



Heavy Water Loophole in the Iran Deal

A priority is ending Iran's overproduction and sale of heavy water

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Although President-elect Donald Trump's position on the Iran nuclear deal remains unclear, he and his allies in the Congress are expected to at least better enforce and strengthen the Iran deal. They should start by focusing on the deal's heavy water loophole, whereby Iran can store offshore in Oman heavy water it owns and controls in excess of the nuclear deal's limits, awaiting its eventual sale. To date, if the stocks in Iran and Oman are counted together (a reasonable view since Iran owns and controls both stocks), Iran has far exceeded the nuclear deal's stated limit of maintaining a stock of only 130 metric tons of heavy water. Yet, this loophole was sanctioned by the executive body of the Iran deal, the Joint Commission. Despite such generous treatment, Iran has even so twice violated the narrow limit of 130 metric tons of heavy water it can hold *inside Iran* since the deal started in January 2016. Iran should no longer be facilitated in its overproduction of nuclear-related heavy water. Oman would do the world a favor by halting its willingness to accept Iranian heavy water and send any back to Iran for downblending. The return of the heavy water and its blending down would dramatically signal to Iran that violations of the Iran deal are no longer going to be tolerated, or worse, facilitated. Moreover, any further overproduction should be seen by the United States as a violation of the deal. It should work to end the Oman loophole and mitigate damage caused by a U.S. purchase of Iranian heavy water.

Heavy Water Limits Violated and then Facilitated

Heavy water is controlled because of its link to Iran's plutonium pathway to nuclear weapons. Iran's last violation of the 130 metric ton cap of the stock in Iran occurred in November, despite Iran receiving a warning from the international inspectors charged with monitoring the nuclear deal. Sound enforcement of the Iran deal should have mandated that Iran blend down any excess heavy water to normal water or stop producing more. If an overage occurs, blending down heavy water is easy and safe, given that the material is non-radioactive and naturally present in tiny concentrations in water.

Iran recently announced that it had shipped 11 metric tons of heavy water to Oman for storage while it awaits a buyer and produces additional heavy water. This followed previous shipments to Oman and eventual sale of 70 metric tons of excess heavy water to the United States and Russia--heavy water that should have been blended down rather than sold internationally. Instead of focusing on adequately enforcing the Iran deal, the United States tolerated and minimized Iran's violations and sought to legitimize its international standing as a commercial supplier of heavy water.

Although the excess of heavy water held inside Iran above the cap has been relatively small in each case, the UN nuclear watchdog, the International Atomic Energy Agency (IAEA), showed that the second violation involved Iran deliberately exceeding the cap even after it notified Iran that it had reached the 130 metric ton limit. This deliberate flaunting of the cap raised questions about Iran's commitment to the Iran deal and left the United States vulnerable to Iran exploiting other parts of it.

Secret Decision

That Iran can send the heavy water it owns to Oman is a flaw in the Iran deal's implementation. The Joint Commission, comprised of representatives of Iran and the E3/EU+3 (China, France, Germany, the Russian Federation, the United Kingdom, and the United States, with the High Representative of the Union for Foreign Affairs and Security Policy), sculpted the work around of the heavy water cap prior to Implementation Day or shortly thereafter. Iran did not want to either stop production of heavy water or blend down its excess, and finding enough international buyers to take the heavy water at the time was not possible. Instead of saying no to Iran's desire to "have its cake and eat it too," the Obama administration endorsed a major concession. The Joint Commission ruled in secret during late 2015 or early 2016 to allow Iran to park its unsold heavy water in excess of the limit in Oman while Iran sought buyers, which ultimately turned out to be the United States and Russia, two countries that did not need the heavy water. The Joint Commission has not released publicly the details of this decision, like many others it has reached that affect the limitations and conditions of the deal. But the contents of the decision have inevitably emerged, some out of necessity as the heavy water in Oman was sold, particularly to the U.S. Department of Energy (DOE), and some following investigations by [the Wall Street Journal](#) and [our Institute](#). Other details emerged out of Iranian bravado about getting such a good arrangement, something it wanted to advertise to help it sell its heavy water. We have recently learned that although Iran has selectively revealed secret aspects of the Joint Commission heavy water decision that suits its needs, it is the major roadblock to the Joint Commission publicly revealing information about several of its decisions and interpretations of the deal.¹ Given the overriding need for the transparency of the nuclear deal, and in particular Iran's nuclear activities, this excessive secrecy is counterproductive.

¹The Iran deal states that the Joint Commission can release information if it decides to do so (see Annex IV to the Joint Comprehensive Plan of Action (JCPOA)). Because the JCPOA states in general that the Joint Commission makes decisions by consensus, the Joint Commission has taken the position that releasing information about its decisions also requires consensus. Despite overwhelming support for the release of such information among the members of the Joint Commission, Iran has so far blocked consensus on releasing a set of about a half dozen

In summary, Iran has been able to exploit this loophole to export a total of 81 metric tons of heavy water to Oman (see table below). Without this loophole, Iran would have needed to halt production of or blend down by now almost all of this heavy water, or about 70-75 metric tons. The rest would have required eventual blend down, if Iran continues to produce heavy water.

Table: Iran’s Stock of Heavy Water in Iran and in Oman

Heavy Water Stock	Amount (metric tons)	
	In Iran	In Iran and Oman
Prior to Implementation Day(ID)	about 180.9	about 180.9 (none in Oman)
Shipped out before or right after ID	-50	
As of February 17, 2016	130.9	180.9
Shipped out on February 24, 2016	-20	
Subtotal	110.9	180.9
As of May 9, 2016	116.7	186.7
As of August 30, 2016	126.5	164.5 (with U.S. shipment)
As of November 8, 2016	130.1	130.1-168.1 (sent to Russia?)
Shipped to Oman in Nov/Dec 2016	-11	
Subtotal	119.1+ ?	130.1+ ? (with Russian shipment)
Total shipped to Oman	81 metric tons	
Produced, February 17-November 8, 2016	19.8 metric tons	

Notes to Table:

- 1) Sources: Except for the shipment of 50 metric tons to Oman, IAEA quarterly reports on Iran.
- 2) The amount of heavy water produced in Iran from the date the 50 metric tons were shipped to Oman until February 17, 2016 has not been revealed by the IAEA. This amount, which should be a few to several metric tons, would reduce the value of 180.9 metric tons in stock prior to Implementation Day, which was January 16, 2016.
- 3) Production from February 17, 2016 to November 8, 2016: 19.8 metric tons, or a daily average rate of 0.075 metric tons per day over 264 days. Extrapolating this daily average to a yearly production of 365 days, or an annualized production rate, gives 27.4 metric tons per year (365*0.075). The production is occurring in two lines at the Arak heavy water production plant, where each line has achieved an average annualized rate of 13.7 metric tons per year. Prior to Implementation Day, the IAEA stated that the Arak plant had a design capacity of 16 metric tons of nuclear-grade heavy water per year, apparently unaware of the second production line. Based on the IAEA value, the average capacity factor of one line is estimated at 85.5 percent (13.7/16).

explanatory notes or clarifications of how certain paragraphs of the JCPOA are interpreted. Some of the clarifications and interpretations apparently involve changes in the limitations and conditions of the deal; others involve exemptions to nuclear constraints. For more on this issue, see a forthcoming report by our Institute on Joint Commission secrecy.

Uneconomic and Strategically Unwise U.S. Policy

Other than getting heavy water out of Oman and subsidizing and helping legitimize Iran's nuclear program, two goals arguably not in U.S. interests, the United States' purchase of Iran's heavy water makes no sense economically. The United States faced no imminent shortage of heavy water. Canada, North America's main supplier, was ready and able to provide heavy water.

When the DOE purchase of Iranian heavy water emerged publicly last spring, the DOE and then the State Department issued [misleading statements](#) about why the United States bought the heavy water. They said that DOE had to buy Iranian heavy water for one of its facilities at Oak Ridge, Tennessee because the normal expected supply from Canada had been disrupted. What they did not state is that it was the United States that disrupted the existing Canadian supply by cancelling the procurement process won fairly by a Canadian company. In a procurement process started in 2014, a DOE Oak Ridge facility awarded the contract to this Canadian company in late 2015 to supply six metric tons of heavy water. This process was terminated suddenly by Oak Ridge in late December 2015 or early January 2016 when Oak Ridge decided to use Iranian heavy water instead.

Although a DOE official many months later apologized to the Canadian company, it received no public acknowledgement of its sacrifice for a supposedly broader good or any compensation for the lost business with the Oak Ridge facility. This company had to undertake a considerable amount of testing and development to show how it would meet the strict specifications of Oak Ridge's procurement award. In fact, based on the unusual strictness of the specifications on impurities as well as extremely low conductivity in the heavy water, legitimate doubts remain about whether the Iranian heavy water did in fact meet those specifications. Or, was the DOE required to further purify the Iranian heavy water to meet the strict specifications for the Oak Ridge facility? This would raise additional questions about the fairness of DOE's actions in suddenly rejecting the Canadian company's well-tested heavy water.

Based on an analysis of the DOE's purchase price of the heavy water and Iran's heavy water plant, Iran sold its heavy water to the United States at below its cost to produce the heavy water and the market price internationally. The U.S. purchase of Iran's heavy water unfairly helped Iran enter the international market and disrupted the existing commercial market.

To make matters worse, the DOE purchase damaged the prospects for a reliable North American heavy water supply chain that the Canadian company is developing. Since the DOE needed only six metric tons for Oak Ridge out of its total purchase of 32 metric tons, it announced that the rest, or 26 metric tons, was to be sold on the commercial market, perhaps at below market value if DOE passes along the relatively low price paid to Iran. The sudden appearance of this heavy water disrupted needed investment in a reliable long term production capability of heavy water for both the U.S. government and private industry. While the North American supply of heavy water is plentiful today, the medium and long term prospects are bleak since there has not been significant heavy water production in North America for well

over a decade. The existing North American stockpile is shrinking and supplies from India, the other major supplier, are needed for India's own domestic requirements. As a result, investment is needed for new production capability in North America, which could end up being located in the United States. The DOE purchase and sale of Iranian heavy water has threatened the prospects of avoiding a shortage in the future.

U.S. officials told one of us that the DOE would be very unlikely to buy any more heavy water from Iran. However, according to a person briefed by the administration, the Obama administration may be willing to grant special licenses under the Iran deal to U.S. companies so that they can buy heavy water directly from Iran.

The U.S. purchase of heavy water and subsequent actions turned the Obama administration into a promoter and legitimizer of Iran's heavy water sales. The administration should call this sale what it is – a sweetener for Iran. The arrangement has only encouraged Iran to overproduce heavy water for sale and seek legitimacy as a nuclear supplier. Iran subsequently offered heavy water for sale through the IAEA by circulating a letter dated November 7, 2016 offering two grades of heavy water. According to Iranian officials, Iran is now seeking to sell about 20 metric tons of heavy water per year, which is most of its annual production at the Arak heavy water production plant (see table).

Illegitimate Nuclear Supplier

But Iran has not taken the necessary actions to become a legitimate nuclear supplier. Simply put, it does not abide by international rules. It does not have an export control system meeting international standards, and under the Iran deal, it has only committed that it "intends" to create such a system for nuclear materials, equipment, and technology. The Iran nuclear deal does not contain a deadline for creating such a control system. More concerning, Iranian officials continually boast of Iran's prowess at violating other countries' sanctions and export control laws to obtain banned goods for its nuclear, missile, and military programs. Iranian President Hassan Rouhani stated on August 30, 2014, "Of course we bypass sanctions. We are proud that we bypass sanctions." After the negotiation of the Iran deal, the Iranian Majlis Special Commission tasked with approving the nuclear deal stated in an October 4, 2015 report: "The Islamic Republic of Iran's government has said that it does not intend to implement sections of United Nations Security Council Resolution 2231 that compromise defense and national security," a clear reference to not abiding by conventional arms and missile bans on imports to Iran.

Consistent with Iran's commitment to illegal overseas commodity trafficking, the heavy water Iran has been sending to Oman has been produced in the illegally outfitted Arak heavy water production plant. Its recent increased heavy water production rate was likely achieved by importing goods in violation of sanctions and export control laws. Some of these goods were seized by South Korea in 2010 and discussed in a report by the UN Panel of Experts on Iran. Analysis by experts in another government contacted by the Institute showed that the quantity seized implied that Iran intended to double the size of its heavy water plant, a goal Iran

subsequently achieved. Its success in increasing the plant's output indicates that Iran's illicit procurements for this plant continued after 2010. This example is just one of many that show that Iran remains a serial criminal state undeserving of any stamp of legitimacy from the United States.

Recommendations

The Trump administration should announce as soon as possible that it will neither buy more heavy water from Iran nor grant any licenses under the Iran deal for U.S. private companies to buy any. This policy was earlier encapsulated in a bill, H.R. 5119, that passed the House of Representatives in July 2016.

The new administration should also seek to end the Oman heavy water loophole. A way to do this would be for the United States to indicate to its Joint Commission partners that it views retransfers of heavy water from Oman to another country as subject to the Procurement Working Group (PWG) requirement that the country, in this case Oman, must submit a proposal for approval.² The PWG is a Joint Commission body set up at the United Nations to administer and approve or not approve proposals by countries seeking to participate in or permit certain transfers of nuclear or nuclear dual-use goods and technology, or engage in nuclear or nuclear-related transactions for the benefit of Iran. Heavy water is a nuclear good on Part 1 of the Nuclear Suppliers Group list, and the onward transfer of Iranian heavy water by Oman clearly benefits Iran, a key condition listed in the nuclear deal, even though the heavy water originated in Iran. As a result, under the nuclear deal, Iranian heavy water transfers from Oman to a foreign customer should require a proposal from Oman subject to PWG review. The Trump administration should next make clear that it will block at the PWG any transfers of Iranian heavy water from Oman to a foreign customer, and that Oman's lack of an official proposal would violate the Iran deal's provisions.

The Iran deal should be strengthened so that the IAEA regularly re-verifies the design of the Arak heavy water production plant. A goal would be to ensure that no new equipment is installed and that additional capacity is not commissioned. The IAEA should also regularly monitor any heavy water in Oman until it is removed.

A policy of the United States should also be to block at the Procurement Working Group any procurements of goods, materials, or technology for use in producing heavy water. In

² Under 6.1. of annex IV of the JCPOA, with the purpose of establishing a procurement channel, the Joint Commission will, except as otherwise provided by the United Nations Security Council resolution endorsing this JCPOA, review and decide on proposals by states seeking to engage in: 6.1.1. the supply, sale or transfer directly or indirectly from their territories, or by their nationals or using their flag vessels or aircraft to, or for the use in or benefit of, Iran, and whether or not originating in their territories, of all items, materials, equipment, goods and technology set out in INFCIRC/254/Rev.12/Part 1. Since heavy water in amounts greater than 0.2 metric tons is subject to Part 1 and Iran benefits from the retransfer of its heavy water from Oman to a customer, this provision should require Oman to submit a proposal to the PWG for each heavy water shipment from its territory to an overseas customer.

particular, Iran should not be able to expand its production of heavy water. The United States should also re-establish vigorous investigations and prosecutions aimed at thwarting Iran's repeated violations of U.S. and other countries' export control laws.

Lastly, instead of further disrupting the North American market and subsidizing Iran, the United States should work to minimize the damage of its heavy water purchase. One useful mitigating step would be for the DOE to place any remaining heavy water of the original 32 metric tons into a strategic reserve. This strategic reserve would act as a key "last resort" supply, reducing the chances of a shortfall in the future and limiting the DOE's disruption of the private market.

Conclusion

The Iran nuclear deal requires considerable strengthening and in some areas even renegotiation. However, that will take time. The new administration needs to act quickly to rectify a glaring weakness created in part by the current administration that facilitates on-going Iranian violations via sending heavy water to Oman for eventual sale. It should end the Oman loophole and undo damage wrought by this loophole at home. Quick action would also send an early signal that the new administration intends to rigorously enforce the nuclear deal.