing as is required in the 2009 nuclear cooperative agreement with the United Arab Emirates (UAE), who's nuclear nonproliferation requirements Are referred to as "the Gold Standard." The last section makes the case for proposed legislation that would require a majority vote in both houses of Congress before a US nuclear cooperative agreement with a non-weapon state can come into force if it fails to include these Gold Standard nuclear nonproliferation conditions.

Overview

Failure to require Riyadh to forswear enriching or reprocessing in the text of a US-Saudi nuclear agreement (either by excluding this condition or proposing to put a sunset on it) risks pouring kerosene on the embers of nuclear proliferation already present in the Middle East. Last Sunday, Crown Prince Mohammed Bin Salman threatened to withdraw from the Nuclear Nonproliferation Treaty, insisting in a *60 Minutes* interview that "If Iran developed a nuclear bomb, we will follow suit as soon as possible."[1] The Saudi government also has made it clear that intends to be "self-sufficient" in nuclear fuel making.[2]

This is unprecedented. Unlike official public comments made during the negotiation of previous US civil nuclear cooperative agreements, these Saudi statements lay bare for all to see exactly what the security implications of failing to get Riyadh to forswear enriching and reprocessing will be. It's quite clear the Saudis are interested in a nuclear weapons option that can be exercised, if needed, "as soon as possible." That, rather than any economic purpose, is why the Kingdom is seeking US nuclear assistance and is insisting on its "right" to enrich and reprocess.

If our government green lights such Saudi efforts by failing to uphold the Gold Standard, no one will be fooled as to what we are doing: Instead of upholding the last 73 years of American and international efforts to limit the spread of nuclear weapons by tightening nuclear controls, our government will be doing just the opposite, playing a risky game of nuclear chicken between Riyadh and Tehran. What's worse, this competition will not be limited to just the Saudis and Iranians.

Administration officials may also renew, revise, or cut additional nuclear cooperative agreements with Jordan, Egypt, Turkey, Morocco, and the UAE. As a practical matter, there will be tremendous pressure to have these understandings track whatever we allow the Saudis, turning an already troubled Middle East into a nuclear Wild, Wild West. In this new, nuclearized arena, not just Iran and Saudi Arabia, but their largest neighbors will gain the nuclear technology they need to join the nuclear-armed ranks of the Israelis and Pakistanis. The hope, against almost all experience, is that deterrence will work perfectly in one of the world's most imperfect, unstable regions. As for what might follow if such deterrence fails, the mind boggles — think a nuclear 1914.

To avoid this, it is essential first to hold the line by insisting on the Gold Standard conditions in the US-Saudi nuclear cooperative agreement. Second, the United States must hold the same line with agreements it might negotiate with Riyadh's neighbors and to work with the world's three key nuclear reactor supplier states — France, China, and Russia — and the three key uranium fuel supplier states – France, the British-Dutch-German URENCO consortium, and Russia -- to tighten nuclear restraints on their civil nuclear exports as well. Finally, along with others, the United States needs to convince Iran to back off its enrichment efforts. To be sure, this is a tall order. That said, not to try all but assures a failure of the most horrific kind.

As for the proposed legislation, the House Foreign Affairs Committee did the right thing in 2011 when it unanimously approved an earlier version of the bill. Given the nuclear proliferation developments that have transpired since the last major revision of the rules governing nuclear cooperative agreements in 1978, approval of such legislation is long overdue.

Why Congress should be wary of a US-Saudi nuclear agreement that fails to uphold the Gold Standard:

First, it risks igniting a nuclear arms race starting in the Middle East. Language in the current UAE and Egyptian nuclear cooperative agreements with the US explicitly stipulates that if Washington seals a nuclear deal with any other Middle Eastern state that is more "favorable in scope and effect" than what Cairo and Abu Dhabi were able to secure, the UAE and Egypt have the right to demand "equal terms and conditions."[3] In theory, the United States could try to resist such demands. In practice, Washington would be under tremendous pressure to cave. Egypt's nuclear cooperative agreement with the United States is up for renewal in 2021. Then, there is Turkey—its agreement is up for renewal in 2023– and Jordan, which the United States has long sought to strike a nuclear cooperative agreement with. Egypt, Turkey, and Jordan all insist they have a right to enrich and reprocess. Once our government opens the door for the Saudis to do so, these states will demand no less. How this impacts Israel, other than negatively, is unclear. Last week, Prime Minister Netanyahu told the Senate Foreign Relations Committee, the President, and the Israeli cabinet that the United States should cut no nuclear deal with Saudi Arabia *unless* it clearly prohibits enrichment and reprocessing.[4]

Assuming our government goes ahead, it is uncertain what Israel, which already has nuclear weapons, might do.* It is worth noting, however, that every large reactor in the region — Israeli, Iranian, Syrian, and Iraqi —has either been bombed or targeted with aerial attacks. In each case, the attacking state was concerned that weapons plutonium or uranium was either being or might be produced. This worry, perhaps more than any other, is why the United States insisted in 2009 that the UAE forswear enriching or reprocessing in the text of the nuclear cooperative agreement. It was understood that without such a legally binding pledge, the UAE's program would be viewed warily by its neighbors. If the United States is serious about promoting peaceful nuclear power in the region, it needs to get *more* states in the region to adopt this standard, not fewer.

Finally, states outside the Middle East are watching. South Korean President Moon Jae-in wants to build nuclear submarines. These would require enriched uranium fuel. The current US-ROK civilian nuclear

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* It should be noted that the last time the United States made an exception from its nonproliferation policies and legal requirements not to promise to transfer controlled nuclear commodities to another close friend, India, Israel quietly petitioned for equal treatment (See Glenn Kessler, "Israel Submits Nuclear Trade Plan," *The Washington Post*, September 30, 2007, available from http://www.washingtonpost.com/wp-dyn/content/article/2007/09/29/AR2007092901530.html). Neither country is a member of the NPT. The US deal did require New Delhi to open portions of its civilian nuclear program to international inspections. India also, however, accrued significant, indirect weapons benefits from the "peaceful" commerce the US nuclear deal made possible, which has allowed it to expand its military nuclear production significantly. (See Adrian Levy, "India is Building a Top-Secret Nuclear City to Produce Thermonuclear Weapons, Experts Say," *Foreign Policy*, December 16, 2015, available from http://foreignpolicy.com/2015/12/16/india_nuclear_city_top_secret_china_pakistan_barc/ and Mansoor Ahmed, "Addressing South Asia's Fissile Material Conundrum," The Stimson Center, February 20, 2018, available from https://www.stimson.org/sites/default/files/file-attachments/Off%20Ramps%20Mansoor%20Ahmed%20-%20Final.pdf).

agreement only allows the ROK to enrich uranium if it first secures US permission, which Washington has yet to grant. If the United States allows the Saudis to enrich uranium and reprocess spent reactor fuel, though, Seoul would likely step up its demands, arguing, that as a close security ally, it should be afforded equal treatment for its planned submarines. Needless to say, this nuclear activity could also be used to support a nuclear weapons option.[5] Assuming Seoul persuaded President Trump to relent and honor its request, the responses of Japan, North Korea, and China could be dramatic.[6]

Second, Riyadh's interest in enriching and reprocessing is difficult to explain — *unless* it wants a bomb option. In 2012, the Saudis announced their intention to build sixteen reactors by 2032. By 2017, Saudi planners had pushed this back to 2040. Shortly thereafter, Crown Prince Mohammed bin Salman backed a national development plan for 2030 that didn't mention nuclear power but instead focused on investing in renewables. Most recently, the Saudis announced that instead of opening bidding on sixteen large power reactors, they are only soliciting bids for two. Some analysts contend that this slippage reflects the Kingdom's desire to finance reactor construction with its oil revenues.[7] With the price of oil dropping from $100 a barrel several years ago to roughly $60 a barrel today, the schedule for nuclear construction, they argue, had to slide. A more compelling explanation, however, is that Riyadh doesn't need nuclear power. Recent analyses have determined that the Saudis could more cheaply and more quickly meet their energy and environmental requirements by developing their natural-gas resources and investing in renewables—photovoltaic, concentrated solar power and wind. These analyses also found economic value in the Kingdom upgrading its electrical grid and reducing government subsidies that artificially drive up electrical demand. These findings are hardly surprising. The UAE, Riyadh's next-door neighbor, which began construction of four power reactors several years ago, just announced it would not be building any more nuclear plants.[8] Why? Cheaper alternatives: In addition to plentiful natural gas and wind resources, the Emirates are now investing in photovoltaic systems and solar thermal storage systems, which together can operate twenty-four hours a day more cheaply than nuclear.[9] These findings also apply to Saudi Arabia, which has begun working on all of these options.[10]

As for the Saudis enriching their own uranium, the economic case, again, is negative. Uranium is plentiful globally from a variety of suppliers and priced at historic lows (less than $23 a pound)[11], as are uranium-enrichment services.[12] If the Kingdom is anxious about security of supply, it would make far more economic sense for it to buy long-term contracts for uranium ore and enrichment services than to spend billions on a variety of plants (besides a large centrifuge facility) that would be needed to produce its own nuclear fuel. Even under the most optimistic of scenarios, investing in such an undertaking would only make economic sense after the Kingdom had most or all of its planned 16 large reactors up and running sometime after 2040.[13] It currently has no reactors operating and has only opened a process for buying two. All of these facts help explain Crown Prince Salman's comment that if Iran got the bomb, the Kingdom would "follow suit as soon as possible" and why he insists his country should be allowed to reprocess and enrich. The two points are tightly related: One is the goal (to get a bomb quickly if needed); the other is the means (having the ability to produce and stockpile nuclear weapons uranium and plutonium). This is not something Washington should be a party to. Instead, it should uphold the Gold Standard, help Saudi Arabia with safer nonnuclear energy options, and push these policies throughout the Middle East, including Iran.

Third, failure to secure the Gold Standard with Riyadh, when Washington has the leverage to do so, risks *reducing* US strategic influence in and outside the region. As I've explained in detail elsewhere, the Saudis are unlikely to buy reactors from France, the US, or China.[14] In each case, the export models being pitched for export have not yet operated and, where they are being built, are dramatically behind

schedule and over budget. Meanwhile, the Russians' export reactor (the VVER-1200) has an extremely limited, troubled safety record. More important, given the Saudis' interest in developing a bomb option, Riyadh will be hard-pressed to trust the Russians to keep their confidences, as the Russians have long provided sensitive nuclear technology to their Iranian adversaries and cooperated with Iran in fighting against the Kingdom's interests in Syria.

Who might Riyadh, then, buy from? The Kingdom's original nuclear bid requirements were for two reactors that would produce 2,800 megawatts. There is only one proven, operating reactor that can meet this requirement — South Korea's APR 1400. This reactor is up and running in South Korea, is fully and properly safety certified, and is being built (in the UAE) roughly on time and on budget. The APR 1400 bid also has one other clear advantage: The construction crews finishing their work on the Korean reactors in the UAE are tried and true and can be easily dispatched to complete APR 14009 construction work in the Kingdom. In fact, the Saudis changed their bid requirements to permit reactors other than the APR 1400 *only* after US, Chinese, Russian, and French reactor vendors all complained.

In any case, the South Koreans are most likely to win the bid. Given the APR 1400 reactor's American technical content, senior Korean officials are convinced they cannot export it to the Kingdom unless the Saudis first reach a nuclear cooperative agreement with the United States.[15] For this reason (and others besides), Washington has serious leverage over Seoul and what nonproliferation conditions it might chose to place on its Middle Eastern nuclear exports. It would be remarkable if our government chose not to use this leverage. Seoul would surely spot this and would likely demand equal treatment regarding its desire to enrich. As already noted, Egypt, Turkey, Jordan, and the UAE would also take notice. But there's more. Besides the awkward optics of looking like a version of the 2015 Iran nuclear deal (which President Trump says is "the worst deal ever" because it allowed enrichment),[16] a permissive deal with Riyadh that failed to include the Gold Standard would make a hash of the President's announced desire to get Germany, the European Union, the UK, France, Russia, and China to work with Washington to "fix" the Iran deal and its enrichment provisions. I have already noted the concerns of our key ally in the region, Israel, and Netanyahu's request that the United States make a prohibition on enrichment and reprocessing a precondition of any nuclear cooperation with the Kingdom. Clearly, bending to Saudi nuclear ambitions to enrich and reprocess will only reduce, not increase, Washington's "wins" for nuclear influence with all of these states.

The case for requiring Congress to vote to approve nuclear Cooperative Agreements that fail to include the Gold Standard

It's been 40 years since Congress updated the Atomic Energy Act to reflect the latest insights into what the safety margin should be between "peaceful" nuclear activities and materials and nuclear bomb making. Congress incorporated its first thoughts on this issue in the Atomic Energy Act of 1946. At the time, Congress and the Executive Branch were wary of sharing any nuclear technology, peaceful or military, with any foreign government. With the further development of experimental power reactor designs, though, Congress reconsidered and amended the act in 1954 to promote Eisenhower's Atoms for Peace Program. As a result of this program, the United States actively shared the means to make and separate plutonium, a nuclear weapons explosive, on the mistaken assumption that bilateral and international inspections would be sufficient to prevent its misuse.

India's 1974 nuclear weapons test literally blew this assumption away. Thinking it had clear assurances that New Delhi would not use its help to make bombs, Washington helped India get the reactor, the

heavy water to run it, and the reprocessing plant that produced the plutonium New Delhi used in its first "peaceful" nuclear test. At first, State Department officials denied that India had used US-exported heavy water. This, however, proved to be untrue. When Congress found out, it amended the Atomic Energy Act in 1978, tightening controls over reprocessing and enrichment of US nuclear materials and the export of the most dangerous "peaceful" nuclear technology and hardware. Congress also required that a majority of both houses of Congress approve any proposed US civilian nuclear agreement with non-weapons states that did not place all of their nuclear facilities under international nuclear inspections. Experts hoped that these conditions would be sufficient to afford a sufficient margin of safety against the possible diversion of exported civilian nuclear goods to bomb making.

Unfortunately, the last 40 years suggest otherwise. Iraq used its internationally "safeguarded" nuclear program to support its nuclear weapons program. North Korea did the same, openly reprocessing spent fuel and stockpiling plutonium, insisting it had a "peaceful" right to do so. Syria, meanwhile, imported and constructed a covert nuclear production reactor from North Korea even while its nuclear program was supposedly under "full-scope" international nuclear inspections. Iran's insistence on a "right" to enrich and the worrisome practical and diplomatic fallout is too well known to need review. In each of these cases, though, finding a clear violation of any binding commitment was extremely difficult or impossible to make. Finally, in recognition of these developments, the Bush and Obama administrations successfully negotiated a new, tough set of nuclear nonproliferation conditions for the US-UAE deal, known as the Gold Standard.

This history more than recommends yet another adjustment of what the US Atomic Energy Act specifies as a "compliant" nuclear cooperative agreement — i.e., one that automatically comes into force unless Congress passes a veto-proof law after 90 days of continuous executive session. Currently, a joint resolution of Congress is only required to bring a nuclear cooperative agreement into force if the country in question did not have nuclear weapons at the time the Nuclear Nonproliferation Treaty was negotiated and refuses to place all its nuclear activities and materials under international nuclear inspections. This is why a joint resolution of approval was needed in the case of India.

After what we have learned about the inadequacy of such safeguards for countries that want to reprocess or enrich (overtly or covertly), though, it's time Congress updated the act. In specific, if a proposed US civilian nuclear cooperative agreement does not include the nuclear nonproliferation conditions contained in the US-UAE agreement, it ought to require a joint resolution of approval.

The nuclear industry is strongly opposed to this. Having Congress vote on agreements that do not contain the Gold Standard, the nuclear industry argues, could jeopardize significant nuclear commerce. This is the same complaint industry made against the 1978 amendments, which the nuclear industry also opposed. This concern turned out to be unfounded, and now the industry backs those changes. Given the fall in US nuclear exports and the decline of nuclear power's fortunes internationally, there is even more reason to believe the industry's complaints today are also unfounded.[17]

But perhaps industry has things right and nuclear cooperative agreementsI are important trade agreements. Assuming this, though, it hardly strengthens the nuclear industry's case against the proposed legislation. Congress, after all, must approve all significant trade agreements by joint resolution. Given the security equities now at play with US civil nuclear cooperative agreements — where they are serving more and more as the equivalent of high-tech mutual security pacts (with emerging security partners such as the UAE, Vietnam, India and, now Saudi Arabia) — treating nuclear

cooperative agreements that fail to include the Gold Standard as being at least as important as normal trade agreements, then, only makes sense.

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Ms. ROS-LEHTINEN. Thank you very much. We appreciate it.
Mr. Tobey.

STATEMENT OF MR. WILLIAM TOBEY, SENIOR FELLOW, BELFER CENTER FOR SCIENCE AND INTERNATIONAL AFFAIRS, THE JOHN F. KENNEDY SCHOOL OF GOVERNMENT, HARVARD UNIVERSITY

Mr. TOBEY. Madam Chair, Ranking Member Deutch, members of the committee, thank you for holding this hearing, on an important but often overlooked subject.

I will distill my testimony to just six points but would be happy to elaborate upon your questions.

First, the proliferation risks associated with light water power reactors are modest and manageable.

Second, the proliferation risks associated with enrichment and reprocessing technology, however, are deep and dangerous.

Third, Saudi Arabia is justifiably concerned about Iran's nuclear program. The Joint Comprehensive Plan of Action has serious flaws. The durations of its key provisions are too short and it fails to require of Iran a complete and correct declaration of all of its relevant nuclear activities.

Even if the deal endures—and I hope it does, despite its flaws, even though I was a critic of it before it was brought into force—our forty-sixth President will likely face an Iran technically capable of producing enough fissile material for a nuclear weapon in weeks or months.

Fourth, the further spread of enrichment technology would only compound these dangers and should be resisted vigorously by U.S. policy.

Fifth, the arguments that the United States lacks leverage in this situation are overstated. The United States is the kingdom's most important security partner and one of its largest trading partners, particularly in the realm of arms sales. If we join a race to the bottom, we forfeit this leverage.

Sixth and finally, the United States has never before contemplated, let alone concluded, a nuclear cooperation agreement with a state that is threatening even provisionally to leave the nonproliferation treaty.

We should have no truck with nations threatening to bolt from the NPT, especially not nuclear truck.

Thank you. I look forward to your questions.

[The prepared statement of Mr. Tobey follows:]

William H. Tobey
Senior Fellow
Belfer Center for Science and International Affairs, Harvard Kennedy School
Testimony Before the
House Committee on Foreign Affairs
March 21, 2018

Implications of a U.S.-Saudi Arabia Nuclear Cooperation Agreement for the Middle East

Status of Saudi Arabia's plans for nuclear power

According to the World Nuclear Association, the Kingdom of Saudi Arabia envisions building 16 nuclear reactors over the next quarter century, each generating about a gigawatt of electricity, as well as smaller reactors for desalination. These plans, however, may well be subject to delays or deferment. The Saudis at one point also planned to install 24 gigawatts of nuclear powered generating capacity by 2020, a goal that proved wholly infeasible. No reactors are now operating or under construction in the Kingdom. Building 16 reactors in 25 years, starting from scratch, would be extremely ambitious. In a largely successful analogous project, the United Arab Emirates (UAE) will likely take about twelve years to build four reactors, from contract signature to full operational capacity. Still, momentum in Saudi Arabia is building with political commitments, organizational and regulatory infrastructure, international cooperation agreements, and a request for information from potential suppliers. The Saudi Energy minister said last December that he hopes to sign construction contracts for the first two reactors by the end of 2018.

On March 15, 2018, the Saudi Ministry of Culture and Information pledged in a statement announcing a new national policy for nuclear energy that, "all nuclear activities will be restricted to peaceful purposes, within the framework defined by international legislation, treaties, and conventions."

What the United States and Saudi Arabia hope to gain from cooperating on nuclear energy

Saudi Arabia's announced intentions are to shift from fossil-fuel generated electricity to solar and nuclear energy, to reduce carbon emissions and to husband oil and gas resources for continued exports. Saudi Arabia would benefit from cooperating with the United States by gaining access to American nuclear energy technology, which has a justifiable reputation of unsurpassed safety and reliability. Despite its technical excellence, this technology is controlled by firms facing straitened finances.

By cooperating with Saudi Arabia, the United States could benefit from sales of technology, equipment, and services (e.g. the 2009 UAE deal reportedly went for up to $40 billion for construction and operations). The United States could also extend influence over Saudi nuclear energy policy through such engagement. Nonetheless, the Emirates contract, which was won by

a Korean-led consortium including Westinghouse Electric, demonstrates that U.S. firms would face stiff competition—not only from Korea, but also from France, Russia, and China.

The potential impact on nonproliferation

The nuclear proliferation effects from the spread of light water power reactors are modest and manageable. Saudi Arabia has a Safeguards Agreement with the International Atomic Energy Agency, but should subscribe to the Additional Protocol. Assured fuel supply and spent fuel takeback arrangements could also reduce proliferation risks. International cooperation itself, if structured correctly, can be a source of nonproliferation reassurance. (This is not to say that construction of nuclear power plants in a region subject to political instability, terrorism, and regular ballistic missile flights is manifestly sensible; that is a separate question.)

While a nuclear power program will necessarily build some proliferation-sensitive expertise within a country, the most important firebreak is *whether or not a nation state possesses the capacity to produce weapons-usable nuclear material*—highly enriched uranium and plutonium. These can only be produced with additional technologies and facilities for enrichment and reprocessing. For this reason, limiting the spread of these technologies has been a priority for American policy in both Democratic and Republican Administrations supported by a bipartisan consensus in both houses of Congress.

The UAE committed in its nuclear cooperation agreement with the United States not to possess enrichment or reprocessing facilities, and thereby set the so-called nonproliferation gold standard. Although the Obama Administration touted its improvement of a document initially drafted during the Bush Administration, it also said that it would decide about such provisions in future agreements on a case-by-case basis.

Saudi Prince Turki bin Faisal, a former intelligence chief for the Kingdom who reportedly continues to wield influence, has recently argued that Saudi Arabia should not adopt the gold standard to preserve its sovereign rights and because it must be treated on equal terms with Iran, which enriches uranium under the Joint Comprehensive Plan of Action (JCPOA). Indeed, referring to nuclear capabilities, Prince Turki said publicly in 2015, "Whatever the Iranians have, we will have too." There are also published reports that Saudi negotiators have insisted on retaining freedom to enrich uranium. Given the proposed size of the Saudi nuclear program—even at its most optimistic projections—there is no economic justification for indigenous enrichment and reprocessing capabilities; both could be provided more cheaply in the international market.

Prince Turki is justifiably concerned about the Iranian nuclear program. The JCPOA has serious flaws. The duration of its key restrictions is too short and it failed to require of Tehran a complete and correct declaration of all its relevant nuclear activities—the bed rock of any effective verification regime. Even if the deal endures, and I hope it does despite its flaws, our 46th president will likely face an Iran technically capable of producing enough fissile material for a nuclear weapon within weeks or months, a condition Secretary of State John Kerry testified

was unacceptable. Nonetheless, the *further* spread of enrichment technology would only compound these dangers, and should be resisted vigorously by U.S. policy.

Some now say that we cannot seek restrictions on Saudi enrichment and reprocessing because we permit it under the JCPOA. As noted above however, the deficiencies of the Iran agreement do not justify making more flawed ones. A plutonium production race in the Middle East would be an international security nightmare, and we should do all we can to prevent it.

A second argument sometimes made against seeking restrictions on enrichment and reprocessing is that if the United States resists the spread of such technology, it will open the door to less scrupulous providers of nuclear technology. This argument is incorrect in two respects. First, on principle the United States should not join in a race to the bottom leading to a more dangerous world. Second, and more practically, the United States has considerable leverage in the situation. Russian and Chinese reactors do not enjoy the same record of proven safety and reliability as U.S. technology. Saudi Arabia might not want to rely on the same company that supplies its self-described enemy—Iran. Korean suppliers depend on U.S. technology, which requires American approval. France has evinced strong interest in nonproliferation. Moreover, the ties between the United States and Saudi Arabia are broad and deep, spanning political, economic, security, and technology realms, and are a source of considerable influence, should we choose to use them.

A third argument often invoked is that it is unrealistic to expect nation states to divest themselves of sovereign rights. This is a straw man. Clever diplomats can formulate ways to record agreement that a state voluntarily chooses not to exercise a right that would be economically irrational, and that U.S. cooperation is premised on an understanding of that choice.

Recommendations for Congressional action

Having been asked for recommendations for Congressional action, I would offer the following thoughts:

- First, nuclear cooperation agreements cover technologies invoking vital national security interests, plant and equipment with lifespans longer than many governments, and commercial agreements larger than many trade deals. They therefore should be accorded equal procedural standards to those that apply to security and trade agreements.

- Second, Congress should make clear to the executive branch and to our potential partners that it will not approve additional agreements under Section 123 of the Atomic Energy Act which do not in some way discourage the spread of enrichment and reprocessing.

- Third, Congress should provide incentives for agreements to include the so-called gold standard such as H.R.3766.

- Fourth, in Federalist No. 75, Hamilton recognizes that creation of international agreements necessarily spans the separate and equal powers of the executive and

legislative branches, requiring their joint action. I would encourage both branches to consult regularly and deeply in advance of agreements, perhaps reviving something akin to the Arms Control Observer Group, which operated in the 1980s and 90s. The requirement for Congressional assent can be a source of leverage for the executive branch in international negotiations, which it should welcome as advancing American interests.

Finally, I would like to address a development that has unfolded over the last several days. According to media reports, Saudi Crown Prince Mohammed bin Salman recently warned that, "without a doubt, if Iran developed a nuclear bomb, we will follow suit as soon as possible." While as I noted earlier, there are good reasons for Saudi Arabia to be concerned about Iran's nuclear programs, we should have no truck with nations threatening to bolt from the Nonproliferation Treaty, especially not nuclear truck. The United States should refrain from concluding a 123 Agreement with Saudi Arabia until it is convinced that Riyadh's commitment to the Nonproliferation Treaty is unconditional. Were Iran to produce nuclear weapons, the situation would not be improved, and could be made much worse, by a Saudi decision to follow suit. U.S. political, military, and diplomatic capabilities are appropriate to address the threat of an Iranian nuclear breakout; Saudi nuclear weapons are not.

Ms. ROS-LEHTINEN. Thank you very much, Mr. Tobey.

Ms. Squassoni.

Thank you. You can push that little button there to activate your microphone. Thank you.

STATEMENT OF MS. SHARON SQUASSONI, RESEARCH PROFESSOR OF THE PRACTICE OF INTERNATIONAL AFFAIRS, INSTITUTE FOR INTERNATIONAL SCIENCE AND TECHNOLOGY, ELLIOTT SCHOOL OF INTERNATIONAL AFFAIRS, GEORGE WASHINGTON UNIVERSITY

Ms. SQUASSONI. Chairwoman Ros-Lehtinen, Ranking Member Deutch, and members of the committee, thanks for the opportunity to share some views on the implications of nuclear cooperation with Saudi Arabia for the Middle East.

I too have six points, Will, but we didn't collaborate. [Laughter.]

Before my six points, I want to just give a little bit of introductory remarks. In the Middle East, countries have been slow to deploy nuclear power for a few reasons—abundant oil in some countries, fear after Chernobyl, cost issues, and sensitivity about nuclear weapons proliferation, whether it's Israel, Iraq, or Iran.

The first country to deploy a commercial nuclear power reactor, Iran, underscored the risks of proliferation. Perhaps because of that, the next country deploying nuclear power, the United Arab Emirates, took a bold step in renouncing sensitive fuel cycle capabilities.

Separately and in its nuclear cooperation agreement with the U.S., the UAE rejected pursuit of domestic uranium enrichment and spent fuel reprocessing.

As the members have noted, that's been called the gold standard. Why did the UAE do that?

Well, it was confident that the international market would supply its fuel while being sensitive to the need to instill confidence in the international community about its peaceful nuclear intentions.

Besides, as the U.S. has proven, it's possible to run 100 reactors while relying on foreign sources of uranium and/or enrichment and without having reprocessing at all.

Saudi Arabia is taking a different approach. The U.S. has been trying for 10 years to persuade Saudi Arabia to commit to relying on the international market. But Saudi officials are wary.

Technology and economics are less important here than politics. Saudi officials have stated consistently since 2011 that they would match Iranian nuclear capabilities whether just in uranium enrichment or nuclear weapons.

For Saudi Arabia, obviously, the Joint Comprehensive Plan of Action with Iran is a problem because it did not completely eliminate Iran's uranium enrichment program.

This creates a dilemma for all nuclear suppliers, not just the United States. It seems risky to engage in nuclear cooperation with a country that has avowed its intention to pursue nuclear weapons under specific conditions.

How confident are Members of Congress that Iran will not acquire a nuclear weapon? How confident are Members of Congress

about Saudi Arabia's intelligence capabilities regarding Iran's nuclear program?

Here are the six points.

One, critics can debate whether a universal gold standard for nuclear cooperation agreements is feasible or desirable. But the U.S. has quietly implemented this approach in the Middle East since 1981 precisely because of the proliferation risks.

There's no reason to create an exception to that policy for Saudi Arabia.

Two, concerns about the JCPOA make it even more important to limit the spread of enrichment in the region. The best hope for reining in Iranian capabilities is to bring Iran into line with norms in the region.

The JCPOA limits are the start, not the finish.

Three, there's no substitute for U.S. leadership in nuclear nonproliferation, nuclear safety, and security. The point is not to lower our standards but to raise others.

And four, if Saudi Arabia desires flexibility for future options, it should sign a shorter agreement with the U.S.—an agreement with 10 to 15 years' duration would match phases in the JCPOA if that's a concern.

Fifth, Nuclear Suppliers Group members will discourage Saudi enrichment but might support a multilateral approach that could possibly benefit the whole Middle East.

Finally, part of the challenge in collaborating with Saudi Arabia will likely be a lack of transparency. Congress can help in the following ways. I do applaud the new bill. I think it does a lot of important things.

Saudi Arabia needs to rescind its Small Quantities Protocol or adopt the amended version recommended by the IAEA. An Additional Protocol is essential to its safeguards agreement but would also be a useful educational exercise for Saudi Arabia's new regulatory authority.

And finally, you should levy a requirement for the Director of National Intelligence to provide annual unclassified and classified reports to Congress on WMD-related acquisitions and transfers to and from Saudi Arabia.

You used to get those reports across the board and for some unknown reason they were ended.

Thank you very much and I welcome your questions.

[The prepared statement of Ms. Squassoni follows:]

Statement before the U.S. House Committee on Foreign Affairs, Subcommittee on Middle East and North Africa

"THE IMPLICATIONS OF NUCLEAR COOPERATION WITH SAUDI ARABIA"

A Statement by

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For seventy years, trade in nuclear materials, equipment, and technology has been heavily regulated by the United States and many other countries for one fundamental reason: what is sold or shared for peaceful purposes can be diverted to help make nuclear weapons. There is really no way to prevent diversion by a country determined to produce nuclear weapons but there are many ways to make that diversion difficult, costly, time-consuming, and detectable. The system of deterrence – broadly known as the nuclear nonproliferation regime – is built upon national, bilateral, multilateral and international mechanisms. Over the decades, each instance of countries acquiring nuclear weapons capabilities through peaceful trade has prompted measures to tighten those multi-layered mechanisms. Despite improvements, the risk never drops to zero because states acquiring capabilities are free to opt out of their legally binding commitments.

Today, as this Committee considers the implications of an agreement between the United States and Saudi Arabia to share nuclear technology, the stakes could not be clearer: Saudi officials, including Crown Prince Mohammed bin Salman just last week and Prince Turki al-Faisal in 2011, have indicated that if Iran acquired a nuclear weapon, Saudi Arabia would soon follow suit. This implies that Saudi Arabia is either confident that it could acquire nuclear weapons from another country that has them and is not bound by the Nuclear Nonproliferation Treaty (for example, Pakistan or North Korea) or that it has the intention to acquire latent capabilities that could quickly be converted to military purposes if it finds it necessary to pull out of the Nuclear Nonproliferation Treaty. Sensitive fuel cycle technologies like uranium enrichment and spent fuel reprocessing are essential to a latent capability, and Saudi Arabia is reluctant to renounce acquiring such capabilities.

The United States has long opposed the spread of uranium enrichment and spent fuel reprocessing because of their proliferation risk and it is essential that its nuclear cooperation agreements reflect this, regardless of the partner. This paper assesses the impact of a potential nuclear cooperation agreement with Saudi Arabia, providing background on the role of nuclear cooperation agreements in nonproliferation, Saudi Arabia's plans for a nuclear program and what both parties hope to gain through cooperation. The paper concludes with recommendations for structuring a potential nuclear cooperation agreement for best advantage, and suggests ways to strengthen congressional oversight.

Background

Peaceful nuclear cooperation carries inherent risks, some of which are obvious and others not. The obvious risk is the potential for the misuse of peaceful nuclear energy for military purposes. Agreements typically outline what kinds of technology, material and equipment can be

transferred and what cannot. Recipient countries will almost always ask for the most permissive agreement and supplier countries must weigh the political and economic benefits of selling material, equipment, and services against the political and technical risks of proliferation.

The risk of misuse of U.S. material, equipment and technology is minimized by the stringent requirements for approving these agreements as provided for in the 1978 Nuclear Nonproliferation Act (NNPA) which amended 1954 Atomic Energy Act. The nine requirements contained in Section 123 are:

- Safeguards in perpetuity (whether IAEA or bilateral) on all material and equipment supplied;
- A comprehensive nuclear safeguards agreement with the International Atomic Energy Agency;
- Assurances against use in a nuclear explosive device or any other military purpose;
- Right of return in case of a nuclear test or abrogation of an IAEA safeguards agreement;
- Prior consent by the United States for transfer;
- Adequate physical protection;
- Prior consent by the United States for alteration in form or content, including enrichment or spent fuel reprocessing;
- Approval in advance of storage facilities;
- The application of all those requirements to any material, production facility or utilization facility "contaminated" by any material transferred under the agreement.

Most countries that supply nuclear materials and equipment do not apply such stringent conditions, although over time, the Nuclear Suppliers Group (NSG) has incorporated several of these elements in its guidelines for harmonizing trade. The playing field for suppliers is uneven for many reasons, not least of which is the extent to which governments subsidize their nuclear industries. For example, AREVA's recent restructuring included a $5 billion taxpayer-funded bail-out.

While U.S. agreements are typically more restrictive than others', a nuclear cooperation agreement with the United States is essential for other suppliers if their equipment contains U.S. components, design or technology. For example, the UAE awarded a $40 billion contract in 2009 to Korea's nuclear consortium to build nuclear power plants, of which Westinghouse content is estimated to be $2 billion. The Korean deal would not have been possible without a U.S.-UAE nuclear cooperation agreement in place because of the U.S. content. The dominance of the U.S. nuclear industry has not yet faded entirely, giving U.S. nuclear cooperation agreements more leverage than they might otherwise have. In other words, some countries

may see value in negotiating a 123 agreement with the United States not because they mean to engage in significant trade with the U.S. but because it is the price of admission for broader nuclear commerce.

In addition, U.S. peaceful nuclear cooperation agreements also pose risks that may be less obvious or immediate but significant nonetheless. One is the use of consent rights in such a way that it undermines U.S. policies to discourage uranium enrichment and spent fuel reprocessing. Granting consent for countries to transfer fuel to nuclear weapon states for reprocessing may limit proliferation, but does little for nuclear security. Consent for reprocessing could also encourage countries to delay finding sites for final disposal of waste. In recent agreements concluded by the United States, countries that have foresworn reprocessing on their soil (Taiwan, UAE, ROK) all have been given advance consent to send fuel out of the country elsewhere for reprocessing.[1] Instead, such agreements should have provided incentives for long-term interim storage.

In particular, because the United States has been a leader in nuclear nonproliferation efforts for 70 years, concluding a U.S. nuclear cooperation agreement is the equivalent of providing a Good Housekeeping seal of approval to some countries' nuclear energy programs, regardless of how strict or permissive the agreement may be. This was certainly the case for the U.S.-India nuclear cooperation agreement, which paved the way for other countries to engage in nuclear cooperation with India (but ironically, not the United States). Worse still, the U.S. agreement compounded the problem by legitimizing India's poor separation of military and civilian activities and anemic Additional Protocol.

The common argument that it is better for the United States to engage in nuclear cooperation than for other, perhaps less scrupulous suppliers to do so conveniently ignores that cooperation agreements are not contracts and do not guarantee trade. Moreover, the buyer's market that has persisted over the last few decades makes it more likely for recipients to reward those bidders with the most to offer. The risks of a "race to the bottom" in terms of nonproliferation standards are growing as U.S. nuclear dominance fades.

Another subtle risk has been the use of nuclear cooperation agreements to cement strategic relationships. Making technical cooperation agreements prestigious politicizes them. The more important the relationship is in terms of commercial, political and security needs, the greater the pressure is to adjust the balance of obligations towards facilitating engagement and

[1] While the agreement with South Korea did not contain language about South Korea foreswearing reprocessing (and in fact leaves the door open through future consultations regarding pyroprocessing), South Korea signed a joint declaration with North Korea in 1992 foreswearing enrichment and reprocessing facilities on it soil. Providing South Korea with advance consent to transfer spent nuclear fuel provides a pressure valve against pyroprocessing.

away from restrictions. This has been demonstrated many times over, most recently in the case of the agreement with South Korea.[2]

U.S. Nuclear Cooperation Agreements in the Middle East

In the early days of Atoms for Peace, the United States had nuclear cooperation agreements with Israel (1955-1960), Iran (1959-1964), and Lebanon (1955-1960). The U.S. signed an agreement with Morocco in 1980 (expiring in 2022), with Egypt in 1981 (expiring in 2021), and with the United Arab Emirates in 2009. The U.S. has been in discussions with both Jordan and Saudi Arabia for about ten years on nuclear cooperation agreements.

The United States recognized the importance of not introducing sensitive nuclear technologies into the region and included restrictions on reprocessing in an agreed minute added to its cooperation agreement with Egypt. While the text of the agreement was standard (no reprocessing unless the parties agreed), the agreed minute stated that Egypt had no near-term plans to introduce the fast breeder reactor cycle (which requires reprocessing) or to recycle plutonium in thermal reactors. The agreed minute also stated that if the parties mutually agreed to reprocessing, it would take place in a facility outside of Egypt. Most importantly, the agreement with Egypt provided an assurance that U.S. cooperation with other states in the region would have equal terms and conditions for cooperation. Finally, "If any situation arises which could increase the risk of proliferation of nuclear weapons, the United States and the Arab Republic of Egypt, at the request of either, shall enter into consultations with respect thereto with a view to maintaining the objectives of the NPT."

Negotiators of the 2009 agreement with the UAE clearly recognized the precedent set in the Middle East with the 1981 Egypt 123 agreement and adapted some of the provisions. While the UAE agreement contains an article (Article 7) that explicitly states the UAE would not possess any sensitive nuclear facilities for enrichment or reprocessing on its territory, the text of the Agreed Minute is similar to that in the Egypt agreement. The assurance of equal terms and conditions was also included, along with a specific reference to the possibility of altering the

[2] The ROK agreement was signed in June 2015 after long negotiations that required a two-year extension from Congress. South Korea's demands for advance consent for enrichment and reprocessing, which U.S. policy has long rejected for countries that do not currently have enrichment or reprocessing, were repeatedly framed by Korean senior officials in the context of the strategic ROK-US alliance. The compromise included a first-ever High Level Bilateral Commission (HLBC) within the agreement "to facilitate peaceful nuclear and strategic cooperation between the parties and ongoing dialogue regarding areas of mutual interest in civil nuclear energy, including the civil nuclear fuel cycle." Regarding sensitive nuclear technology, the agreement allows (per amendment of the agreement or by "a separate agreement between the Parties") transfer of SNT and technology that is not in the public domain concerning fabrication of nuclear fuel containing plutonium. While it does not grant advance consent for reprocessing, it states that uranium enrichment up to 20% U-235 is permissible if the Parties agree in writing on an arrangement to do so, following HLBC consultations and consistent with the Parties' applicable treaties, national laws, regulations, and license requirements.

agreement in the event that another state in the region received more favorable terms in scope and effect. The Morocco agreement contains more favorable terms, but predates the other two agreements.

Saudi Arabia as a nuclear energy partner

Saudi Arabia is a "nuclear newcomer." It has been involved for forty years in basic nuclear science, but has no commercial nuclear power plants. In 1977, the Kingdom established the King Abd Al-Aziz Center for Science and Technology for basic nuclear research and in 1988 founded the Atomic Energy Research Institute, which researches "industrial applications of radiation and radioactive isotopes, nuclear power and reactors, nuclear materials and radiation protection."

Like other countries caught up in the resurgence of interest in nuclear energy in the mid-2000s, Saudi Arabia reviewed its nuclear ambitions. A royal decree in 2010 established the King Abdullah City for Atomic and Renewable Energy (K.A.-CARE) in Riyadh. One year later, the scientific coordinator of K.A.-CARE announced Saudi Arabia's intention to construct 16 nuclear reactors to generate about 20% of the Kingdom's electricity by 2032. The announcement followed the March 2011 Fukushima nuclear accident that caused a few states to end nuclear power in their countries, and many states to pause their plans at least long enough to conduct safety reviews. Saudi Arabia moved ahead, however. In mid-2017, the government approved the Saudi National Atomic Energy Project (SNAEP) to implement a civil nuclear program focused on three business areas: large nuclear power plants, small modular reactors, and fuel cycle activities. In late 2017, the Saudi government issued a tender for bids for large nuclear power plants and expects to choose two or three contenders by the end of 2018. According to publicly available government briefing slides, fuel cycle activities are currently limited to an assessment of uranium and thorium reserves in Saudi Arabia (through 2022) and yellowcake production with Jordan. [3]

Saudi Arabia does not have one nuclear suitor in mind; it has been steadily accruing nuclear partners in the last decade. The Saudis already have arrangements with France (2011), China (2016), Argentina (2015), South Korea (2013), Russia (2015) and Kazakhstan (2016). Some of these have already begun training programs for Saudi nuclear workers and construction of the Korean SMART reactor was scheduled to begin in 2018.

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[3] See K.A.-CARE's briefing to IAEA meeting, availabile at https://gnssn.iaea.org/NSNI/SMRP/Shared%20Documents/Workshop%2012-15%20December%202017/Saudi%20National%20Atomic%20Energy%20Project.pdf

The two primary motivations for Saudi Arabia to pursue nuclear energy are conserving its oil for export and meeting soaring electricity demand. Others, according to official government briefings, include diversifying the country's economy, diversifying the national energy mix, creating jobs with high returns, developing national human resources, increasing the level of local industries and services, localizing and exporting technologies, and expanding other medical, agricultural and industrial uses of nuclear energy. In 2011, Saudi officials estimated that electricity production would need to triple from 40 GWe to 120 GWe by 2030. Given that oil and gas generate almost 60% of its electricity, finding another fuel for electricity would free up significant quantities of oil for export. The plan in 2011 was to generate 24 GWe, or 20% of expected electricity demand by 2030, from nuclear energy. Adding that kind of capacity in 20 years was fairly ambitious and although the schedule has slipped, the current plan remains ambitious. A sober analysis of responses to Saudi challenges in electricity generation, particularly for water desalination, concluded a few years ago that ending subsidies for electricity could help reduce demand while deploying solar power could be cheaper than nuclear energy in the next decade and take advantage of peak demand during daylight hours.[4]

Saudi Arabia intends to localize and indigenize the supply chain for nuclear technology as well as export, not dissimilar to other recipients of U.S. technology like South Korea and China. Its January 2016 agreement with CNEC includes localization, as does its agreement with Korea. Saudi entities have also embarked on joint ventures with foreign entities, including Argentina's INVAP, to develop small modular reactors based on the Argentinian CAREM design.

With regard to fuel cycle capabilities, it's not clear how Saudi Arabia would pursue uranium enrichment. Current plans are vague. It is clear that indigenous development would take decades and likely billions of dollars unless an existing technology holder transferred technology. Under current NSG guidelines, members are unlikely to agree to transfers unless to a multinational concern and even then, it's never been done. Two options for Saudi Arabia that would not include indigenization of technology would be purchasing equity in a foreign enrichment concern like Orano (the successor to AREVA's enrichment business which owns 50% of the company that holds URENCO's enrichment technology, the Enrichment Technology Corporation) or persuading an enrichment technology holder to build and operate a plant on Saudi soil, without transferring technology or operating know-how. For example, URENCO built a centrifuge enrichment plant in Eunice, New Mexico, and did not transfer the technology, although it is likely that the U.S.'s nuclear weapons state status made certain processes less

[4] Ahmad A, Ramana MV, "Too costly to matter: Economics of nuclear power for Saudi Arabia," *Energy* (2014), http://dx.doi.org/10.1016/j.energy.2014.03.064

difficult (e.g., getting Q-cleared U.S. workers in the construction phase). Despite having the world's most advanced technology in the world's most advanced nuclear state, it still took 10 years between licensing and operation of the first cascades in New Mexico. An agreement with Saudi Arabia would be highly contentious and likely to take longer. As noted above, Saudi Arabia might be more successful proposing a fully multinationally owned and operated enrichment facility on Saudi soil. Although multinational facilities might provide earlier warning of diversion, past experience with such ventures offer few paths forward: the reprocessing multilateral experiment in Europe, Eurochemie, made no effort to compartmentalize knowledge among its international workforce, and the multilateral enrichment consortium, URENCO, let each country (Netherlands, Germany and UK) develop its own technology before choosing one.

For the part of the United States, commercial advantage, rather than technical cooperation, motivates U.S. interest in nuclear cooperation with Saudi Arabia. Saudi Arabia expects to spend $80 billion on 16 nuclear power plants and fuel supply thereafter could be similarly lucrative. However, Saudi Arabia may not choose U.S. vendors and may be considering supplying its own fuel, even though that would not be cost-effective.

U.S. negotiations with Saudi Arabia

After the shock of discovering in 2004 that Pakistani scientist A.Q. Khan had proliferated enrichment equipment, the Bush administration sought to increase restrictions on sensitive nuclear technology. Thus, the U.S. asked Saudi Arabia for assurances on this as it discussed potential nuclear energy cooperation. On May 16, 2008, then-Secretary of State Condoleeza Rice and Saudi Arabia Foreign Minister Prince Saud Al Faisal signed a memorandum of understanding on Civil Nuclear Energy Cooperation. The State Department issued a press release that stated, among other things, that "The United States will assist the Kingdom of Saudi Arabia to develop civilian nuclear energy for use in medicine, industry, and power generation and will help in development of both the human and infrastructure resources in accordance with evolving International Atomic Energy Agency guidance and standards. Saudi Arabia has stated its intent to rely on international markets for nuclear fuel and to not pursue sensitive nuclear technologies, which stands in direct contrast to the actions of Iran."

In subsequent talks, however, the Saudis stepped back from that commitment. In the fall of 2009, the U.S. secured the so-called "gold standard" commitment from the UAE to include a legally binding decision not to enrich uranium or reprocess spent nuclear fuel in the text of its nuclear cooperation agreement. Similar successes with Jordan and Saudi Arabia were not forthcoming. In 2011, the U.S. held an initial round of talks with Saudi Arabia, followed by a round in 2012. At the time, Saudi officials declined the U.S. proposal to sign a side letter to a

123 agreement that contained legally binding restrictions on enrichment and reprocessing. For the remainder of the Obama administration, talks did not advance.

Saudi Arabia as a nonproliferation partner

Assessments of Saudi Arabia as a nonproliferation partner should review past programs, present policies and potential future actions. That said, past clandestine nuclear weapons programs are not an automatic disqualifier for nuclear cooperation with the United States, as the recent agreements with India, Taiwan and the ROK have shown. The State Department will present its perspectives on Saudi Arabia as a nonproliferation partner in the Nuclear Proliferation Assessment Statement (NPAS) that must accompany the 123 agreement when it is submitted to Congress. That NPAS is unlikely to delve too deeply into rumors of Saudi interest in nuclear weapons or tales of investment in Iraq's nuclear weapons program from Saudi defector Mohammed Abdalla al-Khilewi. However, it will likely have to address statements from high-level Saudi officials about Saudi Arabia's intention to match capabilities with Iran, whether in uranium enrichment or actual nuclear weapons. What's more, it will need to address why Saudi Arabia has been so slow to undertake additional safeguards strengthening measures. For example, Saudi Arabia still has a Small Quantities Protocol attached to its comprehensive safeguards agreement that it has not amended, even though the IAEA requested amendment 13 years ago. About half the states (43 of 88) with such agreements complied. The Small Quantities Protocol largely limits a state's responsibilities to an annual report of imports and exports of material and does not allow for the IAEA to conduct inspections until a threshold quantity of nuclear material is present in a facility.[5] The modified protocol amends those weaknesses.

Saudi Arabia also lacks another key feature of the strengthened safeguards system, the Additional Protocol. This addendum to a comprehensive safeguards agreement, which has been signed by 147 countries out of 189 members of the Agency, provides for additional information and access by International Atomic Energy Agency inspectors. It was developed in response to Iraq's clandestine nuclear weapons program in the mid-1990s. Although Saudi Arabia joined the NPT in 1988, it did not complete its safeguards agreement until 2005; that safeguards agreement only entered into force in 2009. The Saudis had at least four years to revise the protocol before going through the ratification process. It is likely that the Bush administration pressured Saudi Arabia to complete its ratification after signing an MOU on nuclear cooperation in 2008. At that time, Saudi Arabia also signed up to join the Global

[5] See, for example, *Safeguards Implementation Guide for States With Small Quantities Protocols*, IAEA Services Series 22, Vienna, 2016. See https://www-pub.iaea.org/MTCD/Publications/PDF/SVS_22_web.pdf

Initiative to Combat Nuclear Terrorism (GICNT) and endorsed the Proliferation Security Initiative.

Real investment in nuclear energy may make Saudi Arabia a more forward-leaning member of the nonproliferation community but for the time being, the U.S. should insist at the very least that Saudi Arabia rescind or update its Small Quantities Protocol and sign an Additional Protocol.

Saudi interest in uranium enrichment

Potential reserves of uranium are one reason for Saudi interest in uranium enrichment, but the fact that Iran still retains some enrichment capability under the JCPOA is another. The Saudi Arabian Geological Survey concluded an agreement with the Chinese National Nuclear Corporation (CNNC) in 2017 to jointly conduct an assessment of Saudi uranium resources. Saudi officials have made the case that enrichment would allow Saudi Arabia to take advantage of potential uranium resources. This echoes arguments made by Jordan in the last ten years. However, the economics are unlikely to support domestic uranium enrichment for many reasons. First, there are high levels of oversupply and inventories in the uranium market worldwide, as concluded in the Nuclear Energy Agency and the International Atomic Energy Agency's *Uranium 2016: Resources, Production and Demand.* In fact, that highly regarded publication concluded that "Regardless of the role that nuclear energy ultimately plays in meeting future electricity demand, the uranium resource base described in this publication is more than adequate to meet projected requirements for the foreseeable future. The challenge in the coming years is likely to be less one of adequacy of resources than adequacy of production capacity development due to poor uranium market conditions." Saudi resources are not covered in those estimates because there is no information or assessment about Saudi uranium. However, the high case for nuclear energy does assume Saudi Arabia will acquire nuclear power. [6] One question is whether small scale production could be cost-effective but more importantly, only two of the thirty countries with nuclear power match their uranium production to domestic needs – Canada and South Africa. For most other countries, there is a significant mismatch in domestic production and use, which does not seem to cause a problem.[7]

A second obstacle is timing. Although Saudi Arabia currently envisions reactors coming on-line by 2040, this is not a long period of time to develop the infrastructure to support nuclear power. After surveying potential resources, Saudi Arabia would need to produce the ore, mill

[6] The Redbook assumed that Saudi Arabia will have installed 1.4 GWe of reactor capacity in 2030 and 2.8 GWe in 2035 (4 smaller reactors or 2 larger ones), requiring about 440 tons of uranium annually.
[7] http://www.oecd-nea.org/ndd/pubs/2016/7301-uranium-2016.pdf See page 102.

it, convert it, enrich it and fabricate it into fuel. How much of that process is Saudi Arabia prepared to do itself or to contract out? The conversion and enrichment industries worldwide have shrunk significantly over time even in advanced nuclear states because of declining economics.

A third obstacle is pricing, both for uranium and enrichment. Uranium has returned to the historically low prices from the 1980s (hovering around $20/lb) after a brief surge ten years ago to a high of $140/lb. One factor has been reduced optimism about nuclear energy following the nuclear accident at the Fukushima Daiichi power plant in March 2011. The Bible of the uranium industry, the so-called Redbook, admitted that "Challenges remain in the global uranium market with high levels of oversupply and inventories, resulting in continuing pricing pressures."[8]

The enrichment market is worse: while the SWU spot price managed to climb through the 1990s to reach a high of $160/SWU in 2009, the price has dropped steadily to today's rate of less than $40/SWU. There are many reasons for this, including overcapacity of enrichment services, particularly in Russia. This is one reason that established uranium enrichment providers like URENCO do not add capacity without signed, long-term contracts for supply. While Saudi Arabia can guarantee demand in its own country (assuming reactor construction proceeds in a predictable way), it could never compete economically with established enrichers.

Simply put, a Saudi enrichment capability is unwise and uneconomic.

At this juncture in time, Congress needs to ask the following questions:
a) What are the minimum adequate nonproliferation assurances in this case?
b) What are the extenuating circumstances that could increase proliferation risk?
c) Are there risks in walking away from a deal?
d) What conditions that could improve the robustness of non-proliferation collaboration and reduce proliferation risks?

What are the minimum adequate nonproliferation assurances?

The nine requirements in Section 123a of the Atomic Energy Act constitute a bare minimum for assurance of nonproliferation. The agreement could include standard language on the possibility for consent to enrich or reprocess on a case-by-case basis, because in practice, such consent has become synonymous with refusal. To meet the "Equal terms and conditions" requirements of the agreements with the UAE and Egypt, the agreement with Saudi Arabia

[8] http://www.oecd-nea.org/ndd/pubs/2016/7301-uranium-2016.pdf

would at least need to include a statement regarding Saudi Arabia's intentions to rely on the international market for fuel cycle services for a foreseeable period. Rather than negotiate a less restrictive agreement, it would be better to negotiate a shorter agreement, even if it is only ten or fifteen years' duration. This would parallel the timeframe for the Joint Comprehensive Plan of Action with Iran, or JCPOA, which Saudi officials have criticized as flawed because it contains sunset clauses on Iranian enrichment capacity.

On IAEA safeguards, the U.S. needs to insist that Saudi Arabia either rescind its Small Quantities Protocol or adopt the amended version recommended by the IAEA. Concluding an Additional Protocol would be a useful, educational exercise for Saudi Arabia's new regulatory authority.

What are the extenuating circumstances that could increase proliferation risk?

Saudi officials have repeatedly stated that acquisition of nuclear weapons by Iran would trigger their own acquisition of nuclear weapons. Bruce Riedel of the Brookings Institution suggested in 2016 that Saudi Arabia is less concerned about Iranian nuclear weapons than Iran's quest for regional hegemony because it believes it is covered by the U.S. nuclear umbrella.[9] However, one way to counter an Iranian regional hegemony based on nuclear weapons would be with Saudi nuclear weapons. Whether fear or regional rivalry motivates Saudi Arabia, the result is the same for the nonproliferation regime -- bad.

A key question is how Saudi Arabia would determine when it was time to break out of the NPT. What threshold of evidence would be sufficient? Some experts suggest that Saudi Arabia would welcome the collapse of the Joint Comprehensive Plan of Action (JCPOA) with Iran. This week, Crown Prince Mohammed bin Salman called the Iran deal flawed, perhaps egging President Trump on to withhold certification of the deal and thus endanger U.S. compliance. Without a replacement for the JCPOA, collapse of the deal could dramatically increase proliferation risks in the Middle East. Collapse as a result of evidence that Iran was engaged in clandestine nuclear activities would be worse than a U.S.-engineered collapse in Saudi eyes, but either way, a collapse could be used as justification for proliferation.

In a scenario where Saudi Arabia decides it must develop nuclear weapons to counter Iran's nuclear weapons, it will not matter whether the United States has successfully negotiated a "gold standard agreement" (wherein the Saudis have renounced enrichment and reprocessing), a standard agreement (with no consent rights) or a permissive agreement (with advance consent rights). Any nuclear cooperation that the United States had provided up to that point could feasibly be diverted for a military program. The only difference would be how much help the U.S. provided.

[9] https://www.brookings.edu/blog/markaz/2016/07/13/what-the-iran-deal-has-meant-for-saudi-arabia-and-regional-tensions/

There is the possibility that Saudi Arabia's statements are meant to deter Iran rather than reflecting actual policy. Such statements, however, undermine norms of nonproliferation. It would be hard to imagine U.S. acceptance of such statements emanating from South Korea or Japan, even though both countries face a growing nuclear weapons threat from North Korea.

Are there risks (or benefits) in walking away from a deal if Saudi Arabia does not accept certain conditions? The common refrain that it's better for the U.S. to sell nuclear equipment than other countries implies that these contracts are all or nothing. In fact, Saudi Arabia may not choose one supplier for its entire fleet of reactors. If U.S. insistence on robust nonproliferation assurances resulted in the failure to conclude a nuclear cooperation agreement, U.S. vendors could lose between $0 and $10 billion worth of business (about 2 reactors worth), assuming they were competitive in the first place. Regardless of the agreement, there is always the risk that no nuclear trade will result because nuclear cooperation agreements are merely frameworks, not contracts. The lack of a U.S.-Saudi 123 agreement could affect South Korea's bid for a nuclear contract, but it is not yet clear to what extent.

The real question is whether other countries are willing to supply what the United States is not willing to supply. Ultimately, Saudi efforts to acquire enrichment and/or reprocessing technology would have to go through the Nuclear Suppliers Group. Technically, Saudi Arabia in the future could meet NSG criteria for transfer but such a decision is unlikely for a group that operates by consensus decision-making.

What conditions that could improve the robustness of non-proliferation collaboration and reduce proliferation risks?

Congress' role over the years has been limited by the NNPA's streamlined approval process for new agreements, wherein agreements that meet all the requirements of Section 123 of the Atomic Energy Act enter into force after 90 days unless Congress passes a law otherwise. A resolution of disapproval is one alternative, and so is a resolution of approval that contains conditions. In 1985, Congress passed a resolution of approval for the first nuclear cooperation agreement with China, but conditions placed within the resolution effectively blocked exportsfor 13 years.

If it is impossible to get language related to an Additional Protocol into the text of the 123 agreement, Congress should condition its approval upon such execution, similar to the approach it took for the U.S.-India nuclear cooperation agreement. Or, Congress could amend Section 123a of the Atomic Energy Act to require that all partners in U.S. nuclear cooperation agreements have an additional protocol in force before agreements can enter into force. Another alternative would be to condition exports, rather than the nuclear cooperation

agreement itself on implementation of an Additional Protocol by Saudi Arabia. This could be a requirement in the resolution of approval for export licensing or a simple presidential certification that an Additional Protocol is in force a prerequisite for export license approvals.

Other ways of strengthening oversight could include a requirement for the Director of National Intelligence to provide annual unclassified (and classified) reports to Congress on WMD-related acquisitions and transfers to and from Saudi Arabia. Since Section 721 reports were discontinued in 2013, there is no regular mechanism for updating Congress on WMD-related acquisitions and transfers. Congress could also authorize expanded export control cooperation between the US and Saudi Arabia.

Part of the challenge in collaborating with Saudi Arabia will likely be a lack of transparency. These steps above would enhance that transparency and provide additional leverage to both the executive branch and the Congress.

Lastly, Congress should consider updating the Atomic Energy Act to strengthen its oversight. In the last ten years, the executive branch has had to renew virtually all of its nuclear cooperation agreements because their 30- or 40-year durations expired around the same time. Officials creatively came up with new ways to limit their work and, in effect, congressional oversight: many agreements now have rolling extensions, automatic extensions, indefinite extensions and in the case of two agreements, indefinite duration. The practical effect is that Congress will have little to no influence over nuclear cooperation with existing partners and approval of 123 agreements may become a historical relic. Members of Congress may want to consider whether specific language regarding extensions or congressional review is desirable to protect its equities in ensuring that U.S. nuclear cooperation does not contribute inadvertently to proliferation. In particular, this could include periodic Nuclear Proliferation Assessment Statements for agreements with indefinite or 40-50 year duration. Congress should also consider specifying a process for preparation of NPASes (e.g., prior consultation with committees and/or agreement on scope) or the content of such assessments. Additional reporting requirements might also be valuable.

Specific actions for Congress are listed below:

1) Require congressional review of ongoing cooperation under 123 agreements with indefinite duration and/or rolling or automatic extensions.
2) Require all new nuclear partners (and in renewal agreements) to have Additional Protocols to their IAEA safeguards agreements in force before a 123 agreement can be approved or enter into force. Making the Additional Protocol a legally binding requirement could eventually help

NSG adoption of that requirement, in much the same way that countries adopted full-scope safeguards as a condition of supply before the NSG did.

3) Require the United States to provide favorable options or incentives to other countries in 123 agreements to adopt interim storage over reprocessing of spent nuclear fuel.

4) Require the executive branch to consult with Congress on the general scope of Nuclear Proliferation Assessment Statements or about individual NPASs before they are written or more substantially, specify additional reporting requirements for NPASs.

Ms. ROS-LEHTINEN. Thank you very much. Really excellent testimony. I will begin with the question and answer period.

The administration and the nuclear industry are both touting the economic and commercial benefits of a 123 Agreement with Saudi Arabia. Exactly how much the U.S. economy would benefit is highly uncertain, as all of the models and all of the projections make heavy assumptions that are far from guaranteed.

But this economic and commerce argument raises another question about the lack of congressional oversight. Trade agreements are subject to strong congressional debate. We have an up and down vote on approval.

But 123 Agreements, which also impact our national security, are passively approved under current law. If the administration and the industry are touting this agreement as, essentially, a trade or commerce deal—however flawed that logic may be—based on its economic impact, then should it not at a minimum be getting the same treatment with an up and down vote? And so you can answer that when I finish my round of questions here.

And on Monday, the Saudi foreign minister called the Iranian nuclear deal a flawed agreement and the administration's next steps on the JCPOA are reported to be a major part of the discussions between the U.S. and Saudi Arabia officials this very week.

And with the Crown Prince stating earlier that Saudis will get a nuclear bomb as soon as Iran gets one, it is clear that the JCPOA and the administration's current 123 negotiations are linked.

So I would ask the panelists what impact do you think the JCPOA had on Saudi Arabia's nuclear plans and how did the JCPOA impact our leverage in 123 negotiations?

And related to that, considering the JCPOA's enrichment restrictions—they start to sunset in just 10 years—what options do we have with the Saudis and how can we meet our nonproliferation goals in the region?

And we will start with you, Henry. Thank you.

Put the microphone on and hold it closer.

Mr. SOKOLSKI. Sorry.

I think we need to think a bit bolder than even Mr. Trump, and that's saying a lot because he's a pretty bold guy.

I think you can't just extend the duration of the kinds of controls on enrichment that are in Iran. The reason your legislation and this hearing is important is it ought to be a wake-up call that maybe we have to think big and that would mean getting the gold standard not just for Saudi Arabia but that should be part of the President's agenda.

In this regard, the quickest smartest way to help that happen is to take the advice that the UAE actually is giving by not going any more nuclear to provide assistance to folks in the region for lots of things that make more economic sense.

I have entered into the record two recent studies by leading energy economists that show what the kinds of things are that you would do that—where you'd make money and you don't have to worry about bombs or being bombed because these facilities, when they're large, get targeted.

So that, I guess, is my brief answer.

Ms. ROS-LEHTINEN. Thank you very much.

Mr. Tobey.

Mr. TOBEY. So, Madam Chair, if I understood your questions correctly, it was what impact did the JCPOA have on Saudi thinking and how did that affect our leverage in this situation.

So it's very clear that the weaknesses in the JCPOA drive valid Saudi concerns. I just happen to think that the correct way to address those weaknesses is not by a Saudi nuclear weapons program, but by other means, which are quite possible, that would bring to bear American influence—political, military, diplomatic—on the situation.

With respect to what impact it had on our leverage, those that say that we have no leverage on this situation because others will sell the reactor ignore broader aspects of the problem.

It's true that within the narrow focus of just nuclear matters there are other suppliers that would be willing to take the field.

But Saudi Arabia would be foolish to take on Iran without American support.

Ms. ROS-LEHTINEN. Thank you, sir.

Ms. Squassoni.

Ms. SQUASSONI. Thank you.

On the question of what economic benefits we might have, I think it's important to remember that a 123 Agreement is not a contract and, honestly, Westinghouse is not in a good position to be selling reactors.

I agree with Henry that it's likely going to be a South Korean contract. Now, does that mean that we should lower our standards to enable South Korea to get business with Saudi Arabia? That is not clear to me.

On the JCPOA, I would say little impact because, really, it's kind of a red herring. Without the JCPOA, Iran would be enriching.

Let's not forget that countries can legally acquire enrichment and reprocessing and they can stockpile as much material as they would like, right.

If they have a big stockpile of bomb-grade plutonium or highly enriched uranium, they have a lot of inspections—it's true.

But whether or not the JCPOA has linkage to this, the fact of the matter is the U.S. does not support the spread of this technology. The JCPOA, even though it has sunset provisions, is giving us an opportunity to bring Iran around and we need to take every opportunity we can so that when those provisions sunset they wake up and realize pursuing those kinds of capabilities is not in their national security interest.

Ms. ROS-LEHTINEN. Thank you very much to all of you again for being here.

And now I am very pleased to turn to my friend, Mr. Deutch of Florida.

Mr. DEUTCH. Thank you, Madam Chairman.

We've had lots of discussion about the decision on a nuclear agreement with Saudi Arabia and having ripple effects throughout the region.

I guess my question is this. We are at this moment where the President—where the President is now talking openly of pulling out of the Iran nuclear deal at the same time that there's conversation about entering into a nuclear agreement with the Saudis,

which may permit enrichment if—and I would like to just—you have touched on—each of you have touched on this a bit but if you could just explore what it means if both of these things were to happen if we—if the President pulls us out of the Iran deal and what that will mean in terms of Iranian enrichment, then look at what impact that would have on a deal like this with Saudi Arabia, particularly in light of the comments that I referred to earlier.

Mr. Sokolski.

Mr. SOKOLSKI. I am reminded of the Tom Lehrer lyric, "We'll all go together when we go." Let's think this through.

First of all, please don't rush. If you're going to do something wrong, don't be in a rush for it. I always tell my staff if you're going to do something stupid, take your time. Okay.

Second, if it's going to be really foolish, let's put it to a vote. I will tell you why you want to do all that because your question goes directly to our future.

The Saudis, clearly, are going to try to bootstrap up. If the Iranians break out of that deal or that deal is terminated, you will see them ramp up their enrichment almost certainly is quite likely or, you know, in time.

The Saudis will then work with what they have whether they buy it from us or not. They have those two Korean reactors. They can use that. It has everything they need to do what they want to. They don't even have to buy American or Russian or any of that.

What then will happen is the UAE, if we strike this deal with the Saudis, will say hey, what about us—we have a clause that says we should at least be given an opportunity to amend ours.

So too does Egypt and its deal comes up, I believe, in 2021. Then Turkey, our favorite ally—you folks must have a hearing or two on that—in 2023, Morocco in 2021, and let's not forget why Mr. Sherman showed up. South Korea, they also want to enrich. At a minimum, even their current President wants nuclear submarines and previously the President before that wanted to do recycling. Well, you have a deal with Saudi Arabia—what about us, and then, of course, you have what Japan will do.

You get the picture. I mean, it's a mess. You are throwing kerosene on the embers of the current proliferation problem in expectation that with enough of it, you will snuff the fire out.

Mr. DEUTCH. Mr. Tobey, Ms. Squassoni, what would tell—what would you tell the Emiratis when they come to us after a deal is struck with Saudi Arabia that permits enrichment and assume that happens.

Assume also that the President pulls us out of the Iran deal. The Emiratis come and say, wait a second—in light of everything that's going on in the region, you're our ally—we assume you're going to be willing to renegotiate our deal—that gold standard just doesn't work anymore.

What's our response?

Mr. TOBEY. The UAE deal provides for the ability to renegotiate it if the UAE faces terms that are less favorable than others that are negotiated subsequently.

So they have the right to pursue that and there's not much we can do. I actually think the UAE is unlikely to do so because I re-

gard them as a genuinely responsible proliferation—nonproliferation player.

Your earlier question about what the combined impact of a withdrawal from the JCPOA and a green light to Saudi enrichment would be, the short answer is it would be a proliferation disaster.

I've been a critic of the JCPOA. But if the duration is one of your criticisms, taking its duration to zero makes no sense whatsoever, especially since the bulk of the benefits to Iran have already accrued to Tehran, whereas the benefits to us accrue over time.

Mr. DEUTCH. Just if I may, Madam Chairman, just one last question.

Ms. Squassoni, so let me ask what would America's response—what should America's response be then to the Saudis if the question is okay, well, we would very much like to enter into this deal with you.

But if you're prepared to do it then we are just going to go elsewhere? I know Mr. Sokolski says unlikely the Russians. I understand why. But Russians, South Koreans, anywhere else, what's our response then?

Ms. SQUASSONI. Well, there's a thing called the Nuclear Suppliers Group where we harmonize our export controls and Russia and China are members of that.

Let me just make something crystal clear. We don't give enrichment or reprocessing technology to anybody. We don't do it.

So what we are actually talking about and what Saudi Arabia wants is our consent for them to do that with our material in the future. So they've got to get it from somewhere else.

We still, even though we stirred the pot 10 years ago with the India deal, we still have a lot of leverage within the Nuclear Suppliers Group.

If the JCPOA goes away and there's nothing to replace it, and we have an agreement with Saudi Arabia or we don't, Saudi Arabia has to go to someone to ask them for enrichment and reprocessing.

If no one in the Nuclear Suppliers Group will give it to them, they could go to North Korea or they could go to Pakistan. Either way, that is creating a whole other dynamic in the region.

It would be even worse than Henry's, you know, pouring oil on the fire. That would be a disaster. I am not saying it's going to come to pass but they do have limited options.

In terms of what we tell Saudi Arabia, it is you are a nuclear newcomer state—you do not need enrichment and reprocessing.

We have a standard in the Middle East, which we are committed to upholding, and if you're concerned in the future let's talk about it in 10 years' time.

Mr. DEUTCH. Great. Thank you, Madam Chair.

Ms. ROS-LEHTINEN. Thank you very much. Thank you.

Mr. Donovan of New York.

Mr. DONOVAN. Thank you, Madam Chairman.

Are the international inspections—we enter this agreement—are international inspectors able to—I mean, are they overworked by the JCPOA?

Are they going to be able to make inspections that are going to make us feel comfortable about Saudi Arabia following whatever protocols are in place?

Mr. SOKOLSKI. In a word, no, and the reason why is they are very clear in Vienna and they've been very honest, if we would bother to listen, that they cannot absolutely guarantee that they know where things might be if someone wants to hide them from them. That's what happened in Iraq. That's what happened in Iran. That's what happened in North Korea, and the Agency, to its credit, was candid about that.

We won't take no for an answer, though. We need to. There are limits. Not only that, but there are ways of operating overt facilities such that you can break out so quickly that the ability of us to convene a hearing, much less to do anything, might not be very quick.

It's called timely warning. We don't have it. You can have inspections of light water reactors if you know there's not any desire to enrich or reprocess. You can keep track. You can do that.

But if there's any reason to believe someone is covertly or overtly enriching or reprocessing, you're in trouble and I think—you know, I share the criticisms that Will Tobey has about the Iran deal on that basis. I think we are kind of kidding ourselves as to how well that can be verified.

Mr. DONOVAN. Do you all agree with that as well?

Mr. TOBEY. Yes, and I would just add that it's important to understand that the scale of enrichment capacity necessary to fuel reactors is far larger than the scale that's necessary to have a viable weapons program.

So it's easy to hide a weapons program within this larger system, which makes the breakout potential even more dangerous and the breakout period even shorter.

Ms. SQUASSONI. I have a slightly different perspective. I would say that under the JCPOA we have higher confidence than we do under just regular comprehensive safeguards. That was the whole purpose, right?

You get more information, more access to more sites. You have a lot of information about the procurement chain. So the measures under the JCPOA are better than what we have under the Nuclear Nonproliferation treaty's comprehensive safeguards agreement.

But your question did not specify whether Saudi Arabia had enrichment capability or not. I would say we have more confidence if it has a simple program with light water reactors.

When you introduce sensitive nuclear fuel cycle technologies into the equation, the confidence goes down.

And let me just say one thing. Most countries with a complete fuel cycle are former nuclear weapon states or nuclear weapon states. There are few exceptions. Japan—who else? Germany.

Mr. SOKOLSKI. Brazil.

Ms. SQUASSONI. Well, yes. Brazil and Argentina. Brazil has a small enrichment program. But that came from its weapons program.

Mr. DONOVAN. Aren't we dependent, though, on the country being forthcoming, permitting access, whereas, my understanding, in part of the Iran deal is Iran is selecting where the inspectors go, what soil to test.

They're removing the soil and giving what soil they want tested rather than having the inspectors themselves choose the sites.

Mr. SOKOLSKI. Two comments. I don't know how many lawyers are up here. Too many. Well, but I've always been told—and I worked in the Justice Department briefly—that laws are meant to be broken but people don't understand what that means. What it means is you have got to catch people breaking the laws and if you do, that's okay. That's part of the reason why even outrageous countries like North Korea are very concerned about the law and what they're being asked to sign up for. It's not for nothing that the Iranians negotiated as long as they did. It's not for nothing that the North Koreans took so long to negotiate the things that they negotiated with us and it's not for nothing that the Saudis are also very concerned about the letter of the law.

You have got something here. Use it.

Mr. DONOVAN. Thank you.

Madam Chairman, my time has expired. Thank you.

Ms. ROS-LEHTINEN. Thank you very much, Mr. Donovan.

Ms. Frankel of Florida.

Ms. FRANKEL. Thank you very much.

So I want to go back to the statement that my chair and ranking member mentioned at the beginning.

When Crown Prince Mohammed bin Salman met—let's see, he had an interview with CBS and said Saudi Arabia does not want to acquire any nuclear bomb, but without a doubt, if Iran developed a nuclear bomb we will follow suit as soon as possible.

So here's my question. What are the steps that Saudi Arabia has to start to take to get to that position and what is the leverage that we have to prevent that from happening?

Mr. SOKOLSKI. I will take a shot at that.

Let's put on our bomb-making hats. Okay. First thing you want to do is have a program that causes so much noise for anyone monitoring what you're doing that it's very hard for them to see the signal of you procuring the bits and pieces to do enrichment.

You don't have to buy it from the Russians, the Americans, or the French. You buy it by going to perhaps Pakistan, your good buddy, and you say, how do you go about procuring the little bits and pieces and who do you contact, and you put that together while you continue to train up and build some large reactor.

And as I noted, even these research reactors are way big. Well, you have two routes then. One would be you could divert plutonium made in the research reactors and there are ways to get around IAEA safeguards.

I can go into detail later if you'd like. Or you bide your time and put together an enrichment program. A lot of people—I am married to someone who's Australian and because she worked for the government, I got to know a lot of Australians including people who worked on their bomb project. And it did not take more than a few years, as in maybe three, for them to put together a really good enrichment system.

We are assuming that the Saudis somehow are inferior or they don't know how to do long division or they can't buy assistance. I think all of that's wrong. It's been wrong every time. We said that of the Indians, the Pakistanis.

Ms. FRANKEL. What are their options on getting the reactor?

Mr. SOKOLSKI. Well, they already have it.

Ms. FRANKEL. Okay. So they need to get the material——

Mr. SOKOLSKI. In other words, they are buying two of them. They will be built.

Ms. FRANKEL. And what is our leverage? What is our strength?

Mr. SOKOLSKI. Your leverage is what the chairwoman is suggesting you all sign up to, again. You reported it out of committee in 2011. Do it again. Repetition is the soul of wit in politics, I am told.

If you do it, it'll mean that the gold standard will be something the negotiators, who are not done with our deal, will be thinking a lot more about. If you get that, then it won't matter that they have the reactors.

Ms. FRANKEL. Well, what is—what is our leverage to get them to sign that?

Mr. SOKOLSKI. I think——

Ms. FRANKEL. If they can——

Mr. SOKOLSKI [continuing]. President Trump did a pretty good job on TV yesterday laying out all the things that the Saudis are buying. They are not just buying pieces of hardware. They're trying to integrate themselves into the American security system. That, I would submit, is an enormous lever that, for some reason, no one's thinking about.

Ms. FRANKEL. Got it.

Anybody else want to add something?

Mr. TOBEY. I would say it perhaps in a more succinct fashion.

We should tell them that U.S. support for Saudi Arabia is contingent upon Saudi Arabia's commitment to the NPT and a Saudi nuclear weapons program will end the American security commitment to Riyadh.

Mr. SOKOLSKI. That's it.

Ms. FRANKEL. Got it. Thank you.

Ms. SQUASSONI. I agree with my esteemed colleagues.

Ms. FRANKEL. Thank you very much. I yield back, Madam Chair.

Mr. DONOVAN [presiding]. The gentlewoman yields.

The Chair recognizes the gentleman from Virginia, Mr. Connolly.

Mr. CONNOLLY. Thank you, Mr. Chairman, and welcome to our panel.

I've got to say, Mr. Sokolski, I very much enjoy your repartee and your answers. It's nice to have color in our hearings now and then.

No, but I mean that as a compliment. You indicated, look, the odds of Riyadh—because we keep on hearing, well, if we press them too hard they're going to go to Russia and China, and you said the odds of Riyadh buying Russian are about as likely as them buying Iranian because they're about that close.

Similarly, China is not an attractive option either. Could you expand on that? Because I think we hear that as if it's a real threat. I've never been persuaded of it but I thought you'd expand on your statement.

Mr. SOKOLSKI. This was an insight I got from someone from Congressional Research Service, who I don't think thought through what he meant, and we both worked this up in our heads.

Let's say you're interested in a bomb option. You're a Saudi. Putting aside the quality of the product which, I got to tell you, is not great—the last time their export version was put up on the grid for

a safety test it immediately had to be taken off the grid. Putting aside that when you allow the Russians into your financial dealings you lose money or, in the case of the South Africans, you get thrown out for corruption. Put all that aside.

Mr. CONNOLLY. Or you could even get compromised politically, but that's a different——

Mr. SOKOLSKI. Yes. Right.

Put all that aside. There's a bigger problem. Your game has to be to keep the world from knowing what you're doing. Why would you let Russian technicians who are thick as thieves with the Iranians into your house? I am not worried about the Russians. If somebody wants to use that narrative to buffalo you, grab your wallet. Walk out. It's not right, in my head.

The Chinese have a different problem. They and the French have the same kinds of problems and, arguably, we do, and Westinghouse does. We don't have an operating version of many of these reactors that we are trying to pitch them. The ones in China that might be exporting have not been reviewed or licensed anywhere in the West. They will be, but not for a few years. So, you know, there's a reason why, when the original bid went out from Saudi Arabia it was almost rigged so only the South Koreans could win it. They read the newspapers. They know what's in their interest. Now, we opened that up but I don't think we should assume that somehow it's immediately going to go to someone other than the Koreans.

Mr. CONNOLLY. Yes. Well, thank you, and of course, the other thing is if we fall below the so-called gold standard we invite the UAE to insist on renegotiating and we have—we have basically dumbed down the standard for others in the region and other parts of the——

Mr. SOKOLSKI. Well, I mean, essentially if you buy the Russian argument you might as well just not pay any attention to this issue.

Mr. CONNOLLY. Right.

Mr. SOKOLSKI. You give them all the leverage and you say, well, whatever you want.

Mr. CONNOLLY. That's right.

Mr. SOKOLSKI. I don't think that makes sense at all.

Mr. CONNOLLY. I agree. I thank you.

Ms. Squassoni, in the time I have left, so if we renounce or abrogate the JCPOA—the Iran nuclear agreement—doesn't that incentivize countries like the Saudis to now have their own nuclear development program because, clearly, the Iranians will develop a nuclear—will return to their nuclear threshold status and beyond if we renounce our own agreement roll it back or freeze it?

Ms. SQUASSONI. I think you have to ask the question what happens if the U.S. renounces this agreement. It's not entirely clear to me that everyone else will take their toys and go home.

Iran has certain benefits from continuing to adhere to the agreement.

Mr. CONNOLLY. I agree with your point, but forgive me—I've got 35 seconds.

Ms. SQUASSONI. Sure.

Mr. CONNOLLY. But my point is should Iran say okay, fine, then we are going to return to our nuclear development program that we had rolled back and frozen at your insistence under this agreement.

Doesn't that mean that the Saudis—this topic we are talking about here—have more of an incentive to develop their own nuclear program because they're now worried that the Iranians are proceeding?

What we have on ice is suddenly no longer on ice, and Mr. Tobey, you look like you might want to comment as well. Real quickly, because—I thank the chair.

Ms. SQUASSONI. I will be quick. Yes an incentive.

Mr. CONNOLLY. Yes, go ahead, Ms. Squassoni. I am sorry.

Ms. SQUASSONI. Yes. That will provide them greater incentives. There were other things that the United States can do in terms of security assurances, nuclear deterrence, other things like that.

But if the Saudis are intent on matching then there's not much we can do about it except put something else in place before you torpedo something that is currently freezing Iranian capabilities.

Mr. CONNOLLY. Excuse me. Well, it is a novel approach to diplomacy to renounce and abrogate your own treaty. But that's a different subject.

Mr. Tobey.

Mr. TOBEY. I agree with you, sir, and with Ms. Squassoni.

Mr. CONNOLLY. And Mr. Sokolski, do you agree?

Mr. SOKOLSKI. Yes, you're on to something at least to this extent, for sure. You don't get the Saudi agreement in such a fashion signed out that it permits enrichment and reprocessing before you find out what's going on with Iran.

Mr. CONNOLLY. Yes.

Mr. SOKOLSKI. And I would urge you all to slow the train down. Getting that darn bill out finally again, will be the loudest signal to the negotiators you can possibly deliver. The last time you guys had an opinion, you know what you produced? The gold standard. Get on it again, will you?

Mr. CONNOLLY. Thank you.

Well, we have a checkered past but some of our opinions actually have efficacious value, and I appreciate your saying that.

I do think it's important though what we just heard from this panel, and then I will shut up, Madam Chairman.

But is that renouncing Iran agreement—the JCPOA—has consequences far beyond Iran and, frankly, would have the unintended consequence potentially of actually proliferating, especially in countries such as the one we are talking about today—Saudi Arabia.

So I would hope the President and the White House will take that into account before they make any kind of decision.

Thank you, Madam Chairman, for your indulgence.

Ms. ROS-LEHTINEN [presiding]. Thank you, Mr. Connolly. Thank you very much.

And if I might just have two follow-up questions and then anybody would—if you wanted to you could have one. Thank you.

But just to emphasize the need for the bill that I've been pushing, has there ever been an instance where Congress has ever

passed a resolution of disapproval and then in fact successfully blocked a 123 Agreement?

The answer is no, but go ahead. Yes, has there been one?

Ms. SQUASSONI. No, but in the case of the China agreement, Congress conditioned its approval——

Ms. ROS-LEHTINEN. True.

Ms. SQUASSONI [continuing]. And there were no nuclear exports for 13 years, and so there are various ways that Congress can put in conditions, can put in certifications, et cetera.

May I just take a moment and respond to you?

Ms. ROS-LEHTINEN. Yes, please.

Ms. SQUASSONI. You know, the Nuclear Nonproliferation Act of 1978 made a tradeoff. It strengthened the nonproliferation requirements but it also gave this kind of quasi fast track approval, a passive approval.

The one thing that it envisioned was consultations with Congress and those have not happened. So when the U.S.-India nuclear deal came before you, it was already written.

And so thank you for holding this hearing because I think you have to start the debate before the ink is dry.

Ms. ROS-LEHTINEN. We need to have a voice instead of a fake process. Yes, Henry?

Mr. SOKOLSKI. Actually, the fast track was locked in when we were in a propaganda war pushing out small research reactors in 1954. We went along in 1978 with that again.

Seems to me, though, that every—you had 1946, 1954, 1978—that's 40 years. You're due to do an estimate of what the margin of safety requires. Surely you have learned something in the last 40 years about the adequacy of IAEA safeguards, the willingness of people to cheat, our ability to keep track of covert facilities, and just how many things have been bombed.

Take that into account. I think your bill is long overdue. It is something that has been—you know, the correction on what is an exempt agreement. It has been visited routinely. You're due. It's time for an oil change.

Ms. ROS-LEHTINEN. Thank you.

And as you mentioned, we have some 123 Agreements with Egypt, with Morocco, Turkey. They're up soon. So let's see what the administration is going to take these agreements one at a time or what it will do.

Ms. Frankel, I know that you had a follow-up question.

Ms. FRANKEL. I guess I would just——

Ms. ROS-LEHTINEN. Yes.

Ms. FRANKEL. I am just trying to get something clarified here. So in listening to you, I guess we can assume that Saudi Arabia, hypothetically, could get a research facility and the materials they need without going through the United States or without the United States' participation. Is that right? Yes? You think so? Okay. Okay.

So yes, that's what—because that was going to get my next step to that. They are now a party to the nonproliferation treaty. Is that correct?

Mr. SOKOLSKI. Yes.

Ms. ROS-LEHTINEN. Microphone on?

Mr. SOKOLSKI. Yes, they are.

Ms. FRANKEL. Yes. Okay. So I guess what I am trying to understand is, and I know I heard you say we have a lot of leverage, which sounds correct, over Saudi Arabia in a lot of different areas.

But my question is, they've signed on to the nonproliferation treaty. What more can we do, let's say, or should we do?

Mr. SOKOLSKI. I think what Will Tobey said succinctly and I didn't say succinctly, and I give him credit, is basically the Pope and the U.N. don't have as many divisions as we do, and if you are willing to tell your good friend and ally that we are there for them but the prerequisite is they actually have to follow the NPT and not threaten to leave it and live up to the gold standard and get behind us leaning on the Iranians to get them to behave, it'll work.

That's the reason, again, I think the legislation is reasonable and urgently needed.

Mr. TOBEY. By the way, as someone who has negotiated some of these agreements on behalf of the executive branch, I can say that it really helps to have Congress in the right place on these issues.

If we can point to the fact that we can't get it past our Congress if it doesn't have certain provisions, that's a powerful tool and speaks all the more about the importance of cooperation between the two branches.

Mr. CONNOLLY. Well, we are here to help, Mr. Tobey. That's——

Ms. FRANKEL. Did you want to add something?

Ms. SQUASSONI. I did want to add something. I mentioned this is in my testimony. Saudi Arabia is a member of the NPT but it hasn't crossed all the T's and dotted all the I's.

Because it has very little material in the country it has what is called the Small Quantities Protocol.

Back after we discovered Iran's clandestine program, the International Atomic Energy Agency said, hey, all you countries with Small Quantities Protocol this is a huge problem because you won't let our inspectors in.

So you either have to modify that or rescind it. They asked Saudi Arabia in 2005. We are still waiting. Half the countries who had those protocols have changed them. So that's one thing.

And the other thing is the Additional Protocol, which is in H.R. 5357. We should certainly ask Saudi Arabia to sign that Additional Protocol because it gives inspectors more access and more information.

Ms. FRANKEL. Thank you very much. I yield back.

Ms. ROS-LEHTINEN. Thank you. Thank you for that follow-up question.

Thank you to our witnesses. Thank you for everyone to—for being here. We look forward to continuing this discussion. This is not going away.

And with that, our hearing is adjourned. Thank you.

[Whereupon, at 3:15 p.m., the committee was adjourned.]

APPENDIX

Material Submitted for the Record

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

Subcommittee on the Middle East and North Africa
Ileana Ros-Lehtinen (R-FL), Chairman

March 14, 2018

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 by the Subcommittee on the Middle East and North Africa in Room 2172 of the Rayburn House Office Building (and available live on the Committee website at http://www.ForeignAffairs.house.gov).

DATE: Wednesday, March 21, 2018

TIME: 2:00 p.m.

SUBJECT: Implications of a U.S.-Saudi Arabia Nuclear Cooperation Agreement for the Middle East

WITNESSES: Mr. Henry Sokolski
Executive Director
The Nonproliferation Policy Education Center

Mr. William Tobey
Senior Fellow
Belfer Center for Science and International Affairs
The John F. Kennedy School of Government
Harvard University

Ms. Sharon Squassoni
Research Professor of the Practice of International Affairs
Institute for International Science and Technology
Elliott School of International Affairs
George Washington University

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 SUBCOMMITTEE ON *Middle East and North Africa* HEARING

Day *Wednesday* **Date** *04.27.18* **Room** *2172*

Starting Time *2:00 p.m.* **Ending Time** *3:15 p.m.*

Recesses [ ] (____to____) (____to____) (____to____) (____to____) (____to____) (____to____)

Presiding Member(s)

Chairman Ros-Lehtinen, Chairman Donovan

Check all of the following that apply:

Open Session [✓]
Executive (closed) Session [ ]
Televised [✓]

Electronically Recorded (taped) [✓]
Stenographic Record [✓]

TITLE OF HEARING:

Implications of a U.S.-Saudi Arabia Nuclear Cooperation Agreement for the Middle East

SUBCOMMITTEE MEMBERS PRESENT:

GOP- Chairman Ros-Lehtinen, Reps. Chabot, DeSantis, Zeldin, Donovan
Dem- Ranking Member Deutch, Reps. Connolly, Frankel, Schneider, Lieu

NON-SUBCOMMITTEE MEMBERS PRESENT: *(Mark with an * if they are not members of full committee.)*

GOP- Rep. Wilson
Dem- Rep. Sherman

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.)*

Statement for the Record Submitted by Mr. Connolly of Virginia
Submitted for the Record by Mr. Henry Sokolski:
A New Light on the Proposed U.S.-Saudi Nuclear Agreement by Victor Gilinsky and Henry Sokolski
Economic Consideration of Nuclear Power Deployment in Saudi Arabia by Ali Ahmad
Nuclear Cooperation with Gulf Arabs by Mark Fitzpatrick
Saudi Arabia Energy Needs and Nuclear Power

TIME SCHEDULED TO RECONVENE _____
or
TIME ADJOURNED *3:15 p.m.*

Subcommittee Staff Associate

Statement for the Record
Submitted by Mr. Connolly of Virginia

The United States is exploring a civil nuclear cooperation agreement with Saudi Arabia. Such an agreement has the potential to yield benefits for the U.S. nuclear energy sector, but there are important national security contingencies we must consider. Depending on the structure of a final deal, the agreement could weaken the non-proliferation standards of other U.S. nuclear cooperation agreements or strengthen the U.S. non-proliferation regime in the Gulf. In the absence of an agreement with the United States, Saudi Arabia may deepen cooperation with U.S. adversaries, namely Russia and China, but Riyadh remains wary of their simultaneous support for Saudi's rival Iran. It is in the best interests of the United States to pursue an agreement with Saudi Arabia that incorporates robust non-proliferation provisions, also known as the "gold-standard" of peaceful nuclear cooperation.

Significant U.S. nuclear cooperation with a foreign country requires the signing of a peaceful nuclear cooperation agreement, known as a "123 agreement," which refers to the relevant section of the Atomic Energy Act (AEA) of 1954 (P.L. 95-242). In November 2017, Assistant Secretary of State for International Security and Nonproliferation Christopher Ford said that discussions about a nuclear cooperation agreement with Saudi Arabia are underway. While both the United States and Saudi Arabia stand to benefit from enhanced nuclear cooperation, the U.S. Government has released no official estimates of potential export revenues or the impact a 123 agreement with Saudi Arabia would have on employment in the United States.

Regarding the national security concerns, the devil is in the details. Many observers refer to the 2009 U.S.-United Arab Emirates (UAE) 123 Agreement as the "gold standard" of peaceful nuclear cooperation. Under that agreement, the UAE vowed not to enrich or reprocess nuclear material, and to obtain nuclear fuel for the reactors from outside sources. The deal also requires that the UAE incorporate its Additional Protocol into its IAEA safeguards agreement before the U.S. approves the transfer of "nuclear material, equipment, components, or technology." It is important to remember that this agreement also includes a provision that allows the UAE to request amending the deal if other parties in the region are held to a less restrictive standard. It is safe to assume that the UAE would act on this provision if a future U.S.-Saudi deal does not constrain Saudi's nuclear activities in the same way.

Just last week, Crown Prince Mohammed Bin Salman said "Saudi Arabia does not want to acquire any nuclear bomb (sic), but without a doubt if Iran developed a nuclear bomb, we will follow suit as soon as possible." Riyadh certainly has an interest in meeting rising domestic energy demands and preserving its vast oil reserves for export revenue. However, as the architect of a robust global non-proliferation regime, the United States must seek to mitigate the risk of nuclear proliferation in the Middle East by pursuing a "gold-standard" nuclear cooperation agreement with Saudi Arabia.

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

[*Forthcoming in* The National Interest]

A NEW LIGHT ON THE PROPOSED US-SAUDI NUCLEAR AGREEMENT

By

Victor Gilinsky and Henry Sokolski

In a recent *60 Minutes* interview the Saudi Crown Prince, the effective ruler, cast a new light on the proposed US-Saudi nuclear energy cooperation agreement that he and the Trump administration would like to seal: "Without a doubt," the Prince said, "if Iran developed a nuclear bomb, we will follow suit as soon as possible."

The Prince's threat to break the agreement to match "*as soon as possible*" a move by Saudi Arabia's bitter rival to nuclear weapons makes clear he wants a ready nuclear weapons option. This goes a long way toward explaining Saudi insistence that the agreement leave the door open to Saudi enrichment of uranium. A domestic centrifuge facility (the preferred enrichment technology) would provide quick access to explosive levels of enriched uranium, and thus to weapons.

The alternative energy-related explanation is not plausible as it makes no economic sense for Saudi Arabia to develop commercial enrichment. There is a thriving world enrichment market, and lots of capacity. If Saudi Arabia buys nuclear reactors it will have no worries about access to fuel. And the country would gain no economic advantage whatsoever in extracting plutonium, the other dangerous technology at issue.

In any case, our overriding consideration should be national security. We should rule out the dangerous fuel technologies in the agreement by insisting on what has come to be known as the nonproliferation Gold Standard for U.S. civil nuclear cooperation.

We are at an important turning point. The widely publicized calculations on the military significance of Iran's centrifuges educated the world on the dangers of national uranium enrichment facilities. If in the full knowledge of that, we choose a permissive approach—allow

domestic Saudi enrichment—we will set an awful precedent endorsing nuclear programs that put countries within arms-reach of a nuclear weapon.

Some US supporters of a permissive US-Saudi agreement see it as a fight-fire-with-fire tactic to frighten Iran. The trouble with that approach is that it can easily get out of hand, with disastrous consequences, and not only in the Middle East. The answer is to convince Iran to back off in its uranium enrichment, not to open the door to others to emulate it.

Much has been written about the dangers of having many nuclear-armed countries. As Henry Kissinger famously observed, "To assume that, in such a world, nuclear catastrophe could be avoided would be unrealistic." It is only a short step from that if lots of countries have easily exercised nuclear weapons options. It would be an inherently unstable arrangement, one whose consequences are incalculable. Better to slow things down, to provide time for sober thought before countries reach for the ultimate weapon.

The immediate effect of a permissive US-Saudi agreement would be to roll back the tighter one with Saudis' neighbor, the United Arab Emirates, which is predicated on keeping the same key provision in future agreements. Next, it would set a pattern for upcoming negotiations with Egypt in 2021 and with Turkey in 2023, neither of which will settle for anything stricter than is in the US-Saudi agreement. And at the other end of Asia it would bolster South Korea's continuing efforts to gain US approval to extract plutonium and enrich uranium.

The two worrisome proliferation regions, Northeast Asia and the Middle East, are now coupled through nuclear energy deals and—it has recently emerged—security agreements. South Korea's 2009 nuclear energy contract with UAE included secret military clauses. South Koreans are the leading contenders for the Saudi's nuclear project. It would not be surprising if similar clauses appeared in that contract. It's clear the current interest in nuclear fuel technologies in the Middle East and northeast Asia has a large military component, which makes it all the more important to maintain strict conditions.

Washington nuclear policy "experts" tell us not to worry because the nuclear cooperation

agreements have provisions that can be used to delay Saudi enrichment, and anyhow the Saudis don't want nuclear weapons. Significantly, the Israelis, who otherwise line up with the Saudis against Iran, aren't buying this and vigorously oppose a permissive agreement.

The ultimate argument is of course the venerable one—if we don't loosen our nonproliferation requirements the Saudis will buy from the Russians or Chinese instead of us, and we'll lose influence in the Middle East. Even the premise is wrong. The Saudis will most likely choose the South Korean team that is coming off successful completion of UAE reactors. As for switching to Russia or China, neither is an attractive partner. Would the Saudis trust the builder used by Iran?

More fundamentally, this thinking reflects an outdated and exaggerated notion about the importance of nuclear energy. Its prospects have diminished radically, as has its international importance as a political currency. There is no chance, for example, the United States will build another large nuclear power plant based on current technology. They no longer make economic sense. Why then do we promote such plants abroad and thereby excite interest in dangerous technologies?

More sensible would be to invite the Saudi Prince to discuss energy alternatives. His United Arab Emirates neighbors have announced they won't build any more nuclear plants. The same economics applies to Saudi Arabia. That would also facilitate a reasonable outcome with Iran over its nuclear program.

Victor Gilinsky served on the U.S. Nuclear Regulatory Commission under Presidents Gerald Ford, Jimmy Carter, and Ronald Reagan. He is program adviser for the Nonproliferation Policy Education Center. **Henry Sokolski** is executive director of the Nonproliferation Policy Education Center and the author of *Underestimated: Our Not So Peaceful Nuclear Future*. He served as deputy for nonproliferation policy in the office of the U.S. secretary of defense from 1989 to 1993.

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

Economic Considerations of Nuclear Power Deployment in Saudi Arabia

Ali Ahmad

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Introduction

Saudi Arabia's plans to acquire nuclear power are ambiguous. In 2012, the kingdom announced its intention to build 16 nuclear reactors by 2032, which was later delayed to 2040.[1] More recently, the "Saudi Vision 2030", championed by the now Crown Prince, Mohamad Bin Salman, did not explicitly mention nuclear power as an option for the kingdom, though it emphasized the need to invest in, and localize renewable sources of energy.[2] The Saudi Vision 2030 was promptly followed by the "National Transformation Program 2020", which included the need to identify and the prepare the construction location of Saudi's first nuclear power plant, localize parts of the nuclear fuel cycle and the SMART small reactor, a South Korean technology.[3]

Saudi officials offer multiple motivations to construct nuclear power plants in the kingdom. Perhaps the most commonly articulated one is a desire to get away from the near-complete reliance on hydrocarbon resources to produce electricity and desalinated water. Such reliance is seen to lead to the depletion of national oil and gas reserves but is also perceived to have an opportunity cost associated with forgone export revenues. Others suggest that interest in nuclear power is also a response to Iran's acquisition of nuclear technology. It has been argued, for example, that, "GCC states want to show Iran, their own people, and the broader world that Arabs also have the prowess and power attributed to nuclear technology".[4] Whatever the motivations behind nuclear power might be, the acquisition of nuclear technology will entail major economic and non-economic costs.

This paper examines the main economic drawbacks and considerations for building nuclear power plants in Saudi Arabia. It focuses on issues such as large vis-à-vis small reactor options, cost of electricity generation, localization potential, and the role of renewables, particularly solar power. The paper also discusses the measures required and investments needed to achieve high penetration of renewables in the kingdom.

The Electricity Sector in Saudi Arabia

The kingdom's power generation capacity is built on conventional thermal plants fueled by a mix of crude oil, heavy fuel oil, natural gas and other petro-residuals, as shown in Figure 1.[5] All of the natural gas produced within the Kingdom is consumed domestically while electricity generation is dominated by gas turbines which offer a cheap way of meeting demand.[6] [7] The

Saudi Electric Company (SEC), a vertically integrated electricity company, controls 71% of the generation capacity and is responsible for transmission and distribution across the country.[7] More recently, government reforms are pushing for unbundling of the generation, transmission and distribution sectors in order to encourage the entry of new producers thereby increasing efficiency and decreasing government spending.[8]

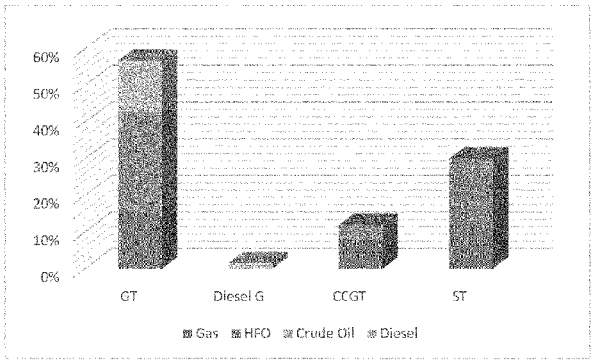


Figure 1: Electricity generation in Saudi Arabia by type of fuel and generation technology (ST= steam turbine, CCGT– Combined cycle gas Turbine, GT–Gas Turbine, Diesel Generators)

By 2032, power generation capacity in the kingdom is expected to reach 120 GW.[9] The increase in electricity demand will be mostly driven by population growth, a fast-growing economy and an increase in consumption fueled by cheap energy prices and high government subsidies.[10] Based on 2014 data, the maximum peak load reached in Saudi Arabia was approximately 56.5 GW occurring during week 36 (September 1-7, 2014), while the minimum peak reached was 31.88 GW occurring during the first week of that same year (December 30-January 5, 2014). The high peak load occurred in summer and low peak load occurred in winter. The difference between highest and lowest load in summer was 8.77 GW, the difference in the winter was 7.55 GW.[11] The summer pattern is specific to a number of countries including the Gulf countries where air conditioning is widely used in summer and barely needed for heating in winter. See Figure 2.

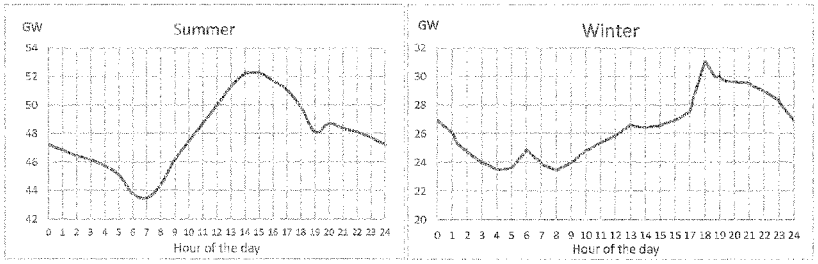


Figure 2: Hourly load in Saudi Arabia during summer (left) and winter (right) Source: Chite and Ahmad, 2017

Nuclear Technology Options

There are multiple reactor technologies that are available for deployment in Saudi Arabia. Many of the reactors that have already been sold and are being operated or under construction have relatively large power capacities (Table 1).[12] More detailed technical descriptions of reactor technologies and their relevance to the Middle East market can be found in the literature.[13] In the Gulf Cooperation Council (GCC), the South Korean APR-1400 technology is the only one currently under construction in the United Arab Emirates.[14]

Table 1: Current reactor designs available for Saudi Arabia

Country	Technology	Reactor Design	Capacity (MWe)
South Korea	PWR	APR-1400	1400
France	PWR	EPR	1600-1700
USA/Japan	PWR	AP1000	1110
Russia	PWR	VVER	1000
USA/Japan	BWR	ABWR	1350
India/Canada	PHWR	PHWR/ACR-700	700

Saudi Arabia's ambitious plans for nuclear power has attracted a number of nuclear vendors. In 2013 both GE Hitachi Nuclear Energy and Toshiba/Westinghouse signed contracts with Exelon Nuclear Partners (ENP), a division of Exelon Generation, to pursue reactor construction deals with KA-CARE.[15] The reactor designs proposed include the ABWR, the ESBWR and the AP1000. The French companies Areva and EDF have also been aggressively moving into Saudi Arabia. In 2015, KA-CARE signed nuclear cooperation agreement with France to study the feasibility of constructing two EPR reactors while providing training on safety and waste disposal. Saudi Arabia and China signed a MoU in 2016 to build of High-temperature gas-cooled reactors (HTGRs) and in 2017 to study the feasibility of building HTGRs.[16]

More recently, Saudi Arabia sent a "request for information" to nuclear reactor vendors around the world, a step perceived as a first step towards opening a formal tender.[8] As a response, Westinghouse, which promotes the AP1000 design, has been reported to be in discussion with U.S.-based companies to forma bidding consortium.[9] With reports of Russian and South Korean companies also planning to bid, nuclear vendors worldwide look at Saudi Arabia as one of the most promising markets, especially with if KA-CARE's plan to build 16 reactors is materialized.

Small Modular Reactors

Saudi Arabia's interest in small modular reactors seems to be serious. In March 2015, the kingdom signed an MoU with South Korea to conduct a three-year study to review the feasibility of constructing SMART reactors in Saudi Arabia. The agreement also calls for the two countries to cooperate on the commercialization and promotion of the SMART reactor to third countries.[17]

A number of SMR developers have argued that there are multiple motivations to pursue smaller designs, directed both at large industrialized countries and developing countries. One motivation is the high upfront capital cost of standard reactors, which is beyond the financing capacities of many utilities and countries. Another is to expand nuclear power to countries with relatively small electrical-grid capacities; a gigawatt-scale reactor could destabilize a small grid. What is interesting about the SMART partnership between Saudi Arabia and South Korea is that the kingdom falls outside the "niche" SMR market, as advocated by SMR vendors.

However, other factors that have been offered as motivations for SMRs are claims to potentially greater safety due to the reliance on passive features, and enhancement in public acceptability. In the case of the Saudi SMART venture, the technology is also capable of producing desalinated water besides generation electricity.[18]

The downside of SMRs deployment in Saudi Arabia, however, is the loss of economies of scale – smaller nuclear reactors are typically more expensive on a per unit cost basis. Detailed and carefully conducted elicitations showed that even experts drawn from, or closely associated with, the nuclear industry expect SMRs to cost more per kW of capacity than currently operating reactors.[19] Based on the average of expert estimates of the extra per kW cost for SMRs, the percentage increase expected ranged from 12% for 225 MWe reactors to a whopping 120% for 45 MWe reactors.

There are currently dozens of SMR designs under development. Some of these are still in the conceptual design phase, many are still in the R&D phase and only four have been licensed or currently are under construction.[20] The details of these SMRs are summarized in Table 2. Thus far, there is no sign that any of the five remaining GCC countries are considering any of these reactors.

Country of Origin	**South Korea**	**Russia**	**China**	**Argentina**
Reactor Technology	PWR	PWR	HTGR	PWR
Status	Licensed	Under Construction	Under Construction	Under Construction
Electrical Power (MWe)	90-100	35	2X105	27

Table 2: Small modular reactors currently under construction or licensed

The HTGR Option

Saudi Arabia's interest in SMRs extends to the Chinese high temperature gas reactor (HTGR). In March 2017, KA-CARE and China Nuclear Engineering Group (CNEC) signed an agreement to conduct a feasibility study that will consider "the development of system solutions for the investment and construction of HTGRs".[21] The agreement will also examine cooperation in "intellectual property and the development of a domestic industrial supply chain for HTGRs built in Saudi Arabia".

Since HTGRs operate at a higher temperature compared to water-cooled reactors, they can be used to generate process heat and hydrogen production as well as electricity.[10] On paper, Saudi Arabia could deploy HTGRs in their industrial regions such as petrochemical compounds and heavy oil recovery systems. Proponents of HTGRs claim that they possess high safety standards.[22] However, based on a review of the operational history of HTGRs, they face some serious technical challenges and are prone to a variety of small failures such as air and oil ingress, which could trigger accidents with severe consequences.[11] [12] Given the importance of the oil and petrochemical sector for the Saudi economy, the consequences of any accident are likely to be immense. Therefore, the kingdom will be taking on a substantial risk for a return that can be achieved using other sources of energy and technologies.

Cost of Electricity Generation

The conventional way to compare the cost of electricity generated by different sources is to calculate the levelized cost of electricity (LCOE), which can be understood as the ratio of the total cost to the benefits (in this case the electricity produced) with all figures being discounted to the same baseline year. This follows from the standard discounted cash flow methodology, which accounts for the time-value of money. This methodology is used to calculate the life cycle cost of producing electricity.

The calculated LCOE for different energy sources are all busbar costs delivered to the grid; i.e., they take into account auxiliary or in-plant consumption of electricity but do not include transmission and distribution costs. Any large-scale expansion of nuclear power in Saudi Arabia would require an expansion of transmission infrastructure. Such costs are not included here, even though it could be significant.

The cost of electricity generated as well as water produced by desalination from any technology depends on a number of parameters. An important factor is the discount rate. For the case of Saudi Arabia, the chosen discount rate is 5 percent. Note that this is a real discount rate, and inflation is implicitly taken into account. This choice may seem somewhat low, but many studies do indeed adopt discount rates of around 5 to 5.5 percent in their evaluations of electricity economics in the GCC.[13]

Estimates of the cost of electricity generation of various sources in Saudi Arabia are shown in Table 3. These estimates were based on a recent study by Chite and Ahmad.[14] Estimating the cost of generation using prices of subsidized fuel, as usually entailed from Saudi electricity operators, results in very low generation costs where nuclear (and renewables) cannot compete.

[15]Fuel/ Technology	Nuclear	Gas-light oil / GT	Gas- light oil/ CCGT	Heavy Oil/ ST	Diesel/ Diesel
Fixed Cost ($/MWh)	68.5	10.37	17.35	14.77	66.98
Var. Cost(US$/MWh)	12.25	37.69	8.70	8.23	21.50
LCOE (cent/KWh)	8.08	4.81	2.60	2.30	8.85

Table 3: Cost of electricity generation in Saudi Arabia of different technologies using subsidized prices

A special case to be considered is the cost of nuclear electricity generated by SMRs. As discussed earlier, SMRs are expected to have higher capital costs per kW by somewhere between 12 and 120 percent.[16] In this analysis, SMRs' capital costs is assumed 25 percent higher than for current nuclear reactors, i.e., approximately $7,430/kW.[17] SMRs would also have higher fueling cost because of higher uranium requirements.[18] It is also not clear what sets of conditions they would be licensed under,[19] and depending on the safety and security requirements imposed by regulatory authorities, SMRs could have higher fixed and variable operations & maintenance costs. In contrast to these higher costs, the construction time for SMRs is expected to be shorter.[20] For simplicity, it is assumed that all of the cost variables for current (large) LWRs are the same as SMRs with the exception of the capital cost. Then, with these assumptions, the levelized cost of nuclear power from reactors rises from about $81/MWh if large reactors are constructed to over $94/MWh for SMRs.

Baseload Generation: Nuclear versus Natural Gas

Unlike renewables that have zero fueling costs, the cost of natural gas is an important, perhaps overwhelming, component of the cost of generating electricity in a natural gas plant. Therefore, the cost comparison between nuclear and natural gas could vary from country to country. Natural gas prices in countries that use domestic reserves, such as Saudi Arabia, would be significantly lower than countries that import natural gas at international prices, and this would affect the relative economics of power from nuclear reactors and natural gas plants.

The economic competitiveness of gas-fired power plants decreases as the prices of natural gas increase. Ahmad and Ramana estimated the cross-over value between nuclear and natural gas generated electricity for Saudi Arabia is at a natural gas price of $13.6/mmBTU.[21] In other words, nuclear is less economical if natural gas prices are lower than the cross-over value. The economic prospects for nuclear power in the kingdom are not favorable in comparison with natural gas, even if the currently low domestic natural gas prices in Saudi Arabia were to rise substantially.

What if Saudi Arabia were to increase its domestic output and start exporting gas instead of using it in natural gas plants? This is related to what is often termed the opportunity cost. The first thing to note is that such exports will most likely be in a liquefied (LNG) form. Consequently, the costs associated with building infrastructure, liquefaction and shipping should be taken into account. A study on the future of natural gas conducted by the Massachusetts Institute of Technology estimates the cost of liquefaction at $2.15/mmBTU, shipping of LNG at $1.25/mmBTU, and regasification at $0.7/mmBTU.[22] The total of these costs amount to $4.1/mmBTU.[23] Because of this additional expenditure, it would make economical sense for

Saudi Arabia to build a nuclear reactor in comparison to a natural gas plant only if the price that could be obtained on the international market exceeds $13.6/mmBTU over the period of the lifetime of the reactor.

Potential of Solar Power in Saudi Arabia

Aside from meeting the increasing energy demand, integrating solar power in the Kingdom's current energy mix would be both economically and environmentally advantageous. Saudi Arabia has one of the highest potential of solar energy in the region where annual solar radiation is around 2,200 kWh/m^2.[24] Moreover, integrating renewables within the energy industry would drive economic diversification, create jobs and facilitate the implementation of climate change policies. Compared to nuclear, pairing solar power plants with domestic gas turbines can also help with load balancing more effectively.

The Kingdom recently equipped 30 metrological stations able to conduct very accurate measurements including one-minute measurements of Global Horizontal Irradiance (GHI), Diffuse Horizontal Irradiance (DHI), and Direct Normal Irradiance (DNI).[25] GHI ranged from an average daily total of 5,700 Wh/m^2 to the highest 6,700 Wh/m^2 with the higher values found in inland areas and lower values found on the coast. DNI values ranged from an average daily total of over 6,474 Wh/m^2 found on western inland areas to an average daily total closer to 5,510 Wh/m^2 found on eastern areas.[26] The solar resources outlined above are optimal for the performance of two main solar technologies that dominate current and future energy projects in Saudi Arabia: Photovoltaics (PV) and Concentrated Solar Power (CSP).

The hourly load pattern shown in Figure 2 above should offer an advantage for renewables mainly solar, as the high load occurs in the summer, in step with the maximum output of solar PV or CSP systems. However, PV systems generally suffer from reduced power output during the summer due to high ambient temperature affecting the performance of solar cells. On the other hand, CSP systems are less affected by high ambient temperature but are more sensitive to weather conditions like haze or sandstorms which lower the performance of solar CSP plants.[27]

In terms of costs, PV costs are divided into module costs (direct cost of photovoltaic modules); "hard" (inverter, racking, electrical equipment, etc.); and "soft costs" (labor, permitting fees, etc.). Module prices have followed a learning rate of 20 percent over the long term for the last 10 years.[28] Non-module prices, which are also known as BOS (Balance of System) are also decreasing, nearly at the same rate. Future improvements in the PV technology cost should come from a combination of improving power electronics, reducing supply chain complexity and cost, and decreasing installation costs and margins as markets mature.[29]

The dramatic decline in solar PV costs is particularly relevant because of the long construction period of nuclear projects, a decade at the very least.[30] Even assuming that a nuclear power project is given the go-ahead in 2018, it will likely be 2028 by the time it starts generating electricity. On the other hand, there is little reason to expect the costs of nuclear power to decline substantially. Historically, costs of nuclear power have only increased.[31]

Recent solar PV projects benefit from lower prices. For example, the Dewa project in Dubai rated 260 MW is priced at $328 million, giving a capital cost of 1,225 $/kW. The plant is expected to produce electricity at world record of 5.85 cent/kWh. Prices are heavily influenced by the project location. In Saudi Arabia, these costs should be less than those in the US and Europe. Costs should decrease even further as more PV projects are installed and some parts of the PV system are manufactured locally.

Investments Needs

The total investment for the 2012 KA-CARE plan is expected to reach about $360 billion by 2030, with CSP technologies representing the highest costs (see Figure 3).[32] A cheaper scenario involves adding gas turbines and replacing nuclear reactors with CCGT power plants which are cheaper and have a shorter construction time. In that case, the total investments needed are approximately $150 billion, nearly half the investments needed by 2012 KA-CARE plan (see Figure 4).

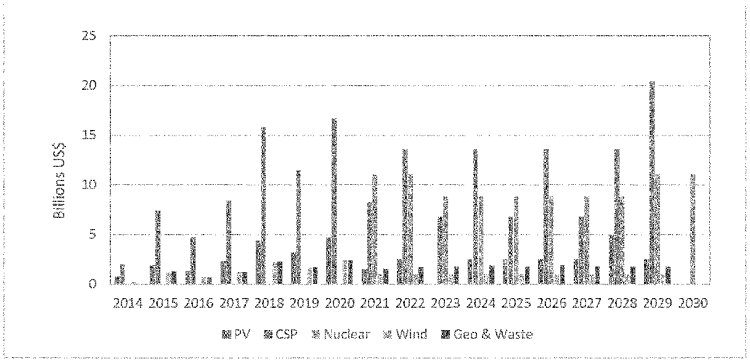


Figure 3: Investment in Billion US$ needed to implement the original KA-CARE plan (16 GW PV, 25 CSP and 17.6 GW Nuclear)

NOTE: The preceding document has not been printed here in full but may be found at https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=108057

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

www.iiss.org

Nuclear cooperation with Gulf Arabs

A US–Saudi nuclear agreement should not depart from strict non-proliferation standards, argues Mark Fitzpatrick.

Date: 15 March 2018

By Mark Fitzpatrick, Executive Director, IISS-Americas

Ten years ago, in discussing its nuclear energy plans with US government officials, Saudi Arabia signed a memorandum of understanding (MOU) expressing an intent not to create indigenous uranium enrichment and plutonium reprocessing capabilities, and to instead rely on the international market for fuel for the reactors it intended to introduce. Bahrain, Jordan and the United Arab Emirates (UAE) signed similar MOUs.

The MOUs were encouraged by the George W. Bush administration as a key non-proliferation policy. By forgoing these sensitive areas of the nuclear fuel cycle, US partners could enjoy streamlined access to civil nuclear technology without raising concerns about the potential for exploiting the atom for non-peaceful purposes. In the absence of either enrichment or reprocessing, it is impossible to build a nuclear weapon.

According to then-principal deputy assistant secretary for International Security and Nonproliferation Patricia McNerney, who negotiated the MOUs, the four Arab states 'deliberately set themselves as counter-examples to Iran', which was vigorously pursuing enrichment as a nuclear hedging strategy. Iran had halted its nuclear-weapons programme in autumn 2003, but it clearly wanted a potential weapons capability for the future. If Arab states could show a contrasting model for nuclear energy development, it would help to undermine the Iranian narrative that Tehran's interest was only in peaceful nuclear purposes. Limiting the spread of the sensitive nuclear technologies was also a non-proliferation goal in its own right, one that the Bush administration sought to apply globally.

Among the four Gulf states which signed the MOUs, however, only the UAE put it into practice. In 2009, it signed a nuclear non-proliferation agreement with the US in which the Emirates accepted the non-proliferation 'gold standard' of forgoing enrichment and reprocessing capabilities as a condition for receiving US nuclear technology. This '123 agreement' (named after Section 123 of the US Atomic Energy Act) paved the way for the negotiation of a commercial deal with the Korea Electric Power Corporation to construct four nuclear reactors. (The US-origin technology content in those reactors required the 123 agreement.) The UAE's reactors, which are on schedule to start operation within the next two years, will be far safer than the Iranian reactor across the Gulf in Bushehr. Six and a half years after that reactor started up, Iran still is not a party to the 1994 Convention on Nuclear Safety.

Some time after 2008, the other three Arab states in question developed second thoughts about what had been non-binding statements of intent. After coming 'very, very close' in 2011 to signing a 123 agreement with those conditions, Jordan could not bring itself to actually do so, apparently as a matter of principle. It also wanted to

retain the right to exploit the large uranium reserves in the country and add value by enriching uranium. With plans to build two nuclear power plants by 2025 delayed due to financial difficulties, Jordan's 123 negotiations have been suspended. Bahrain, not having a nuclear-power development plan, never entered into 123 negotiations.

Negotiations on a US nuclear cooperation agreement with Saudi Arabia also got bogged down. Recently, however, the Saudis accelerated their ambitious plans for nuclear energy – 16 large reactors over the next 20–25 years – and thus resumed the talks. With a tender for the first two reactors scheduled to be awarded this year, the technology agreement with the US has taken on urgency. This would be straightforward except that Riyadh is balking at the gold standard. Its stated reason for reluctance is based on economic grounds. Expressing a future goal of 'self-sufficiency in producing nuclear fuel', Saudi Arabia says it wants to be able to tap its extensive uranium resources. Yet every independent study shows that unless a state has a very large nuclear-power programme, it is more economical to buy nuclear fuel. The Saudis acknowledge that they do not anticipate enriching for the next 25 years.

Saudi Arabia's real concern is in keeping pace with Iran. The Saudis also have a nuclear hedging strategy. With Tehran's uranium enrichment programme having been granted international legitimacy via the 2015 Joint Comprehensive Plan of Action (JCPOA), Riyadh insists on a similar right. As former assistant secretary of state for International Security and Nonproliferation Tom Countryman has impishly noted on Twitter, however, the Saudis naturally are not interested in replicating the price Iran paid for its nuclear programme in terms of the international opprobrium and remaining sanction it is under, and the intrusive inspections to which it had to submit.

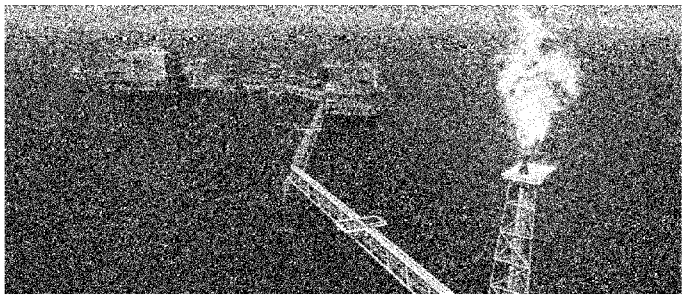
Saudi Arabia has yet to accept the Additional Protocol that the International Atomic Energy Agency (IAEA) has said should be an integral part of every country's nuclear safeguards arrangement. The Saudis also have yet to accept another safeguards protocol that the IAEA has been seeking since 2005. This is the modified version of the 'Small Quantities Protocol' that would eliminate a loophole which allows a number of safeguards measures to be held in abeyance.

In addition to the gold standard on sensitive technologies, the UAE early on accepted the Additional Protocol. It has also adopted the highest-standard conditions for nuclear safety, nuclear security and transparency, signing every nuclear treaty, convention and protocol available to it. Among nuclear 'good guys', the UAE enjoys platinum status.

For the US to sign a 123 agreement with Saudi Arabia that did not include the gold standard on enrichment and reprocessing would be a major change of policy that has guided both Republican and Democratic administrations. It would also effectively invalidate the UAE promise, because of a clause in that country's 123 agreement allowing renegotiation if any other country in the Middle East receives an agreement on more favourable terms.

In short, when Crown Prince Mohammed bin Salman visits on 19 March, the US should stick to standards that would allow for the expansion of nuclear energy in the Middle East that is as safe, secure, and non-threatening as anywhere else in the word.

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



Saudi Arabia Energy Needs and Nuclear Power

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1. Introduction

This report, commissioned by the Nonproliferation Policy Education Center, assesses the prospects for Saudi Arabia to meet its energy and environmental requirements without the use of nuclear power.

There are evidently many ways in which those requirements could be defined and met. This study covers the period up to 2040 since this is the period over which the country has defined its current nuclear power target, and with main focus on 2032 given that this was the year for its initial planned mix of nuclear and renewable energy. Reasonable assumptions are made for growth in electricity demand, other industrial energy demand, and transportation, based on official Saudi forecasts with independent checks and scenarios, including those with greater realised energy efficiency. The primary focus is on electricity given that this would be the main output of a civil nuclear power programme, so the other uses of oil and gas in the transportation and industrial sectors are not considered in detail.

Then a comparison is made of the Saudi energy system up to 2040 with nuclear power at current targeted levels; with the current fossil-fuelled mix; and with a number of scenarios with more renewable energy and no nuclear. These three approaches are contrasted on the metrics of economic attractiveness (cost and value); environmental outcomes; reliability and energy security; local economic development. Possible proliferation-related reasons for pursuing civilian nuclear power have been dealt with at length by others[1] and are not considered here.

The main scenarios considered assume that the regional political situation and climate remain broadly similar to today. It is assumed that, over this period, transport (air, land and sea) will remain fuelled primarily by hydrocarbons (oil and possibly natural gas). In all scenarios, mostly current technologies are assumed, with conservative views on improvements in performance and cost. Of course, more rapid advances in renewable energy, unconventional hydrocarbons, carbon capture & storage, advanced energy storage or other technologies would make it easier to meet the country's energy requirements without

nuclear power. Conversely, advances in nuclear power (such as small modular reactors) would make it relatively more attractive.

Environmental requirements are assumed to be, at minimum, compliance with Saudi Arabia's Paris climate change agreement submission, as well as mitigating local environmental impacts of its current energy system.

2. Current situation

2.1. Objectives

Saudi Arabia's oil and gas are its main natural resource, the foundation of its economy and its political system and international role. With that in mind, the key goals of Saudi energy policy can be defined as[2]:

1. Maintain and increase oil and gas output to meet the needs of the domestic population, supply local business with energy and feedstock, and earn export revenues

2. Maintain its role as one of the world's leading oil producers and the dominant force in the Organisation of Petroleum Exporting Countries (OPEC)

3. Secure markets for its oil by investing in assets and relationships in its main customers

4. Diversify the economy by developing hydrocarbon-based and energy-intensive industries, as well as, more recently, non-oil industries, with a view towards the long-term diminution of oil's role in the global economy

5. Build up substantial fiscal reserves to safeguard against oil price volatility

6. Safeguard the security of its energy industry and country generally via hard security measures, relationships/alliances and "soft power"

7. Delay or minimise environmental measures that would reduce the use of oil in the world economy

More recently, two other objectives have risen to prominence, even if they do not yet eclipse the objectives above:

1. Improve energy efficiency, introduce non-hydrocarbon energy sources, and reform subsidies to reduce the fiscal burden on government and preserve oil and gas for industrial and export use, while bearing in mind domestic public opinion and preserving the competitiveness of business

2. Improve environmental performance, including greenhouse gas emissions

2.2. Oil

Saudi Arabia is, of course, one of the world's largest oil producers (12.3 million barrels per day of crude oil, condensate and natural gas liquids in 2016, second in the world behind the USA and ahead of Russia; of this, 10.46 million bbl/day was crude oil), and the world's largest oil exporter (net 8.4 million barrels per day in 2016[3]; of this 7.5 million bbl/day was crude oil and 1.5 million bbl/day refined petroleum products, with 0.6 million bbl/day import of refined products[4]). It is the world's largest holder of conventional oil reserves with an official total of 266.2 billion barrels at the end of 2016[5] (only Venezuela has a larger figure, but the majority of Venezuela's official reserves are extra-heavy oil of uncertain commerciality).

Saudi oil production costs are exceptionally low, probably on the order of $10 per barrel or less (capital plus operating costs). The reserves/production ratio is 59 years, indicating (simplistically) that production could continue at current rates for 59 years from the existing reserves base. Saudi Arabia has aspirations to raise its total recoverable oil substantially, mostly by increasing recovery from the known fields.

Saudi Arabia is also a major oil consumer, refining 2.5 million bbl/day in 2016 and consuming 3.2 million bbl/day[6], the fifth largest figure in the world (behind the US, China, India and Japan). Of this, a large proportion was crude oil burnt directly in power plants. Figure 1 shows oil consumption by month during 2013-16, and it can be seen that it rises some 700-800 000 barrels per day in summer versus winter, mostly due to an increase in the direct burning of crude oil and to some extent fuel oil.

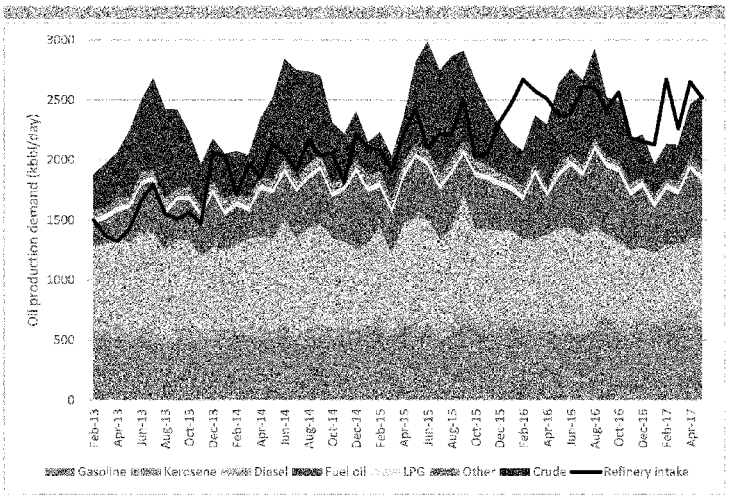

Figure 1 Saudi Arabia monthly oil consumption[7]

All Saudi oil and gas production, apart from that in the Neutral Zone with Kuwait, is operated by Saudi Aramco, the state-owned oil company. Aramco also operates the Kingdom's oil refineries (some in partnership with foreign companies), has a substantial petrochemical and power generation business, and a number of significant international investments in refining and petrochemicals in the US, China, South Korea, Japan and elsewhere. Aramco is respected as a relatively efficient and technically proficient operator. There are plans for an Initial Public Offering (IPO) of 5% of Aramco on the Saudi stock exchange (the Tadawul) and a to-be-chosen international exchange, set for 2018.

2.3. Natural Gas

Saudi Arabia is also an important producer and consumer of natural gas, though not to the same extent as for oil. Official reserves at the end of 2016 were 297.6 trillion cubic feet (the 6th-largest in the world), and marketed production was 10.6 billion cubic feet per day (the 8th largest in the world). All of this gas was used domestically, making the Saudi domestic gas market the world's 6th largest.

A large part of gas production is associated (a by-product of oil production) and is therefore cheap to collect and use but not flexible. The proportion of associated gas, though, has fallen from 42% in 2005 to about 33% in 2015[8]. The reserves/production ratio for gas is 77 years, indicating ample reserves to increase production; however, if oil production remains constant, significant increases in gas production would have to come from non-associated fields. The country has developed its first non-associated fields offshore in the Gulf, Karan and (together feeding the Wasit gas plant) the Arabiyah and Hasbah fields.

Saudi Arabia has significant unconventional (tight/shale) gas resources, estimated at 645 trillion cubic feet[9]. Apart from initial projects in the north-west of the country (Tabuk Basin), shale gas production has consisted only of pilots, with estimates of high production costs ($9/MMBtu in 2012). However unconventional gas production is targeted to reach 4 Bcf/day by 2026[10]. Most versions of hydraulic fracturing, required to produce tight gas, use fresh water, which would require desalination. BP has developed tight reservoirs in Oman's Khazzan field, also in a desert setting, using reverse osmosis desalination plants. Alternatively fracturing fluids using saline water, propane or carbon dioxide could be employed though they may be less effective. In either case, this raises the likely initial cost of tight gas production in Saudi Arabia.

Although it borders two of the world's largest gas resource holders, Iran and Qatar, Saudi Arabia by policy does not import or export gas. Difficult political relations with these two countries (and with another gas-rich neighbour, Iraq, although relations here have somewhat improved recently) make direct imports unlikely. Other than Yemen, whose moderate LNG exports are shut down by the continuing war, its other neighbours – Egypt, Jordan, UAE, Oman, Bahrain and Kuwait – are themselves gas importers or

NOTE: The preceding document has not been printed here in full but may be found at https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=108057