Chapter 1
How Iran Can Attain its Nuclear Capability – and Then Use It

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Iran has been proceeding steadily on its quest for a nuclear weapons capability, and as little seems to motivate it towards abandoning its ambitions, it will likely get there, possibly at the turn of the present decade. Although the international community has been taking coercive action, mainly by economic – fiscal, monetary, and trade – sanctions, it has not been successful in persuading Iran to abandon its program or at least suspend it. True, there have been reports that the sanctions have a perceptible effect on the Iranian population, but as yet these have not translated into government action or, as some hope, a change in government. Tehran has been aided, albeit inadvertently, by the International Atomic Energy Agency (IAEA), which has avoided serious condemnation of Iran, and by Russia and China, which were reluctant first to impose sanctions and thereafter to strengthen them. The realistic if pessimistic view must be, then, that Iran will probably succeed in its quest for nuclear weapons in the foreseeable future. Thus, the time is right to take another look at Iran's nuclear program and to assess the possible trend of future developments.

Any country seeking a military nuclear capability needs to obtain three major capabilities: the production of fissile materials; the development of the explosive mechanism; and the adaptation of existing delivery mechanisms or the development of new, special purpose mechanisms to deliver a nuclear weapon to a pre-designated target and explode it there. Accomplishment of the first two capabilities is sufficient for the production of a nuclear explosive device. The addition of the third one will turn the device into a weapon.

The first part of this paper will describe the route Iran has been taking toward the development of nuclear weapons. The second part will be devoted to the possible ways Iran will act in the international arena vis-à-vis its international non-proliferation commitments, and the third part will detail the possible deployment and utilization of its acquired capabilities. The present work is descriptive in nature, describing the possible alternatives Iran has for proceeding on the development and utilization of its growing potential. Political motivations, actions, and reactions to the deeds of others are discussed elsewhere in this volume, and are mentioned here only as warranted.

Fissile Material Production

Iran's activities in the production of fissile materials are probably only partially known, notwithstanding the abundance of details that have been disclosed by numerous sources, particularly the verification activities carried out and reported by the IAEA. Moreover, comparing the case of Iran with the cases of India, Pakistan, or North Korea is of limited value, at best. Although there are similarities, each of these is a stand alone case, replete with its particular problems, achievements, and political and technical constraints. In addition, it is expected that Iran, which received much technical support from several sources, will be able to perform better, having learned from others' mistakes.

There are two major materials that can serve as the core of a nuclear explosive device, i.e., the essential and indispensable part of any such device: uranium, enriched in the isotope 235 to a high concentration – HEU; and the plutonium isotope 239, which is produced from uranium in a nuclear reactor. According to IAEA criteria, 25 kilograms of HEU or 8 kilograms of plutonium are designated as "significant quantities," sufficient to serve as the core of a nuclear explosive device.

Uranium Enrichment

Iran has embarked on an ambitious large scale uranium enrichment program allegedly intended for the supply of low enriched uranium (LEU) for the nuclear fuel for its nuclear power reactor(s). This large scale activity is located at an underground facility near the town of Natanz. When completed, this facility could certainly supply nuclear fuel for a nuclear

power reactor, albeit at an unreasonably high, clearly uneconomic cost. However, because of its size, once completed the enrichment facility also has the potential to produce a vast quantity of HEU within a short time, sufficient for the production of several nuclear explosive devices within a single year.

The enrichment facility is not a stand alone unit. It needs the feed material, in Iran's case a chemical compound called uranium hexafluoride, and the product treatment facility for the conversion of the enriched compound into metallic uranium, suitable for the use in the core of an explosive device. Both the production of feed material and the conversion of the enriched compound into metal take place at a uranium conversion facility (UCF) located near the city of Esfahan. To date, Iran has a sufficient quantity of uranium for the production of HEU for numerous explosive devices.

Plutonium Production

The uranium enrichment route is at present the shortest one for the achievement of a nuclear capability in Iran. However, Iran has not neglected the second alternative, the plutonium route. In the future, Iran will have two possibilities for producing plutonium. The first and least desirable is the utilization of the irradiated nuclear fuel from its Bushehr nuclear power plant. It is less desirable because of the lower quality of the plutonium produced therein, and because the nuclear fuel, at least for the foreseeable future, will be Russian-produced and under a contractual obligation to be returned to Russia. The utilization of the Russian fuel for the production of plutonium would cause another major international complication for Iran.

Because of the drawbacks of using the power reactor as the source of plutonium, Iran embarked on another project – the construction of a heavy water natural uranium-plutonium production reactor, the so-called research reactor. It is under construction at the site of Arak, which already hosts a heavy water production plant, essential for the operation of this reactor. The fuel for this reactor will be produced at the UCF. In order to separate plutonium from the fuel after it has been irradiated in the reactor, a "reprocessing" plant is needed. At present, no construction of such a plant has been reported. All in all, such a project would take between six and ten years to accomplish, and that is still way into the future.

Parallel Routes

The above description suffices if there are no other, concealed activities to produce feed material and to enrich it. However, one cannot assume that there is no such parallel activity, given Iran's past record of concealing and operating an undeclared facility. The main difference between the large declared facility and small, concealed activities would be in the scale of the operation. Consequently, the output of smaller scale activities to produce HEU would be much less than the potential of the large ones. Depending on small scale activities for the production of HEU would be more hazardous for Iran, given the longer time of operation required to achieve the required total output, which would put it at a greater risk of detection and subsequent possible military action.

Another however unsubstantiated fear is that Iran illegally managed to acquire fissile materials originating from the former Soviet Union (FSU). The probable cause of these rumors is the assessment that some nuclear weapons are still unaccounted for because of the lax accounting methods of the FSU, especially regarding small "tactical" weapons, which were at the disposal of small field units and not centrally controlled. Rumors to this effect have been circulating for some time, but as yet are unfounded.

Timetables

By February 2008, Iran had been operating the UCF for the production of feed material for its enrichment plant for some four years. According to the IAEA report, by February 2008, Iran had produced some 309 tons of UF_6, the feed material for the enrichment process. This amount contains about a ton and a half of the isotope U-235, about 40 percent of which can be produced as HEU. This is a huge amount. Iran started operating its first enrichment cascade, capable of producing only a small amount of LEU, in April 2006. By August 2007 it declared that it achieved 4.8 percent enrichment. If all goes as planned and if it so decided, Iran could be expected to enrich its first significant quantity of HEU around the turn of the decade. However, the IAEA report noted that the throughput of the facility has been well below its declared design capacity. Arriving at highly enriched UF_6 gas is not the ultimate aim of the whole operation. The enriched gas must first be turned into HEU metal, and then machined into the shape that is fit to be inserted into the explosive mechanism. The IAEA inspectors reported

that they had uncovered a document in Iran "describing the procedures for the reduction of UF_6 to uranium metal in small quantities, and for the casting of enriched and depleted uranium metal into hemispheres, related to the fabrication of nuclear weapon components.…Although there is no indication about the actual use of the document, its existence in Iran is a matter of concern."[1]

Although the Bushehr nuclear power plant is expected to start operation sometime in late 2008, there is no indication that the essential reprocessing plant is under construction. Building such a plant would probably take between four and six years. If construction began at the beginning of 2008, this would mean that the production of plutonium could begin in 2012-14. This would also fit into the research reactor schedule, which is already underway. Thus, the earliest date for the production of the first significant quantity of plutonium would be in 2012-14.

Development of the Explosive Mechanism and Warheads

Evidence of Iran's occupation with the development of a nuclear explosive device is limited, primarily because the activities are not exclusively nuclear and are mainly concerned with "conventional" explosives and their testing. Iran has extensive experience in working with explosives, and connecting it to nuclear-related activities is not so simple. The most direct evidence that Iran has been engaged in the development of the explosive mechanism needed for the production of a nuclear explosive device is the uncovering of its activities in the development of the initiator – the "trigger" mechanism that is an essential part of any explosive device.

The first and perhaps the most damning piece of evidence is the Iranian production of an isotope called polonium-210, whose major use is in the production of neutron sources – the initiators for nuclear explosive devices. Further evidence that Iran is occupied with the development of neutron sources came from a media report on the acquisition of other isotopes suitable for the development of another type of neutron trigger. Additional indications of an ongoing program for the development of the nuclear explosive mechanism and possible nuclear warhead development were presented in the IAEA February 2008 report and in a briefing by the head of the IAEA Department of Safeguards.[2]

The first nuclear weapon used in anger, detonated over Hiroshima, was a very primitive but extremely reliable weapon that used a large amount of HEU. Iran's main activities in the development of a nuclear explosive device are probably directed at the perfection of a more advanced, less voluminous explosive device that will use much less HEU for the same effect, one that will be easy to fit into a bomb or a missile warhead. Some evidence of this activity has come to light in the media.

The IAEA has not succeeded in finding evidence at sites where "cold" tests (without fissile materials) are taking place, since there exists little or no telltale evidence that can be uncovered when visiting such sites, especially when Iran conducted ample preparatory cleaning activities prior to IAEA visits.

Iranian Weapons Delivery Means

A nuclear explosion can be conducted without any military involvement and without packaging it in a "bomb" configuration. Thus, a nuclear explosive device can be transported to any site by civilian means, such as in a cargo airplane, a shipping container, or the like. However, when a state has a nuclear weapons development program, it will use the above means of transportation only as a last resort, when it must deploy and use nuclear explosives without having packaged them in a military deliverable weapon.

The medium range ballistic missiles are perhaps the best indicators of Iran's intention of having a non-conventional weapons delivery capability. It can be assumed that if anyone goes to the expenditure, technical complexity, and financial outlay needed for the development of these missiles, their sole intended use is not the delivery of high explosives (HE).

According to official Iranian sources, the Iranian missile program made significant progress in 2007. The older Shahab 3 missile has an approximate range of 1,500 kilometers; the newer missile, which is called either Ghadr or Ashura, was displayed in October 2007, and declared to have a range of up to 2,000 kilometers. Although the medium range ballistic missiles can be used against Iran's neighbors, especially those with large area territories, the ever increasing range of these missiles signals that the possible targets for these military missiles could extend beyond the neighbors' borders. These could therefore be designated as strategic, not tactical weapons

delivery systems. The probability that HE warheads could achieve positive strategic results for the aggressor is rather low. Thus, it is reasonable to assess that the missiles developed by Iran have a strategic purpose, i.e., the delivery of strategic, or WMD, warheads.

Coupled with the IAEA February 2008 report and the Safeguards briefing, it can be assumed that there is a significant probability that the purpose in developing medium (and possibly long) range missiles in Iran is the delivery of nuclear weapons to states not neighboring Iran. Only nuclear weapons can cause wide ranging long term destruction and large scale casualties that could decimate the military capacity of a country to retaliate and recuperate from such an attack.

A single nuclear weapon would be practically useless to Iran, since the probability of the failure of a first nuclear weapon could be significant. From all the above it must be concluded that Iran has a project of having several nuclear warheads, deliverable by missiles and possibly also by fixed-wing military aircraft. It is also conceivable that Iran will develop other delivery systems such as longer range cruise missiles and naval launch systems, if it is not already doing so.

Iran's International Non-proliferation Commitments and their Implementation

Iran has the following international nuclear-related non-proliferation commitments:

- Iran is party to (signed and ratified) the Nuclear Non-Proliferation Treaty (NPT).
- Iran has a full-scope safeguards agreement with the IAEA that came into force in 1974.
- Iran is party to the Partial Test Ban Treaty (PTBT), which includes the ban on testing nuclear explosives on the surface and in the atmosphere.
- Iran signed but has not ratified the Comprehensive Test Ban Treaty (CTBT). However, Iran, angry at the US failure to ratify the treaty, stopped providing timely monitoring data to the CTBT Organization in Vienna.
- At the end of 2003, Iran signed but has not yet ratified the IAEA's Additional Protocol to the Safeguards Agreement. At first it decided

to abide by its requirements but later reneged on its promise and reverted to its old and unsatisfactory full-scope safeguards agreement.
- Iran agreed (twice) with three European Union countries – France, Germany, and the United Kingdom (the EU-3) – to suspend all activities related to the enrichment activities in Iran. It did not, however, abide by these agreements and recommenced converting uranium ore into uranium hexafluoride – the feed material for its enrichment facilities.

In the non-nuclear non-proliferation arena:

- Iran is party to the Biological Weapons Convention (BWC).
- Iran is party to the Chemical Weapons Convention (CWC).
- Iran is not a member of the Missile Technology Control Regime (MTCR).

The NPT

By becoming a party to the NPT, Iran undertook "not to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices; and not to seek or receive any assistance in the manufacture of nuclear weapons or other nuclear explosive devices."[3] At the same time, the NPT treaty language contains an "escape clause": Article X of the NPT states that each country shall "have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country." Only one country, North Korea, used this article to withdraw from the NPT.[4] Notwithstanding North Korea's nuclear test, the United Nations Security Council (UNSC) has taken no punitive action, although much time has passed since its misdeeds came to light.

The implementation of adherence to the NPT is through the verification activities of the IAEA that are mandated by the NPT and formally initiated by national safeguards agreements. The full-scope agreement is a very mild one, with much dependence on the goodwill of the inspected state. Because of the shortcomings of these safeguards agreements, several countries could conceal activities, materials, and facilities with impunity, in the knowledge that they cannot be indicted for misdeeds that cannot be verified.

Iran certainly utilized the shortcomings of the agreement to its benefit. Subsequent to the public disclosures of Iran's undeclared activities, the IAEA demanded and gained access to facilities and activities it knew nothing about previously. In many instances the IAEA found Iran to be in violation of its safeguards agreement obligations. However, because the IAEA secretariat (the implementation body of the IAEA) refrained from using the specific term "non-compliance" when reporting on its activities in Iran, the IAEA governing body – the Board of Governors (BOG) – did not transfer the issue to the UNSC. A change in the formulation that could have enabled the transfer of the issue to the UNSC occurred in September 2005, when the BOG found "that Iran's many failures and breaches of its obligations to comply with its NPT Safeguards Agreement…constitute non compliance in the context of Article XII.C of the Agency's Statute." However, because this resolution was not adopted by consensus, even then the issue was not transferred to the UNSC. For all intents and purposes, at that time no effective international measures aimed at halting Iran's nuclear project were taken.

On July 31, 2006, the UN Security Council adopted resolution 1696, which makes it mandatory (under Article 40 of Chapter VII of the UN Charter) for Iran "to take the steps required by the International Atomic Energy Agency Board of Governors…which are essential to build confidence in the exclusively peaceful purpose of its nuclear programme."[5] On December 23, 2006 the UNSC unanimously adopted resolution 1737, which imposes sanctions on Iran for failing to comply with previous SC demands. In March 2007, a further resolution (1747) was adopted by the SC, but this one too did not have the hoped-for result of forcing Iran to abandon its nuclear development program. On the contrary, public pronouncements by Iranian leaders only became more vociferous, insisting that the enrichment program will never be abandoned. The third round came when on March 3, 2008 the Security Council adopted resolution 1803, further tightening its sanctions against Iran. However, these sanctions are still far short of the actions that would make Iran reconsider its nuclear stance against the international community.

IAEA Safeguards

Iran previously demonstrated that it was not afraid to go back on its commitments when it reneged on its commitment to the Additional Protocol. Admittedly, this commitment is voluntary (as were the agreements with the EU-3), but nonetheless it was an indication of Iran's willingness to use the possibility of withdrawing from commitments either as blackmail, as an indication of intentions, or when not being in formal contradiction with them, should Iran go its own independent way. In this context, Iran is probably heartened by the world's reaction to North Korea's withdrawal from the NPT.

Abandonment of the commitment to abide by the Additional Protocol occurred when the Iranian issue was transferred to the UNSC, and at this point, the verification regime in Iran reverted to the old, ineffective, full-scope safeguards regime. In order to supplement the less effective verification activities, the IAEA could utilize its prerogative of demanding "special inspections" in Iran. The drawback herein is that every request for a special inspection needs the approval of the BOG. Given the uneven attitude of the BOG members towards Iran, it is not certain that these requests would always be approved. Furthermore, even if approved, there is no certainty that Iran would grant a request for a special inspection.

Should Iran choose to withdraw from the NPT, this would not constitute a withdrawal from its safeguards agreement with the IAEA. The agreement does not include a clause terminating the inspections when a country withdraws from the NPT. The only conditions under which inspections can be terminated are when there is nothing more to inspect. Again, however, and learning from the experience with North Korea, a country cannot be forced to proceed with inspections should it decide to withdraw from the NPT.

The CTBT and Other Commitments

Another treaty that could have relevance to the situation in Iran is the CTBT. By signing this treaty, Iran "is obliged to refrain from acts which would defeat the object and purpose of a treaty when…it has signed the treaty."[6] It is not certain if a state that has signed but not ratified the treaty can formally withdraw from it. In a related vein, Iran has long been suspected of acting in contravention of its obligations under the CWC and the BWC.

However, in the chemical weapons case, no state brought an accusation to the Organization for the Prohibition of Chemical Weapons (OPCW) demanding a challenge inspection in Iran.

From the above it would appear that Iran would not let any international commitment stand in its way should it decide that it needs to abandon its obligations to achieve its purposes. The only fact that could make it hesitate is the possibility that the international community would use this as the pretext for imposing international action, such as sanctions.

What will Iran do with its Nuclear Capability?

Why is Iran developing nuclear weapons? It can be estimated that there are four main motivations behind Iran's efforts: deterrence; promotion of regional hegemony ambitions; promotion of internal support of the government; and the threatening of "enemies," and the possible use of its nuclear weapons, either without provocation or as a retaliatory measure. The utilization of the first three needs the proof or apparent proof of the potential to deploy and use nuclear weapons. The fourth would probably need a credible self-assurance of this capability, since failure could lead to grave consequences for Iran.

In the interim stage, before achieving a military nuclear capability, Iran has a variety of options, whose pursuit would determine the world's attitude towards Iran and would also influence the Iranian public's attitude towards its government. Generally speaking, these options are: demonstrating the Iranian potential for enriching uranium to military usable levels while not reaching that stage; enriching a "modest" quantity of uranium to reactor levels (LEU) and suspending any further overt, safeguarded, enrichment of uranium; and enriching uranium to military levels, while declaring the process and placing the product under IAEA safeguards. Iran is almost at the stage of the first option. If it succeeds in enriching a few hundred kilograms of uranium to reactor grade (LEU) it will have demonstrated its capability to produce military grade HEU. This is a technical fact since the same gas-centrifuge machines could be used (albeit in a slightly different enrichment-cascade configuration) for the advanced enrichment process.

The second option is a more advanced one, since Iran would be then in a position to arrive at a small quantity of military grade HEU, sufficient for one or a few nuclear explosive devices. There is, of course, the variant

of this option by withstanding all external pressure and proceeding to expand the enrichment capacity to its present design level and amassing a large quantity of LEU. This would give Iran the potential to enrich large quantities of the LEU to HEU within a short time. In both these options there is always the possibility of proceeding with a parallel covert enrichment program. Without an intensive safeguards program, at the very least the Additional Protocol, there would be little chance of proving an allegation of the existence of such a program.

According to the NPT there is no prohibition on enriching uranium to military usable levels, as long as the product remains under IAEA safeguards. Only the Security Council could demand the halt to such a process, and it is uncertain whether such a demand would be heeded, given past experience.

The following discussion addresses the recurrent question of what would happen if and when Iran acquires a military nuclear capability. To be sure, at this time no scenario is predictable with a high degree of certainty. Many factors will determine Iran's course of action; some factors will be internal, such as the ruling regime's plan of utilizing this capability, and some will be purely external, mainly the course of action (or inaction) the world takes in response to Iran's moves. The description of Iran's options is general in nature rather than comprehensive, since the variety of options constitutes a continuum and their closer description is a work for decision makers. The aim of this discussion is not prescriptive, but descriptive of a general picture of how events could unfold. It is also quite conceivable that at this stage, the Iranians themselves do not have a clear idea on utilization of their capability if and when it is realized. It is conceivable that their aim at present is to keep all options open.

Three major courses of action will be open to Iran once it has acquired the capability to explode a nuclear device: concealment, public declaration of the fact, and declaration by demonstration.

Concealment

Perhaps the least probable course of long term action is concealment of Iran's capability. As of early 2008, true concealment means that Iran suspends its uranium enrichment activities without having produced a sufficient quantity of LEU for further enrichment to HEU level for the

production of a single nuclear explosive device. Any further work for the production of HEU would be totally concealed. In doing this, Iran would never be able to clear itself of a suspicion of wrongdoing, unless it opens itself to inspections along the lines of the post 1991 Gulf War inspections in Iraq. The three main reasons for keeping an advanced status of Iran's nuclear project a secret are: fear of international action; the wish for silence prior to a surprise attack or a demonstration; or as a temporary measure until a considerable nuclear arsenal has been amassed and perhaps deployed. When discussing the possibility of international action Iran has to assess whether a) the world could be unaware of the actual situation, and b) whether the world will take action that would be more severe than the action taken hitherto. If the response to either of these questions might be positive, Iran could decide that its best course of action would be to hide its capabilities and the status of its nuclear project.

However, concealment would not promote any of Iran's reasons for developing nuclear weapons in the first place. Short of actual use in anger, where total surprise would be an asset to the attacker, Iran needs the world to be aware of its capabilities. Therefore, declaration will more probably be the course of choice, and timing will be the important issue.

Declaration of Capabilities

A declaration does not have to be made in so many words. It can be done by inference, such as the celebration of a national holiday in honor of the "completion of the nuclear project," or the proclamation of national heroes, or any other inventive way in which the government of Iran can convey to the world that it probably has nuclear weapons. To be sure, an inferred declaration does not have the power of an outright one. Depending on the purpose of the declaration, its manifestation and timing will need to be determined. For internal consumption, an inferred declaration would suffice. For use in the international political arena, a stronger declaration would probably be needed. Indeed, a declaration by inference would also make it harder for Iran's international opponents to initiate UN-related action, since there will always be those countries who support Iran, mainly because they dislike the others, and not because they want Iran to have nuclear weapons. These countries could certainly prevent acceptance of

action proposals by consensus, and if any of the opponents holds a veto power at the UNSC, no resolution mandating action could be accepted.

Iran, a wily and experienced actor in the international bargaining arena, could use a declaration of nuclear capabilities in a straightforward way, or it could use this as an additional tool for furthering Machiavellian purposes. Should Iran assess that it needs a declaration of nuclear capabilities as a deterrent, it could opt for an early declaration, perhaps even before it actually achieved the ability to deploy and use a nuclear weapon. In assessing the outcome of such a declaration, there could be those who say that without proof, the declaration is not believable. There would also be others who say that the consequences of the declaration are so bad for Iran, that it would not take the chance of declaring nuclear capabilities and causing itself a lot of harm, since the world would surely take action against it.

In addition, a declaration by inference would not require Iran's withdrawal from the NPT, since it could always claim not to possess nuclear weapons, that the celebrations had other meanings, or other deceptions.

Proof of capabilities, partial proofs, and declarations of potential could be presented in many ways:

- Intentional provision of data to IAEA inspectors proving that Iran has succeeded in the large scale enrichment of uranium, first to LEU and then, possibly, to HEU
- Withdrawal from the NPT
- Notification of the decision to withdraw from the obligation under the CTBT not to carry out a nuclear explosion
- Documentation of non-nuclear explosions of devices that would become nuclear when fissile materials are inserted therein
- Non-nuclear documented tests of military means of delivery

According to the NPT, a country is not prohibited from producing any fissile materials, even of military usable grades, as long as the production work is carried out under IAEA safeguards and the produced materials are placed under IAEA safeguards. A country can amass large quantities of these materials, without disregarding any international obligation. The only obligation a Non-Nuclear Weapons State (NNWS) has is to refrain from the acquisition or the development of nuclear explosive devices. Indeed, had Iran declared all its activities, and had it placed them under

IAEA safeguards, no legally based action, such as declaring Iran to be in non-compliance, could be taken against it.

Therefore, Iran had the option to gather as much material as it wants and to carry out secretly the development of the explosive device (which does not come under safeguards, as long as nuclear materials are not inserted into it) with legal impunity. Admittedly, this has the drawback of being under international scrutiny, with the quantities and shapes of the fissile materials known to the inspectors as well as the places where these materials are stored. These drawbacks must be weighed against the benefits of the implied or strongly implied declarations. In Iran's case, however, the "legal" route was closed when the Security Council called for the suspension of all enrichment related and plutonium production activities, which Iran failed to do. A variant on this option would be for Iran to divert some of the fissile materials, without the IAEA inspectors being aware of this. This certainly can be done, since under the full-scope safeguards, the inspectors check books more than anything else, and these can easily be doctored.

Withdrawing from international legal obligations is certainly not proof of action but at the same time it is a strong declaration of intent. It is both a political act of defiance and the manifestation of the will to still abide by international law and act within a country's prerogatives. By withdrawing from the treaty, a country maintains that it is in its supreme interests not to abide by NPT-mandated obligations, in other words, to develop nuclear explosive devices or weapons. If it also declares its intent not to abide by its CTBT obligations, it declares that it intends to carry out a nuclear explosion. These are strong, albeit implied, declarations.

Of course the strongest declaration could be when Iran has credibly demonstrated its ability to produce HEU in sufficient quantities or even produced it, as discussed regarding the interim stage.

A particularly ominous conclusion that emerges from this discussion is that Iran has the possibility to acquire all the necessary materials and equipment "legally," if it declares all its activities to the IAEA, places these and the materials that it produces under safeguards, and does not get caught in any illegal activities, such as trying to produce plutonium from Russian fuel, irradiated at the Bushehr power reactor. This would be

contrary to its contract with Russia, and would be a very foolish act. Iran would probably not do it.

Thus the declaration of capabilities could achieve much in the way of deterrence, regional influence, and the acquisition of internal support for the regime, while still not providing absolute proof of acquisition of an actual nuclear military capability. This sort of ambiguity would support those who claim that without actual proof of misdeeds, they are unable to censure Iran or take political actions against it.

Declaration by Demonstration

Iran's strongest way of letting the world know that it can explode a nuclear device is to explode one. Iran is party to the PTBT, and only a signatory to the CTBT. This could be a factor in a decision to carry out an underground nuclear explosion, since the PTBT does not prohibit it. It should also be noted that Iran would need such an explosion in order to prove to its own satisfaction that it has a viable weapon in hand.

What would such a demonstration look like? India and Pakistan carried out multiple rather than single underground nuclear explosions. Each demonstration was claimed to consist of several explosions, but these claims were never completely verified. The probable reason for this course of action is the fact that there is a high probability of failure or near-failure, because of the complexity of the explosive mechanism. Thus, the scientists wanted to make sure of at least one substantial explosion. Of course, there were other reasons for having parallel explosions, including the common infrastructure for these underground tests, safety and security arrangements, and the testing of several physical concepts of the explosive mechanisms. In addition, if all went well, the scientists could boast a great versatility and variety in the nuclear weapons capability.

What is known about the first North Korean test explosion can be summarized as follows: it was a plutonium-based explosion and its yield was small. The small yield could indicate a near-failure, and not the intentional result. If this is so, the North Koreans would probably need another test to verify any weapon's modifications. Otherwise they could have a dud on their hands.

An interesting question would be when, within the timetable of the nuclear project, Iran would want to perform an underground nuclear

explosion. The two extreme situations are a) when it had just produced sufficient fissile material for such an explosion and b) when it had acquired a sufficient quantity for its military needs – i.e., when it had a strong enough nuclear arsenal for deterring any military action against it or for internal or regional demonstration purposes.

In its February 2008 report, the IAEA made "the identification of an explosive testing arrangement that involved the use of a 400 m shaft and a firing capability remote from the shaft by a distance of 10 km, all of which the Agency believes would be relevant to nuclear weapon R&D."[7] It is difficult to assess when Iran would choose to demonstrate its ability to explode a nuclear device. Much of this decision would probably depend on the political situation. The external political situation, including international pressure, the possible threat of military situation, and so on would have the most influence on this decision. The internal situation in Iran, for example, the reemergence of a strong reformist movement, could make the ruling forces need a nuclear explosion in order to sway public opinion back to the support of the government.

It is difficult to conceal preparations for an underground nuclear explosion, especially when the world is looking for indicators of intentions to carry out such an explosion. Only if a country has many natural deep caves or caverns is there a chance of hiding preparations for such activities. It is even possible that Iran would want to publicize and prepare the world for this event. It is not conceivable that Iran would want to demonstrate a comprehensive capability for delivering a nuclear weapon to a target. Therefore it would need to demonstrate a delivery capability and leave the marriage of the two capabilities to the imagination of the world.

Using Nuclear Explosives in Anger

In answering the question of "what can Iran do with it," one cannot avoid the possibility that Iran would use its nuclear capabilities against others. It is certainly a technical possibility. Is it also a viable proposition? In order to deter, it is sufficient that nuclear weapons be viewed by all, including the owner of these weapons, as a weapon of last resort. The case of Iran cannot be viewed in the same way.

Many experts claim that "the government of Iran is rational." That may well be true in a very general way. The history of recent years demonstrates,

however, that the Iranian government's rationale is not always similar to that employed by others, for example Western governments. The basic aims of the state, the basic values of Iran, and the methods used to achieve these aims differ markedly from those of today's Western states. The theological state, the support of terrorism, the abuse of human rights, the unwillingness to even negotiate a solution to the nuclear issue, the fierce statements against Israel, and many other facts demonstrate this. On the other hand, the Iranian negotiating tactics and their use – if not manipulation – of the international community's institutes and approaches are admirable, in that they try to present a "sensible" point of view that succeeds in winning precious time for Iran. Thus, the government is behaving in a rational way, according to its own beliefs and political aims.

Does the Iranian government view its nuclear weapons in the same way that most of the world does? The common wisdom is that nuclear weapons are weapons of deterrence, and are not intended for use in anger. What are the Iranian internal constraints; what are its checks and balances on the deployment and use of nuclear weapons? Would Iran also view nuclear weapons mainly as a deterrent and not as a weapon in a usable arsenal? Iran must also take into consideration the retaliatory capabilities of those the weapons would target, their allies, and those who would find themselves in an untenable situation should Iran demonstrate its political capability to attack others with nuclear weapons. What is the price Iran would be willing to pay for such an action? These questions are not answerable at the present time. Therefore, it must be assumed here that there is a possibility the Iran would put its nuclear weapons to direct use.

However, in order to be considered as an option for use, these weapons must first demonstrate, at least to Iran's own satisfaction, a reasonable probability of reaching their target and a high expectancy of reasonable performance. Iran's development of a major missile capability, as described above, is well known and publicized by Iran itself. Iran also has a limited long range aircraft capability for delivering a nuclear weapon aided by some airborne refueling capability.[8] Although Iran has a small submarine force, it is not certain whether it could deliver a nuclear weapon to distant targets.[9] In an extreme case Iran could also use a nuclear explosive device in a crude, non-military form and place it inside a commercial airplane, a container, and so on, and transport it to its destination in a non-military fashion.

There are three main ways that Iran could launch a nuclear attack: from its own territory (including from a vessel at sea), from the territory of an ally, and by an agent. Launching a nuclear attack from Iran's territory towards a designated target on foreign territory is an act of war, even if Iran's intention is to designate the explosion target where no significant material damage is expected, such as over a desert area. An explosion over international waters would probably not constitute an act of aggression, if no one was hit and no material damage to property was incurred. Such an explosion would, however, constitute a contravention of Iran's obligations to the PTBT.

An alliance with another country, providing it with a "nuclear umbrella," is a possibility. In the situation of early 2008, an alliance with Syria would not be surprising. It would have to be publicized, and would be supported, if the alliance contains a nuclear clause, by declaration or even proof of Iran's capabilities. However, though it is not inconceivable, it is not easy to foresee the possibility that Iran would transfer nuclear explosives to a non-state entity such as a terrorist organization. The advantage to Iran would be that such a weapon could be viewed as an "orphan" weapon that would not be immediately and definitively attributed to Iran, although any assessment would assign a high probability that its origins were Iranian. On the other hand, once the weapon is attributed to Iran, the consequences could be very serious since a preemptive strike against it by a large coalition of nations would become a very realistic possibility.

Conclusion

It is quite certain that Iran is proceeding on a well-laid technical plan to acquire a military nuclear capability. While the previous regime in Iran did permit international pressure to influence the timetable of its nuclear development project, it is apparent that the reemergence of a conservative, fundamentalist regime brought about a decision not to let international political action influence the way Iran is proceeding towards the completion of its aims.

It can be estimated that Iran will continue with its program with minimal regard of international obligations, until it is necessary to act otherwise. Iran will likely strive to achieve the maximum potential for quickly producing nuclear weapons under the IAEA safeguards, while not ostensibly acting

outside its legal obligations. However, it is also quite probable that Iran will develop a concealed parallel enrichment program. This will certainly not be on the scale of the overt enrichment program at Natanz. Therefore, Iran would need much more time for the development of a viable nuclear arsenal. It is also reasonable to assume that Iran will continue with the development and later production of the nuclear explosive mechanism. This would certainly be ready when the necessary amount of HEU would be produced. Moreover, if and when Iran would declare its nuclear weapons capability, its Natanz facility could have already provided enough LEU for the rapid conversion to military grade HEU. Iran would then be the owner of not only a minimal military nuclear capability, but a considerable versatile nuclear force, consisting of many warheads, deliverable by the variety of means at its disposal. In order to extract all benefits from this situation, Iran will need to declare and perhaps even demonstrate this capability. It will do so, however, only when the time is ripe, according to its own assessment of the situation.

As time goes on, it will become more and more difficult for the world to deter or stop this development. There are many means the world could use to this end, but viable options will become limited in direct proportion to the progress of the Iranian program. The hope for using carrots as a means of persuasion is already almost nil, and one-sided concessions would certainly backfire.

Notes

1 http://www.iaea.org/Publications/Documents/Board/2006/gov2006-15.pdf.
2. http://www.iaea.org/Publications/Documents/Board/2008/gov2008-4.pdf; and http://www.isis-online.org/publications/iran/IAEA_Briefing_Weaponization.pdf.
3 The Nuclear Non-Proliferation Treaty (Article II).
4 There is some legal debate whether North Korea has really left the treaty, or it has only notified of an intention to do so, and still needs the approval of the UNSC.
5 Quoting Article 40 of Chapter VII is a first step "before making the recommendations or deciding upon the measures provided for [in other Articles]."
6 Vienna Convention on the Law of Treaties (Article 18).
7 http://www.iaea.org/Publications/Documents/Board/2008/gov2008-4.pdf.
8 See, e.g., http://www.globalsecurity.org/military/world/iran/airforce-equipment.htm.
9 See, e.g., http://www.globalsecurity.org/military/world/iran/ships.htm.