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Implementation of the NPT safeguards agreement in the Islamic Republic of Iran

Report by the Director General

A. Introduction

1. At the meeting of the Board of Governors on 17 March 2003, the Director General reported on discussions taking place with the Islamic Republic of Iran (hereinafter referred to as Iran) on a number of safeguards issues that needed to be clarified and actions that needed to be taken with regard to the implementation of the Agreement between Iran and the IAEA for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (the Safeguards Agreement)¹. This report provides further information on the nature of the safeguards issues involved and the actions that need to be taken, and describes developments in this regard since March. More general reporting of safeguards implementation in Iran is not addressed in this document, but in the Safeguards Implementation Reports.²

B. Recent Developments

2. At the September 2002 regular session of the IAEA General Conference, Vice President of the Islamic Republic of Iran and President of the Atomic Energy Organization of Iran (AEOI), H.E. Mr. R. Aghazadeh, stated that Iran was “embarking on a long-term plan to construct nuclear power plants with a total capacity of 6000 MW within two decades”. He also stated that such a sizeable project entailed “an all out planning, well in advance, in various field of nuclear technology such as fuel cycle, safety and waste management”.

¹ The Safeguards Agreement, reproduced in document INFCIRC/214, entered into force on 15 May 1974.

² The Agency has been applying safeguards at a range of facilities in Iran since the mid-1970s pursuant to its Safeguards Agreement. The list of facilities under safeguards is set out in the Annex to this report.

3. During the General Conference, the Director General met with the Vice President, and asked that Iran confirm whether it was building a large underground nuclear related facility at Natanz and a heavy water production plant at Arak, as reported in the media in August 2002. The Vice President provided some information on Iran's intentions to develop further its nuclear fuel cycle, and agreed on a visit to the two sites later in 2002 by the Director General, accompanied by safeguards experts, and to a discussion with Iranian authorities during that meeting on Iran's nuclear development plans.
4. The visit to Iran was originally scheduled for October 2002, but finally took place from 21 to 22 February 2003. The Director General was accompanied by the Deputy Director General for Safeguards (DDG-SG) and the Director of the Division of Safeguards Operations (B).
5. During his visit, the Director General was informed by Iran of its uranium enrichment programme, which was described as including two new facilities located at Natanz, namely a pilot fuel enrichment plant (PFEP) nearing completion of construction, and a large commercial-scale fuel enrichment plant (FEP) also under construction. These two facilities were declared to the Agency for the first time during that visit, at which time the Director General was able to visit both of them. Iran also confirmed that the heavy water production plant³, referred to in paragraph 3 above, was under construction in Arak.
6. During the visit, the Director General was informed that Iran would accept modifications to its Subsidiary Arrangements, as requested by the Board of Governors in 1992⁴, which would henceforth require the early provision of design information on new facilities and on modifications to existing facilities, as well as the early provision of information on new locations outside of facilities where nuclear material is customarily used (LOFs). This was confirmed to the Agency in a letter dated 26 February 2003 (see paragraph 15 below).
7. In addition, in response to the Agency's enquiry about certain transfers of nuclear material to Iran, only recently confirmed by the supplier State in response to repeated Agency enquiries, Iran acknowledged the receipt in 1991 of natural uranium, which had not been reported previously to the Agency, in the form of UF₆ (1000 kg), UF₄ (400 kg) and UO₂ (400 kg), which was now being stored at the previously undeclared Jabr Ibn Hayan Multipurpose Laboratories (JHL) located at the Tehran Nuclear Research Centre (TNRC). Iran also informed the Agency that it had converted most of the UF₄ into uranium metal in 2000 at JHL. This information was subsequently confirmed by Iran in a separate letter to the Agency dated 26 February 2003.
8. During the discussions in Iran in February between DDG-SG and the Iranian authorities, reference was made by the Agency to information in open sources on the possible conduct of enrichment activities at the workshop of the Kalaye Electric Company in Tehran. The Iranian authorities acknowledged that the workshop had been used for the production of centrifuge components, but stated that there had been no operations in connection with its centrifuge enrichment development programme involving the use of nuclear material, either at the Kalaye Electric Company or at any other location in Iran. According to the Iranian authorities, all testing had been carried out using simulation studies. While a centrifuge component production facility is not a nuclear facility required to be declared to the Agency under Iran's NPT Safeguards Agreement, Iran was requested, in light of its stated policy of transparency, to permit the Agency to visit the workshop and to take environmental samples there to assist the Agency in verifying Iran's declaration and confirming the absence of undeclared nuclear material and activities. The request was initially declined. The Iranian authorities

³ Heavy water production facilities are not nuclear facilities under comprehensive NPT safeguards agreements, and are thus not required to be declared to the Agency thereunder.

⁴ GOV/2554/Att.2/Rev.2; GOV/OR/777, paras. 74-76.

told the Agency that Iran considered such visits, and the requested environmental sampling, as being obligatory only when an Additional Protocol was in force. However, they subsequently agreed to permit access to the workshop (to limited parts of the location in March, and to the entire workshop in May), and have recently indicated that they would consider permitting the taking of environmental samples during the visit of the Agency's enrichment experts to Iran scheduled to take place between 7 and 11 June 2003 (see paragraph 11 below).

9. On 26 February 2003, a list of additional questions and requests for clarification was submitted to Iran regarding its centrifuge and laser enrichment programmes and its heavy water programme, and a written reply requested. A written response was received from Iran on 4 June 2003, and its contents will be followed up with the Iranian authorities.

10. In a letter dated 5 May 2003, Iran informed the Agency for the first time of its intention to construct a heavy water research reactor at Arak (the 40 MW(th) Iran Nuclear Research Reactor IR-40). Iran also informed the Agency of its plan to commence construction in 2003 of a fuel manufacturing plant at Esfahan (FMP).

11. During a meeting between the Vice President and the Director General on 5 May 2003, the Director General reiterated the Agency's earlier request for permission to send Agency inspectors to the workshop of the Kalaye Electric Company in Tehran, and to take environmental samples. The Director General also referred to an earlier proposal the Agency had made in April for a group of Agency experts to visit Iran to discuss the centrifuge research and development programme to seek to assess how the current status of the project could have been achieved without using any nuclear material during tests. Iran agreed to consider the proposal for an expert mission, and subsequently agreed that the mission could take place from 7 to 11 June 2003.

C. Implementation of Safeguards

12. Article 8 of Iran's Safeguards Agreement requires Iran to provide the Agency with information "concerning nuclear material subject to safeguards under the Agreement and the features of facilities relevant to safeguarding such material."

13. As provided for in Article 34(c) of the Safeguards Agreement, nuclear material of a composition and purity suitable for fuel fabrication or for being isotopically enriched, and any nuclear material produced at a later stage in the nuclear fuel cycle, is subject to all of the safeguards procedures specified in the Agreement. These procedures include, inter alia, requirements for Iran to report to the Agency changes in the inventory of nuclear material through the submission of inventory change reports (ICRs).⁵ Certain inventory changes entail additional reporting requirements. These include the import of nuclear material in quantities in excess of one effective kilogram, which, in accordance with Article 95 of the Safeguards Agreement, requires reporting to the Agency in advance of the import.

⁵ Inventory changes, as defined in Article 98.J of Iran's Safeguards Agreement, include, for example, imports, exports, domestic receipts and shipments, production of nuclear material in a reactor, loss of nuclear material due to its transformation into other elements or isotopes as a result of nuclear reactions, accidental losses of nuclear material and the generation of waste from processing which is deemed to be unrecoverable for the time being but which is stored.

14. To enable the Agency to verify the inventory and flow of nuclear material, Iran is also required to provide design information on facilities (as defined in Article 98.I of Iran's Safeguards Agreement), and information on LOFs. Pursuant to Article 42 of Iran's Safeguards Agreement, the time limit for the provision of design information on new nuclear facilities is to be specified in the Subsidiary Arrangements, but in any event it is to be provided "as early as possible before nuclear material is introduced into a new facility". Article 49 requires that information on LOFs be provided "on a timely basis".

15. The Subsidiary Arrangements General Part in force with Iran from 1976 to 26 February 2003 included what was, until 1992, standard text which called for provision to the Agency of design information on a new facility no later than 180 days before the introduction of nuclear material into the facility, and the provision of information on a new LOF together with the report relating to the receipt of nuclear material at the LOF. With the acceptance by Iran on 26 February 2003 of the modifications to the Subsidiary Arrangements proposed by the Agency, the Subsidiary Arrangements General Part now requires Iran to inform the Agency of new nuclear facilities and modifications to existing facilities through the provision of preliminary design information as soon as the decision to construct, to authorize construction or to modify has been taken, and to provide the Agency with further design information as it is developed. Information is to be provided early in the project definition, preliminary design, construction and commissioning phases.

C.1. Imported Nuclear Material

16. The UF₆, UF₄ and UO₂ imported by Iran in 1991 are materials that, as provided for in Article 34(c) of Iran's Safeguards Agreement, are subject to all of the safeguards procedures specified in the Agreement, including, in particular, the requirement to report inventory changes. Therefore, Iran was obliged to have reported the import of the material in question at the time of import. Equally, Iran was obliged to have reported design information as soon as possible before nuclear material was introduced to the receiving facility, and a Facility Attachment concluded for that facility.

17. In its letter of 26 February 2003 confirming its receipt of the material in question, Iran stated that its interpretation of Articles 34(c) and 95 of the Safeguards Agreement had been that no reporting to the Agency was required since the total amount of uranium did not exceed one effective kilogram. However, as indicated in paragraph 13 above, all material referred to in Article 34(c) of the Safeguards Agreement must be reported to the Agency. Article 95 simply imposes an additional requirement, that of advance notification, with respect to imports of material in excess of one effective kilogram.

18. Iran submitted on 15 April 2003 an ICR with regard to the import of the nuclear material, and, on 5 May 2003, preliminary design information for JHL, where most of the material is currently being stored.

C.1.1. Processing of UF₆

19. The Iranian authorities have stated that the imported UF₆ has not been processed, and specifically that it has not been used in any enrichment, centrifuge or other tests. The one large and two small UF₆ cylinders declared as containing the imported UF₆ were shown to the Agency in February. The cylinders were made available for Agency verification at JHL in March, at which time, after the Agency inspectors noted that one of the small cylinders was lighter than declared, the State authorities explained that a small amount of the UF₆ (1.9 kg) was missing due to leaking valves on the two small cylinders. It was explained during the subsequent inspection in April that the leaks had only been noticed a year before. Final evaluation will be completed when destructive samples have been taken, environmental samples have been analysed, and supporting documentation provided by the operator has been examined.

C.1.2. Processing of UF₄

20. Iran has informed the Agency that most of the imported UF₄ was converted to uranium metal at JHL. While the equipment for the conversion process has been dismantled and stored in a container (shown to the Agency during the February visit), Iran is now refurbishing that part of the facility as a uranium metal processing laboratory. The uranium metal, together with the remaining UF₄ and the related waste, has been presented for Agency verification. Final evaluation will be done when the results of destructive analysis become available, and supporting documentation provided by the facility operator has been examined. The role of uranium metal in Iran's declared nuclear fuel cycle still needs to be fully understood, since neither its light water reactors nor its planned heavy water reactors require uranium metal for fuel.

C.1.3. Processing of UO₂

21. During the February 2003 discussions, the Agency was informed by Iran that some of the imported UO₂ had been used at JHL for the testing of uranium purification and conversion processes. The experiments involved the dissolution of UO₂ with nitric acid, and the use of the resulting uranyl nitrate for testing a pulse column and ammonium uranyl carbonate (AUC) production processes envisioned for the Uranium Conversion Facility (UCF), a facility declared to the Agency in 2000 and currently under construction at Esfahan. In April, in response to Agency enquiries, the Iranian authorities informed the Agency that some of the UO₂ had also been used for isotope production experiments, including the undeclared irradiation of small amounts of the UO₂, at the Tehran Research Reactor (TRR). In addition, they informed the Agency that another small amount of UO₂ had been used in pellets to test the chemical processes of the Molybdenum, Iodine and Xenon Radioisotope Production Facility (MIX Facility). The unused UO₂ has been presented for Agency verification at JHL.

22. Most of the UO₂ used in the UCF-related experiments has been presented for Agency verification as liquid waste at Esfahan; the remaining waste has been disposed of at a location near Qom and cannot be verified. The whereabouts of the AUC produced during the UCF-related experiments is being discussed. Final evaluation of the accountancy will be completed when the results of destructive analysis become available, and the supporting documentation provided by the facility operator has been examined.

23. With respect to the isotope production experiments, Iran has stated that small amounts of the imported UO₂ were prepared for targets at JHL, irradiated at TRR, and sent to a laboratory belonging to the MIX Facility in Tehran for separation of I-131 in a lead-shielded cell. Iran has informed the Agency that the remaining nuclear waste was solidified and eventually transferred to a waste disposal site at Anarak. The operators at TRR and the MIX Facility have provided supporting documentation, which is being examined. The Agency is still awaiting relevant updated design information for the MIX Facility and TRR. Plans are in place to visit the waste site at Anarak in June.

24. With respect to the UO₂ to test the chemical processes of the MIX Facility, the material, including the resulting waste, has been presented for Agency verification at JHL. Final evaluation will be completed when the results of the destructive analysis become available, and supporting documentation provided by the facility operator has been examined.

C.2. Uranium Enrichment Programme

25. During the visit of the Director General in February 2003, the Vice President informed the Agency that over 100 of the approximately 1000 planned centrifuge casings had already been installed at the pilot plant and that the remaining centrifuges would be installed by the end of the year. In addition, he

informed the Agency that the commercial scale enrichment facility, which is planned to contain over 50 000 centrifuges, was not scheduled to receive nuclear material in the near future.

26. The Agency has been informed that the pilot enrichment plant is scheduled to start operating in June 2003, initially with single machine tests, and later with increasing numbers of centrifuges. The Iranian authorities have also informed the Agency that the commercial enrichment plant is planned to start accepting centrifuges in early 2005, after the design is confirmed by the tests to be conducted in the pilot enrichment plant. Iran has also stated that the design and research and development work, which had been started about five years ago, were based on extensive modelling and simulation, including tests of centrifuge rotors both with and without inert gas, and that the tests of the rotors, carried out on the premises of the Amir Khabir University and the AEOI in Tehran, were conducted without nuclear material.

27. In May 2003, Iran provided preliminary design information on the enrichment facilities under construction in Natanz, which are being examined by the Agency. Since March 2003, Agency inspectors have visited facilities at Natanz three times to conduct design information verification and to take environmental samples at the pilot enrichment plant. A first series of environmental and destructive analysis samples has been taken at a number of locations. Additional samples are expected to be taken in the near future. Iran has co-operated with the Agency in this regard. The Agency has presented to the Iranian authorities a safeguards approach for the pilot enrichment plant.

28. As indicated above, on 26 February 2003, the Agency forwarded a number of questions regarding Iran's research and development on centrifuges, including the chronology of its enrichment programme, with a view to assessing, inter alia, Iran's declaration that it had been developed without the centrifuges having been tested with UF₆ process gas. Similar questions and concerns have been raised by the Agency in relation to the UO₂, UF₄ and UF₆ production at the large scale conversion facility UCF, which is stated to have been constructed without any testing, even on a small scale, of key processes.

29. The Agency is also pursuing enquiries into Iran's laser programme. Iran has acknowledged the existence of a substantial programme on lasers, and Agency inspectors have visited some locations said to have been involved in that programme. However, Iran has stated that no enrichment related laser activities have taken place.

C.3. Heavy Water Programme

30. According to information provided by the Iranian authorities (see Section B above), the Iranian heavy water reactor programme consists of the heavy water production plant currently under construction at Arak; the 40 MW(th) IR-40, construction of which is planned to start at Arak in 2004; and the FMP at Esfahan, construction of which is planned for 2003, commissioning for 2006 and commencement of operation for 2007.

31. The stated purposes of the IR-40, which will use natural UO₂ fuel and heavy water (both as a coolant and as a moderator), are reactor research and development, radioisotope production and training. The stated purpose of the FMP is fabrication of fuel assemblies for the IR-40 and for the Bushehr Nuclear Power Plant (BNPP).

D. Findings and Initial Assessment

32. Iran has failed to meet its obligations under its Safeguards Agreement with respect to the reporting of nuclear material, the subsequent processing and use of that material and the declaration of facilities where the material was stored and processed. These failures, and the actions taken thus far to correct them, can be summarized as follows:

- (a) Failure to declare the import of natural uranium in 1991, and its subsequent transfer for further processing.

On 15 April 2003, Iran submitted ICRs on the import of the UO_2 , UF_4 and UF_6 . Iran has still to submit ICRs on the transfer of the material for further processing and use.

- (b) Failure to declare the activities involving the subsequent processing and use of the imported natural uranium, including the production and loss of nuclear material, where appropriate, and the production and transfer of waste resulting therefrom.

Iran has acknowledged the production of uranium metal, uranyl nitrate, ammonium uranyl carbonate, UO_2 pellets and uranium wastes. Iran must still submit ICRs on these inventory changes.

- (c) Failure to declare the facilities where such material (including the waste) was received, stored and processed.

On 5 May 2003, Iran provided preliminary design information for the facility JHL. Iran has informed the Agency of the locations where the undeclared processing of the imported natural uranium was conducted (TRR and the Esfahan Nuclear Technology Centre), and provided access to those locations. It has provided the Agency access to the waste storage facility at Esfahan, and has indicated that access would be provided to Anarak, as well as the waste disposal site at Qom.

- (d) Failure to provide in a timely manner updated design information for the MIX Facility and for TRR.

Iran has agreed to submit updated design information for the two facilities.

- (e) Failure to provide in a timely manner information on the waste storage at Esfahan and at Anarak.

Iran has informed the Agency of the locations where the waste has been stored or discarded. It has provided the Agency access to the waste storage facility at Esfahan, and has indicated that access will be provided to Anarak.

33. Although the quantities of nuclear material involved have not been large⁶, and the material would need further processing before being suitable for use as the fissile material component of a nuclear explosive device, the number of failures by Iran to report the material, facilities and activities in question in a timely manner as it is obliged to do pursuant to its Safeguards Agreement is a matter of concern. While these failures are in the process of being rectified by Iran, the process of verifying the correctness and completeness of the Iranian declarations is still ongoing.

⁶ The total amount of material, approximately 1.8 tonnes, is 0.13 effective kilograms of uranium. This is, however, not insignificant in terms of a State's ability to conduct nuclear research and development activities.

34. The Agency is continuing to pursue the open questions, including through:

- (a) The completion of a more thorough expert analysis of the research and development carried out by Iran in the establishment of its enrichment capabilities. This will require the submission by Iran of a complete chronology of its centrifuge and laser enrichment efforts, including, in particular, a description of all research and development activities carried out prior to the construction of the Natanz facilities. As agreed to by Iran, this process will also involve discussions in Iran between Iranian authorities and Agency enrichment experts on Iran's enrichment programme, and visits by the Agency experts to the facilities under construction at Natanz and other relevant locations.
- (b) Further follow-up on information regarding allegations about undeclared enrichment of nuclear material, including, in particular, at the Kalaye Electric Company. This will require permission for the Agency to carry out environmental sampling at the workshop located there.
- (c) Further enquiries about the role of uranium metal in Iran's nuclear fuel cycle.
- (d) Further enquiries about Iran's programme related to the use of heavy water, including heavy water production and heavy water reactor design and construction.

35. The Director General has repeatedly encouraged Iran to conclude an Additional Protocol. Without such protocols in force, the Agency's ability to provide credible assurances regarding the absence of undeclared nuclear activities is limited. This is particularly the case for States, like Iran, with extensive nuclear activities and advanced fuel cycle technologies. In the view of the Director General, the adherence by Iran to an Additional Protocol would therefore constitute a significant step forward. The Director General will continue to keep the Board informed of developments.

LIST OF NUCLEAR FACILITIES UNDER IAEA SAFEGUARDS

LOCATION	AS IN SEPTEMBER 2002	NEW FACILITIES AS OF JUNE 2003
TEHRAN	Tehran Research Reactor (TRR)	
	Molybdenum, Iodine and Xenon Radioisotope Production Facility (MIX Facility)	
		Jabr Ibn Hayan Multipurpose Laboratories (JHL)
BUSHEHR	Bushehr Nuclear Power Plant (BNPP)	
ESFAHAN	Miniature Neutron Source Reactor (MNSR)	
	Light Water Sub-Critical Reactor (LWSCR)	
	Heavy Water Zero Power Reactor (HWSPR)	
	Fuel Fabrication Laboratory (FFL)	
	Uranium Chemistry Laboratory (UCL)	
	Uranium Conversion Facility (UCF)	
	Graphite Sub-Critical Reactor, decommissioned (GSCR)	
		Fuel Manufacturing Plant (FMP)
NATANZ		Pilot Fuel Enrichment Plant (PFEP)
		Fuel Enrichment Plant (FEP)
ARAK		Iran Nuclear Research Reactor (IR-40)