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Before the US-Israeli Joint Parliamentary Committee
September 17, 2003

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I am pleased to appear before this joint committee to discuss Iran's nuclear program and Iran's imports of sensitive technology. I direct the Wisconsin Project on Nuclear Arms Control, a research organization here in Washington that is devoted to stopping the spread of mass destruction weapons.

I will begin by describing the challenge posed by Iran to the nuclear non-proliferation regime, and then I will comment on some important Iranian procurement attempts. I will conclude with a discussion of Iran's possible noncompliance with its international obligations.

I would like to submit one item for the record. It is a recent op-ed and table authored by myself and Valerie Lincy for the *Week in Review* section of the *New York Times*. The article discusses the possibility that Iran could gain nuclear weapon capability while claiming to be a member in good standing of the nuclear non-proliferation treaty. The article can be found electronically on my organization's web site: http://www.wisconsinproject.org.

The Stakes

With Iraq now under U.S. occupation, Iran is rapidly emerging as the new mass destruction weapon threat in the Middle East. If Iran's nuclear program continues down its present path, Iran is likely to achieve nuclear weapon capability within the next few years. By the end of 2003, Iran plans to complete a centrifuge pilot plant that might be capable of enriching enough uranium to fuel at least one bomb per year, once successful operation begins. Iran is also building a plant to produce heavy water, a material useful for producing plutonium in a reactor, but, like the centrifuges, having no logical place in Iran's civilian nuclear power program.

A nuclear-armed Iran would be an enormous strategic setback for the United States, and the world. Iran has long been a state sponsor of international terrorism. Adding an Iranian nuclear weapon capability runs the risk of joining terrorism and weapons of mass destruction – a combination that our government considers the greatest security challenge of the twenty-first century.

The Dual-use dilemma

In the past year, the world's attention has increasingly focused on Iran's rapid nuclear progress and on international efforts to monitor what Iran is doing. In the last four months, the International Atomic Energy Agency (IAEA) has issued two reports criticizing Iran for failing to come clean about the history of its nuclear program. The U.S. government has put pressure on the IAEA to take a hard line on Iran's violations of its international obligations. Kenneth Brill,

U.S. ambassador to the IAEA, accused Iran of "aggressively pursuing a nuclear weapons program," and President Bush warned that "we will not tolerate the construction of a nuclear weapon" in Iran. In addition, the European Union issued a strong statement urging Iran to be fully transparent about its nuclear program.

For its part, Iran says its nuclear program is benign, legal, and meant only to provide the country with an additional source of energy. To support that claim, it cites its membership in the Nuclear Nonproliferation Treaty, which guarantees "an inalienable right ... to develop ... nuclear energy for peaceful purposes." The treaty also allows for "the fullest possible exchange of equipment, materials and scientific and technological information ... with due consideration for the needs of the developing areas of the world." In building a string of nuclear facilities, Iran claims only to be exercising its treaty rights.

But the uncomfortable reality is that if Iran continues down the nuclear path it has chosen, it will gain the ability to build a bomb with the same equipment it could use to electrify Tehran. There is no technical incompatibility between such programs, only a legal one–Iran's signature on the treaty. As long as inspectors from the IAEA are allowed to monitor each nuclear facility and track the material produced, no part of the nuclear fuel cycle is off-limits to Iran.

Iran has already fielded equipment to mine uranium, convert the uranium to hexaflouride gas, and enrich the gas to reactor- or weapon-grade. Iran predicts that its mine at Saghand will produce 120,000 tons of uranium ore annually beginning late next year. Near the city of Yazd, Iran has produced "yellowcake" from natural uranium. At Isfahan, Iran is building a plant to convert the yellowcake to hexaflouride gas suitable for further processing by centrifuges. At Natanz, Iran expects to complete a pilot plant by year's end that will contain 1,000 centrifuges. In July, and again in August, Iran ran uranium hexafluoride through centrifuges at the pilot plant, in single machine and small cascade tests. When operational, the pilot plant might be able to produce enough bomb-grade uranium to fuel at least one nuclear weapon per year. At the same location, Iran is building a much larger plant designed to hold at least 50,000 centrifuges.

Iran claims the enrichment facility will assure the fuel supply for its 1000 megawatt light-water reactor, currently under construction with Russian assistance at Bushehr. But Russia has agreed to supply the reactor's low-enriched uranium fuel for at least ten years. Nevertheless, Iran could enrich a fairly large quantity of uranium at roughly 3.5% U235, which is a typical enrichment for light-water reactor fuel, while still claiming to be pursuing civilian nuclear power. In a "breakout" scenario, however, Iran could withdraw from the NPT and process its stocks of low-enriched uranium to weapon-grade in a relatively short amount of time. Or Iran could use its mastery of centrifuge technology to produce high-enriched uranium at a secret site, operated in parallel to its declared site at Natanz.

Iran could even produce weapon-grade uranium, under the watchful eye of IAEA inspectors, as long as it provides a civilian pretext for the material. A 5,000 kilowatt research reactor in Tehran, currently fueled with uranium enriched to 19.75% from Argentina, was once

fueled with weapon-grade uranium provided by the United States. Thus, there is a clear precedent for Iran to possess weapon-grade material.

In addition to pursuing the uranium route, Iran has focused its efforts on plutonium production. If its power reactor at Bushehr is paired with a reprocessing plant, Iran would have enough plutonium in spent reactor fuel to construct approximately 35 nuclear weapons annually. Iran is also building a plant at Arak to produce heavy water and has plans to build a 40 megawatt research reactor that will use the heavy water to produce plutonium. Construction of this reactor is expected to begin next year. History has shown that most states with this type of reactor – which is too small to make electricity and larger than necessary for research purposes – use it to produce bombs. The well-known precedents are Israel's Dimona reactor, supplied by France and Norway, and India's Cirus reactor, supplied jointly by Canada and the United States. More recently, Pakistan commissioned a heavy water reactor of about the same size with help from China, and will use it to make bombs. We can expect Iran to do the same.

One more piece of evidence bearing on Iran's nuclear intentions is its effort to develop long-range missiles. Countries seldom develop such missiles to carry anything but nuclear warheads. Iran has developed a 1,300 kilometer missile called the Shahab-3 that can already reach Israel, Iraq, Turkey, Saudi Arabia and U.S. forces in the region. The missile's first flight test was in 1998, and in July 2003, notwithstanding the missile's spotty testing record, Iran's foreign ministry was quoted as saying that the missile was ready for delivery to Iran's armed forces. It is widely assumed that the Shahab-3 will be followed by the 2,000 kilometer Shahab-4, based on the Soviet SS-4 "Sandel" missile. Although the status of the Shahab-4 is unclear, its design would allow it to fly far enough to reach Eastern Europe.

Iran's nuclear program is probably the most serious challenge to the non-proliferation regime today. Iran is showing the world that it is possible to operate within the regime as a party to the NPT, and to come up with a nuclear weapon capability. It is not clear what the solution to this problem might be. Once Iran's nuclear program matures, Iran will have a good chance of crossing the line and fabricating a bomb, perhaps without being discovered. Or, Iran could cite the treaty's escape clause, declare its "supreme interests" to be in jeopardy, and cancel its treaty obligations. Three months later, Iran could use all the nuclear material it accumulated while a member and convert it to bomb-making without breaking any rules.

Transfers of sensitive nuclear technology

Iran is also a challenge for export control. The Iranian program is not indigenous. Imports have fueled virtually all of Iran's known weapon capability. Over the past decade, the United States has sanctioned at least nineteen Chinese firms for contributing to Iran's chemical and other weapon programs. In addition, the United States has punished at least ten Russian entities for helping Iran build missiles, and Russia has sold Iran a significant amount of nuclear wherewithal as well.

These exports have contributed significantly to Iran's nuclear capability and helped Iran to develop its own infrastructure and scientific expertise. Some leading examples of Iran's acquisitions are set out in the following table:

China

- helped prospect for uranium deposits
- supplied one ton of uranium gas useful for fueling reactors or nuclear weapons
- supplied .8 tons of other uranium compounds
- supplied small research reactors
- supplied blueprints for a conversion plant needed to boost uranium gas to weapon- or reactor-grade

Russia

- supplying a 1,000 megawatt nuclear power reactor
- will supply its uranium fuel
- training nuclear reactor operators
- supplied know-how for heavy water reactors
- helped with technology for heavy water production
- helped with technology for nuclear-grade graphite production
- supplied laser equipment for uranium enrichment

United States

- supplied Iran's largest research reactor
- supplied research reactor fuel containing weapon-grade uranium

Pakistan

- suspected of supplying enrichment technology

There is every reason to think that these exports will continue unless more is done to stop them. Exports like these are not likely to be curbed without international pressure on the main suppliers.

Iran is paying a lot of money for its nuclear capability. Russia is getting a large sum – some $800 million – in exchange for a reactor at Bushehr that Iran doesn't really need for making electricity. Given Iran's copious oil and gas reserves, it will cost Iran many times more to produce a kilowatt of electricity from uranium than from petroleum. According to the U.S. State Department, Iran now flares enough gas to generate electricity equal to the output of four Bushehr reactors. So why would Iran pay so much money for something it does not need? The answer is that this payment is probably financing a lot more than just the reactor. There is evidence of Russian help in laser enrichment and heavy water, and there are probably other information exchanges going on that we don't know about.

In early 2003, evidence began to emerge that Pakistan had also supplied Iran. In January, the trade publication *Nuclear Fuel* accused Pakistan of being the origin of Iran's centrifuge program. Western intelligence officials reportedly said that Pakistan provided Iran with centrifuge design data in the early 1990s. In May 2003, an official French paper presented to the Nuclear Suppliers Group buttressed this claim. The French paper stated that there are "convincing indications about the origin of the [centrifuge] technology – it is of Pakistani type..." The paper also said that Iran "controls the manufacturing process of centrifuges and seems even able to improve it." Thus, there appears to be at least circumstantial evidence pointing in Pakistan's direction. I should add that Pakistan has denied the allegation. Time may soon tell, however, as Iran is forced to explain to the IAEA's satisfaction the traces of highly enriched uranium found at Natanz. Iran has argued that the traces were present on imported components instead of being created by secret enrichment work in Iran itself.

Potential breaches of the NPT

In a report issued in June, the IAEA accused Iran of failing to live up to its inspections agreement under the NPT. The IAEA reported that Iran had failed to reveal its purchase of natural uranium in 1991, failed to report the further processing of the uranium, and failed to declare the facilities where the uranium was received, stored and processed. In May, specialized IAEA teams were allowed to take environmental samples at the centrifuge pilot plant at Natanz; in August they took samples at the Kalaye Electric Company in Tehran. Both sites are associated with Iran's efforts to enrich uranium. However, agency inspectors were not permitted to take samples during a visit to two other sites near Hashtgerd, where nuclear-related activities have reportedly taken place.

The IAEA issued a second report in August, which detailed its activities in Iran since June and the results of environmental samples taken so far. The most troubling revelation is that two different types of high-enriched uranium particles were found at the Natanz pilot plant. This finding, according to the IAEA, is "not consistent" with Iran's declaration that its centrifuge development came from simulation and testing without nuclear material. Iran now claims that the high-enriched uranium must have arrived on centrifuge components imported in the 1980s, which contradicts its earlier assertion that it had developed the centrifuge technology indigenously. The IAEA's report also concluded that it was "not possible" to develop the enrichment technology seen at Natanz without tests using hexaflouride gas, which Iran has denied doing.

Although the IAEA did not recommend any punitive action against Iran at the conclusion of its Board of Governors meeting in June, it did adopt a tougher line at a meeting earlier this month. On September 12, the 35-member board voted unanimously to impose an October 31 deadline for Iran to come into compliance with its obligation or risk being brought before the U.N. Security Council. Specifically, the resolution calls on Iran to declare all imported material and components related to its enrichment program, to grant unrestricted access, including environmental sampling, to IAEA inspectors, to provide a full accounting of uranium conversion

experiments, and to resolve all other outstanding nuclear issues. As a confidence-building measure, the resolution also asks Iran to suspend all activities related to its enrichment program and to "promptly and unconditionally" sign the IAEA's additional protocol.

If Iran fails to comply with this deadline or if additional results from environmental sampling reveal that Iran enriched uranium without declaring it to the IAEA, the credibility of the NPT and its inspection regime will be undermined unless serious action is taken. Under the treaty, the issue should be referred to the United Nations Security Council. The Security Council's first step might be to reiterate the demand that Iran come into compliance with its NPT obligations, which would mean explaining to the IAEA's satisfaction the history of Iran's enrichment efforts and the genesis of the samples. If Iran comes clean by providing all necessary records and allows for unfettered inspections and sampling, then a crisis probably will be averted. However, if Iran balks, or provides only partial or misleading information, then the Security Council may move towards imposing economic sanctions or mandating the cessation of all nuclear cooperation with Iran.

The Iranian nuclear drama will play itself out over the next few months. If nothing happens to thwart the program, and it is allowed to mature, the world could face a new nuclear weapon state in the Middle East. It may be too early to predict what the exact consequences of such an event would be, but it is evident that it would not be good for world security.