Background:

by Gordon Edwards, CCNR President, April 2, 2015

The Framework Agreement that has been announced in connection with Iran's nuclear program – if fully implemented – would prevent Iran from producing any nuclear explosive materials for at least 10 or 20 years. More importantly, if the same conditions were accepted by other nations around the world – including the five official Nuclear Weapons States – humankind would be well on its way to a nuclear weapons free world, beginning in the next decade or two.

To understand the unprecedented opportunities presented by this agreement it is helpful to have a basic understanding of the nature of nuclear explosive materials.

All nuclear weapons require a primary nuclear explosive. There are only two materials that are used for that purpose: either Highly Enriched Uranium (HEU) or plutonium of any kind (except plutonium-238).

Highly Enriched Uranium

Highly Enriched Uranium refers to any kind of uranium that has a relatively high percentage (20 percent or more) of uranium-235. Natural uranium -- uranium that is mined from the Earth anywhere in the world -- has only 0.7 percent uranium-235 and 99.3 percent uranium-238. Uranium-238 is not usable as a primary nuclear explosive material. The mix of U-238 and U-235 found in natural uranium is also not nuclear-weapons-usable, because there isn't enough U-235.

Uranium enrichment is a process of gradually removing more and more U-238 from the mix, thereby increasing the concentration of U-235, boosting the percentage of U-235 to 3 percent, or 5 percent, or 20 percent, or 90 percent or more.

Any uranium that is over 90 percent U-235 is called "weapons-grade uranium" and is ideal for making atomic bombs. But in fact any uranium that is over 20 percent U-235 is said to be "highly enriched" HEU and can, in principle, be used to make a nuclear explosive device.

[The uranium fuel for the NRU research reactor at Chalk River is between 19 and 20 percent U-235 -- just below the magic "cut-off" between Low Enriched Uranium (LEU) and Highly Enriched Uranium (HEU). But the NRU reactor also uses weapons-grade uranium "targets" to produce medical isotopes, and is still importing weapons-grade uranium from the USA. In fact Chalk River Labs has an import licence pending for that very purpose, despite the fact that the Canadian government has decided to stop producing medical isotopes using weapons-grade material by October 2016. Alternative production methods exist.]

By agreeing to enrich uranium only to 3.7 percent, the Iranians are foregoing the possibility of producing weapons-grade uranium or even weapons-usable uranium. They are also taking 2/3 of their most advanced centrifuges (used for enriching uranium) out of service -- the very centrifuges needed to make HEU.

Plutonium

Plutonium does not exist in nature; it is a uranium derivative that is created inside a nuclear reactor. Specifically, when a uranium-238 atom absorbs a stray neutron inside the reactor it is transmuted into a plutonium-239 atom. Further neutron captures produce other, heavier plutonium isotopes: plutonium-240, -241, -242, et cetera.

All of these reactor-produced plutonium isotopes are usable as a primary nuclear explosive, but the best of the lot (for weapons purposes) is plutonium-239. Any plutonium that has a very high percentage of plutonium-239 is called "weapons-grade plutonium". Nevertheless, all reactor-produced plutonium is perfectly weapons-usable, regardless of the concentration of plutonium-239.
[See http://ccnr.org/plute.html for documentation on this point.]

To get the plutonium out of the irradiated nuclear fuel requires "reprocessing" technology. Reprocessing involves dissolving the solid nuclear fuel assemblies in boiling nitric acid, producing large volumes of liquid high-level radioactive waste, and then chemically separating the small percentage of plutonium from the liquid solution. Once the plutonium has been re-solidified it can then be used as a very powerful nuclear explosive material.

Heavy Water Reactors

Commercial nuclear power reactors require a nuclear fuel (usually uranium or plutonium) and a substance called a "moderator" to slow down the neutrons so that the nuclear chain reaction can sustain itself. If ordinary water is used as a moderator, the uranium fuel has to be enriched to about 3 to 5 percent U-235. This is called Low Enriched Uranium (LEU).

However if "heavy water" is used instead of ordinary "light water", the uranium fuel does not have to enriched at all. Such a reactor, called a Heavy Water reactor, can run perfectly well on natural uranium. In this way plutonium can be produced without the need for any uranium enrichment at all. That plutonium -- when extracted from the nuclear fuel waste by reprocessing technology -- can then be used as a primary nuclear explosive in nuclear weapons of many different kinds.

By agreeing to forego the pursuit of any reprocessing technology, the Iranians agree not to access the plutonium contained in their irradiated nuclear fuel, thereby making it impossible for them to use that plutonium as a primary nuclear explosive.

In addition, their brand-new Heavy Water Reactor (the Arak reactor) will be modified in design so that it cannot be used to make the ideal kind of plutonium for bomb-making -- the "weapons-grade" plutonium that is exceptionally rich in plutonium-239.

Conclusion

By eliminating the production of HEU, and foregoing reprocessing technology to extract plutonium, Iran effectively closes the door to nuclear weapons of any kind. They cannot produce any primary nuclear explosive materials.

Unless, of course, they smuggle it in from somewhere else, or find a way to produce it clandestinely -- but Iran is also willing to accept far-reaching IAEA surveillance on all their nuclear facilities, including unannounced inspections by IAEA authorities, for up to 25 years.

Closing Thoughts

By imposing similar requirements on all nations, we could eliminate the production of nuclear weapons altogether. Then, when nuclear weapons are dismantled and the primary nuclear explosive materials are made inaccessible, a nuclear-weapons free world would be within our grasp.

Unfortunately, the countries who are most insistent in pointing an accusatory finger at Iran -- the USA, the UK, Israel, France, and Britain, along with several "silent bystanders" China, Russia, India, and Pakistan -- all have their own stash of nuclear weapons. The message to Iran is, "Do as we say, not as we do."

World peace and the abolition of nuclear weapons can never be brought about by means of a hypocritical double standard. If nuclear weapons are indeed the greatest existential threat to the continued survival of humanity and other life-forms on this planet, then NO ONE should have them.

If Iran is willing to forego access to nuclear weapons by making it impossible for them to acquire primary nuclear explosive materials, shouldn't all other nations be willing to do the same? And shouldn't the people of the world insist upon it?

As Albert Einstein famously observed, "The splitting of the atom has changed everything, save man's mode of thinking -- and thus we drift toward unparalleled catastrophe." The Iran Framework Agreement could become a paradigm for peace.

by Gordon Edwards, CCNR President, April 2, 2015

P.S. The following article by Arianne Tabatabai provides added information:

Why the framework nuclear agreement with Iran is good for both sides

Ariane Tabatabai, Bulletin of Atomic Scientists, April 2, 2015
http://tinyurl.com/myuxuxr

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After months of negotiations, Iran and six world powers have finally reached a framework agreement on limiting the country's nuclear program in exchange for sanctions relief. The deal announced on Thursday is intended as the basis for a comprehensive agreement to be worked out by the end of June.

Getting to this agreement was a crucial step, as virtually all technical issues have now been addressed, but much work still remains to be done. The coming months will involve a great deal of legal and political wrangling. In the United States especially, due to anxious allies (Saudi Arabia and Israel) and some domestic opposition (especially among Republicans in Congress), negotiations will keep the White House busy.

Nonetheless, this is a good agreement for both sides, as indicated by some of its key components.

First, most of the public discussion about the negotiations has until now been focused on quantifiable elements, such as the number of centrifuges and amount of low-enriched uranium that Iran gets to keep, and the length of the deal's implementation. But perhaps the most crucial aspect lies in the International Atomic Energy Agency's (IAEA) access to Iranian facilities. In the framework deal, Tehran has said it will once again voluntarily implement the Additional Protocol to its existing IAEA safeguards agreement, granting the nuclear watchdog more inspections authority. (Iran had previously implemented the Protocol but stopped adhering to it.) This means that IAEA inspectors will be able to regularly monitor Iranian facilities and can conduct unannounced inspections as well. Inspectors will also have access to the supply chain through which Iran obtains materials for its nuclear program. Inspections will likely last for about 25 years, longer than the implementation period of the agreement itself.

Second, Iran's enrichment program will be limited. It has agreed not to build any new enrichment facilities for 15 years, and will not enrich uranium above 3.7 percent—a level suitable for commercial power plants, but too low to practically be used in a nuclear weapon—for at least that long. It is also reducing its current stockpile of 10,000 kilograms of low-enriched uranium to a small fraction of that amount.

The Fordow nuclear facility will cease enriching any uranium and will be converted into a research center instead—one barred from doing research on enrichment. In fact, Iran will not keep any fissile material at Fordow for 15 years.

Iran will instead make the Natanz facility the focus of all enrichment activities. There, it will use only its first-generation (IR-1) centrifuges to enrich for 10 years. The more advanced IR-2m centrifuges will be stored for that period, under IAEA monitoring. In fact, advanced centrifuge models (the IR-2, IR-4, IR-5, IR-6, and IR-8) will not be used for enrichment for 10 years.

In total, Iran will reduce its current enrichment apparatus by roughly two thirds. It will have only 6,104 installed centrifuges, as opposed to the current 19,000. All of them will be the IR-1 model.

Third, Iran will implement Modified Code 3.1 of the Subsidiary Arrangements to its IAEA Safeguards Agreement, which requires it to give early notification that it is constructing new nuclear facilities.

Fourth, Iran will take steps to address concerns over the Possible Military Dimensions (PMD) of its program.

Fifth, Iran will redesign and rebuild the Arak heavy water reactor. The design will be agreed upon by negotiators from the six world powers, China, France, Germany, Great Britain, Russia, and the United States. The redesign will mean that the reactor will not be able to produce weapon-grade plutonium. Iran is also recommitting itself to not developing a reprocessing capability. (Reprocessing, the back end of the fuel cycle, is a vital component in developing a plutonium bomb.) The original core of the reactor will be removed and either destroyed or taken out of the country. Additionally, Iran agrees not to build a new heavy water reactor for 15 years.

A number of these steps will, in effect, be irreversible. They will not just limit Iran's nuclear capability for 10 to 15 years, but will reshape it entirely and indefinitely.

So what is Iran getting in exchange?

First, it will receive sanctions relief. US and EU proliferation-related sanctions will be suspended after the IAEA verifies that the above steps have been taken.

Second, all UN Security Council resolutions on Iran's nuclear program will be lifted simultaneously. A transparent procurement channel will be established, allowing Iran to get what it needs for civilian nuclear development while giving assurances to the world that the materials will not be diverted for non-peaceful use.

Third, the agreement "encourages" international cooperation to help Iran in research and development. This stipulation was a sticking point over the last couple of weeks. But as Iranian Foreign Minister Javad Zarif said at the press conference announcing the deal, it will now allow countries that had been reluctant to engage with Tehran to help the country further its technological and scientific progress.

In the following weeks, the agreement will doubtless receive much criticism. Many will claim that one side or the other made too many concessions. But both sides stand to gain from the framework agreement, which should also be considered a victory for the global nonproliferation regime. Ahead of the Nuclear Non-Proliferation Treaty Review Conference that begins in late April, where no major achievements in nonproliferation are likely to be announced, the framework agreement is a very important success.

The negotiating partners will have to meet major political, legal, and financial challenges to turn the framework agreement into a final deal. For the moment, though, it represents a promising and beneficial achievement for all sides.