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Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran

Report by the Director General

A. Introduction

1. This report of the Director General to the Board of Governors and, in parallel, to the Security Council, is on the implementation of the NPT Safeguards Agreement[1] and relevant provisions of Security Council resolutions in the Islamic Republic of Iran (Iran).

2. The Security Council has affirmed that the steps required by the Board of Governors in its resolutions[2] are binding on Iran.[3] The relevant provisions of the aforementioned Security Council resolutions were

[1] The Agreement between Iran and the Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/214), which entered into force on 15 May 1974.

[2] The Board of Governors has adopted ten resolutions in connection with the implementation of safeguards in Iran: GOV/2003/69 (12 September 2003); GOV/2003/81 (26 November 2003); GOV/2004/21 (13 March 2004); GOV/2004/49 (18 June 2004); GOV/2004/79 (18 September 2004); GOV/2004/90 (29 November 2004); GOV/2005/64 (11 August 2005); GOV/2005/77 (24 September 2005); GOV/2006/14 (4 February 2006); and GOV/2009/82 (27 November 2009).

[3] In resolution 1929 (2010), the Security Council: affirmed, inter alia, that Iran shall, without further delay, take the steps required by the Board in GOV/2006/14 and GOV/2009/82; reaffirmed Iran's obligation to cooperate fully with the IAEA on all outstanding issues, particularly those which give rise to concerns about the possible military dimensions of the Iranian nuclear programme; decided that Iran shall, without delay, comply fully and without qualification with its Safeguards Agreement, including through the application of modified Code 3.1 of the Subsidiary Arrangements; and called upon Iran to act strictly in accordance with the provisions of its Additional Protocol and to ratify it promptly (operative paras 1–6).

adopted under Chapter VII of the United Nations Charter, and are mandatory, in accordance with the terms of those resolutions.[4]

3. By virtue of its Relationship Agreement with the United Nations,[5] the Agency is required to cooperate with the Security Council in the exercise of the Council's responsibility for the maintenance or restoration of international peace and security. All Members of the United Nations are required to take actions which are consistent with their obligations under the United Nations Charter.[6]

4. This report focuses on those areas where Iran has not fully implemented its binding obligations, as the full implementation of these obligations is needed to establish international confidence in the exclusively peaceful nature of Iran's nuclear programme. It addresses developments since the last report (GOV/2011/7, 25 February 2011), as well as issues of longer standing.

B. Facilities Declared under Iran's Safeguards Agreement

5. Under its Safeguards Agreement, Iran has declared to the Agency 16 nuclear facilities and nine locations outside facilities where nuclear material is customarily used (LOFs).[7] Notwithstanding that certain of the activities being undertaken by Iran at some of the facilities are contrary to relevant resolutions of the Board of Governors and the Security Council, as indicated below, the Agency continues to verify the non-diversion of declared nuclear material at these facilities and LOFs.

C. Enrichment Related Activities

6. Contrary to the relevant resolutions of the Board of Governors and the Security Council, Iran has not suspended its enrichment related activities in the following declared facilities, all of which are nevertheless under Agency safeguards.

C.1. Natanz: Fuel Enrichment Plant and Pilot Fuel Enrichment Plant

7. **Fuel Enrichment Plant (FEP):** There are two cascade halls at FEP: Production Hall A and Production Hall B. According to the design information submitted by Iran, eight units are planned for Production Hall A, with 18 cascades in each unit. No detailed design information has yet been provided for Production Hall B.

8. On 14 May 2011, 53 cascades were installed in three of the eight units in Production Hall A, 35 of which were being fed with UF_6.[8] Initially, each installed cascade comprised 164 centrifuges. Iran has modified 12 of the cascades to contain 174 centrifuges each. To date, all the centrifuges installed are IR-1

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[4] The United Nations Security Council has adopted the following resolutions on Iran: 1696 (2006); 1737 (2006); 1747 (2007); 1803 (2008); 1835 (2008); and 1929 (2010).

[5] The Agreement Governing the Relationship between the United Nations and the IAEA entered into force on 14 November 1957, following approval by the General Conference, upon recommendation of the Board of Governors, and approval by the General Assembly of the United Nations. It is reproduced in INFCIRC/11 (30 October 1959), Part I.A.

[6] GOV/2011/7, para. 2.

[7] All of the LOFs are situated within hospitals.

[8] On 14 May 2011, the 53 installed cascades contained approximately 8000 centrifuges. The 35 cascades being fed with UF_6 on that date contained a total of 5860 centrifuges, some of which were possibly not being fed with UF_6.

machines. As of 14 May 2011, installation work in the remaining five units was ongoing, but no centrifuges had been installed. There had been no installation work in Production Hall B.

9. Following a physical inventory verification (PIV) at FEP, the Agency confirmed that, as of 17 October 2010, 34 737 kg of natural UF_6 had been fed into the cascades since the start of operations in February 2007, and a total of 3135 kg of low enriched UF_6 had been produced.

10. Iran has estimated that, between 18 October 2010 and 13 May 2011, it produced an additional 970 kg of low enriched UF_6, which would result in a total production of 4105 kg of low enriched UF_6 since February 2007. The nuclear material at FEP (including the feed, product and tails), as well as all installed cascades and the feed and withdrawal stations, are subject to Agency containment and surveillance.[9] In a letter dated 4 April 2011, Iran informed the Agency that a metal seal in the feed and withdrawal area of FEP had been accidentally broken by the operator. The consequences for safeguards of this seal breakage will be evaluated by the Agency upon completion of the next PIV.

11. Based on the results of the analysis of environmental samples taken at FEP since February 2007[10] and other verification activities, the Agency has concluded that the facility has operated as declared by Iran in the Design Information Questionnaire (DIQ).

12. **Pilot Fuel Enrichment Plant (PFEP):** PFEP is a research and development (R&D) facility and a pilot, low enriched uranium (LEU) production facility, which was first brought into operation in October 2003. It has a cascade hall that can accommodate six cascades, and is divided between an area designated for the production of LEU enriched up to 20% U-235 and an area designated for R&D.

13. In the production area, Iran first began feeding low enriched UF_6 into Cascade 1 on 9 February 2010, for the stated purpose of producing UF_6 enriched up to 20% U-235 for use in the manufacture of fuel for the Tehran Research Reactor (TRR).[11,12] Since 13 July 2010, Iran has been feeding low enriched UF_6 into two interconnected cascades (Cascades 1 and 6), each of which consists of 164 centrifuges.[13]

14. As a result of discussions between the Agency and Iran, certain improvements to the operator's measurement system, especially in the determination of the level of U-235 enrichment, were agreed during a meeting which took place on 17–18 April 2011, and are expected to be implemented by the time of the next PIV.[14]

15. Iran has estimated that, between 19 September 2010 and 21 May 2011, a total of 222.1 kg of UF_6 enriched at FEP was fed into the two interconnected cascades and that approximately 31.6 kg of UF_6 enriched up to 20% U-235 was produced. This would result in a total of approximately 56.7 kg of UF_6 enriched up to 20% U-235 having been produced since the process began in February 2010.

16. In the R&D area, between 12 February 2011 and 21 May 2011, a total of approximately 331 kg of natural UF_6 was fed into centrifuges, but no LEU was withdrawn as the product and the tails of this R&D activity are recombined at the end of the process.[15]

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[9] In line with normal safeguards practice, small amounts of nuclear material at the facility (e.g. some waste and samples) are not subject to containment and surveillance.

[10] Results are available to the Agency for samples taken up to 14 September 2010.

[11] GOV/2010/28, para. 9.

[12] TRR is a 5 MW reactor which operates with 20% U-235 enriched fuel and is used for the irradiation of different types of targets and for research and training purposes.

[13] GOV/2010/28, para. 9.

[14] GOV/2011/7, para. 14.

[15] On 22 May 2011, the centrifuges being tested in the R&D area were IR-1, IR-2m and IR-4 machines.

17. As stated in the Director General's previous report, on 19 January 2011 Iran indicated that it would install two new 164-centrifuge cascades (Cascades 4 and 5) in the R&D area. These two cascades, one of which will consist of IR-4 centrifuges and the other IR-2m centrifuges, will be fed with natural UF_6. Although installation work for Cascades 4 and 5 is ongoing, as of 22 May 2011, no centrifuges had been installed.

18. Based on the results of the analysis of the environmental samples taken at PFEP[16] and other verification activities, the Agency has concluded that the facility has operated as declared by Iran in the DIQ.

C.2. Fordow Fuel Enrichment Plant

19. In September 2009, Iran informed the Agency that it was constructing the Fordow Fuel Enrichment Plant (FFEP), located near the city of Qom. In its DIQ of 10 October 2009, Iran stated that the purpose of the facility was the production of UF_6 enriched up to 5.0% U-235, and that the facility was being built to contain 16 cascades, with a total of approximately 3000 centrifuges.[17] In September 2010, Iran provided the Agency with a revised DIQ in which it stated that the purpose of FFEP was now to include R&D as well as the production of UF_6 enriched up to 5.0% U-235.[18]

20. While the Agency continues to verify that FFEP is being constructed according to the latest DIQ provided by Iran, it is still not in a position to confirm the chronology of the design and construction of FFEP or its original purpose. Iran has stated that there is no legal basis upon which the Agency may request information on the chronology and purpose of FFEP, and that the Agency is not mandated to raise questions that are beyond its Safeguards Agreement.[19] The Agency considers that the questions it has raised are within the terms of the Safeguards Agreement, in that the information requested is essential for the Agency to confirm that the declarations of Iran are correct and complete.[20]

21. As stated in the Director General's previous report, on 21 February 2011, Iran informed the Agency that it planned to begin feeding nuclear material into cascades "by this summer". As of 21 May 2011, no centrifuges had been introduced into the facility. The results of the analysis of the environmental samples taken at FFEP up to February 2010 did not indicate the presence of enriched uranium.[21]

C.3. Other Enrichment Related Activities

22. The Agency is still awaiting a substantive response from Iran to Agency requests for further information in relation to announcements made by Iran concerning the construction of ten new uranium enrichment facilities, the sites for five of which, according to Iran, have been decided, and the construction of one of which was to have begun by the end of the last Iranian year (20 March 2011) or the start of this Iranian year.[22,23] To date, the Agency has no information as to whether that construction has started.

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[16] Results are available to the Agency for samples taken up to 1 January 2011.

[17] GOV/2009/74, para. 9.

[18] GOV/2010/62, para. 16.

[19] GOV/2010/46, para. 15.

[20] As previously reported, in Iran's initial declaration regarding the purpose of FFEP, contained in a letter dated 2 December 2009, Iran stated that, "The location [near Qom] originally was considered as a general area for passive defence contingency shelters for various utilizations. Then this location was selected for the construction of [the] Fuel Enrichment Plant in the second half of 2007" (GOV/2010/10, paras 14–16).

[21] The results did show a small number of particles of depleted uranium (GOV/2010/10, para. 17).

[22] 'Iran Specifies Location for 10 New Enrichment Sites', Fars News Agency, 16 August 2010.

[23] GOV/2010/46, para. 33.

23. Iran has not provided further information, as requested by the Agency, in connection with its announcement on 7 February 2010 that it possessed laser enrichment technology,[24] and its announcement on 9 April 2010 regarding the development of third generation centrifuges.[25] Since early 2008, Iran has not responded to Agency requests for access to additional locations related, inter alia, to the manufacturing of centrifuges, and to R&D on uranium enrichment.[26] As a result, the Agency's knowledge about Iran's enrichment activities continues to diminish.

D. Reprocessing Activities

24. Pursuant to the relevant resolutions of the Board of Governors and the Security Council, Iran is obliged to suspend its reprocessing activities, including R&D.[27] In a letter to the Agency dated 15 February 2008, Iran stated that it "does not have reprocessing activities". In that context, the Agency has continued to monitor the use of hot cells at TRR and the Molybdenum, Iodine and Xenon Radioisotope Production (MIX) Facility.[28] The Agency carried out an inspection and design information verification (DIV) at TRR on 8 May 2011 and a DIV at the MIX Facility on 9 May 2011. It is only with respect to TRR, the MIX Facility, and the other facilities to which the Agency has access, that the Agency can confirm that there are no ongoing reprocessing related activities in Iran.

E. Heavy Water Related Projects

25. Contrary to the relevant resolutions of the Board of Governors and the Security Council, Iran has not suspended work on all heavy water related projects, including the construction of the heavy water moderated research reactor, the IR-40 Reactor, which is under Agency safeguards.[29]

26. As indicated in the Director General's previous reports, in light of the request by the Security Council to report to it on whether Iran has established full and sustained suspension of, inter alia, all heavy water related projects,[30] the Agency has requested that Iran make the necessary arrangements to provide the Agency, at the earliest possible date, with access to: the Heavy Water Production Plant (HWPP);[31] the heavy water stored at the Uranium Conversion Facility (UCF) in order to take samples;[32] and any other location in Iran where projects related to heavy water are being carried out. Iran has objected to the Agency's requests on the basis that they go beyond the Safeguards Agreement and because Iran has already stated that it has not

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[24] Cited on the website of the Presidency of the Islamic Republic of Iran, 7 February 2010, at http://www.president.ir/en/?ArtID=20255.

[25] GOV/2010/28, para. 18.

[26] GOV/2008/15, para. 13.

[27] S/RES/1696 (2006), para. 2; S/RES/1737 (2006), para. 2; S/RES/1747 (2007), para. 1; S/RES/1803 (2008), para. 1; S/RES/1835 (2008), para. 4; S/RES/1929 (2010), para. 2.

[28] The MIX Facility is a hot cell complex for the separation of radiopharmaceutical isotopes from targets, including uranium, irradiated at TRR. The MIX Facility is not currently processing any uranium targets.

[29] S/RES/1737 (2006), para. 2; S/RES/1747 (2007), para. 1; S/RES/1803 (2008), para. 1; S/RES/1835 (2008), para. 4; S/RES/1929 (2010), para. 2.

[30] S/RES/1737 (2006), para. 23; S/RES/1747 (2007), para. 12; S/RES/1803 (2008), para. 18; S/RES/1929 (2010), para. 36.

[31] Based on satellite imagery, the HWPP appears to be in operation.

[32] GOV/2010/10, paras 20 and 21.

suspended its heavy water related projects.[33] The Security Council has decided that Iran shall provide such access and cooperation as the Agency requests to be able to verify the suspension of its heavy water related projects.[34] To date, Iran has not provided the requested access.

27. While Iran has made statements to the effect that it has not suspended work on all its heavy water related projects, without full access to the heavy water at UCF, to HWPP, and any other heavy water related projects there may be in Iran, the Agency is unable to verify such statements and therefore to report fully on this matter.

28. On 10 May 2011, the Agency carried out a DIV at the IR-40 Reactor at Arak and observed that construction of the facility was ongoing and that the moderator heat exchangers had been delivered to the site. According to Iran, the operation of the IR-40 Reactor is planned to commence by the end of 2013.

F. Uranium Conversion and Fuel Fabrication

29. As indicated above, Iran is obliged to suspend all enrichment related activities and heavy water related projects. Some of the activities carried out by Iran at UCF and the Fuel Manufacturing Plant (FMP) at Esfahan are in contravention of that obligation, although both facilities are under Agency safeguards.

30. Between 5 March and 9 March 2011, the Agency carried out a PIV at UCF, and verified the total amount of uranium in the form of UF_6 present at the facility.

31. In a letter dated 16 March 2011, Iran informed the Agency that during the period 4–6 April 2011 it intended to start the production of natural UO_2 for IR-40 Reactor fuel. On 18 May 2011, the Agency carried out a DIV at UCF and observed that, although the process to produce such UO_2 had started, none had yet been produced. The Agency also confirmed that no UF_6 had been produced at UCF since 10 August 2009. The total amount of uranium produced at UCF since March 2004, therefore, remains 371 tonnes in the form of UF_6 (some of which has been transferred to FEP and PFEP), and remains subject to Agency containment and surveillance. During the DIV, the Agency observed that Iran had not yet begun the installation of equipment for the conversion of the UF_6 enriched up to 20% U-235 into U_3O_8 for the fabrication of fuel for TRR.[35]

32. On 11 May 2011, the Agency carried out an inspection and a DIV at FMP and confirmed that Iran had not yet started to install equipment for TRR fuel fabrication.[36]

G. Possible Military Dimensions

33. The Board of Governors has called on Iran on a number of occasions to engage with the Agency on the resolution of all outstanding issues concerning Iran's nuclear programme in order to exclude the existence of possible military dimensions to Iran's nuclear programme.[37] In resolution 1929 (2010), the Security Council

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[33] GOV/2010/62, para. 21.

[34] S/RES/1737 (2006), para. 8.

[35] GOV/2010/46, para. 25.

[36] GOV/2010/46, para. 26.

[37] Most recently in GOV/2009/82 (27 November 2009).

reaffirmed Iran's obligations to take the steps required by the Board of Governors in its resolutions GOV/2006/14 and GOV/2009/82, including by providing access without delay to all sites, equipment, persons and documents requested by the Agency.[38]

34. Previous reports by the Director General have listed the outstanding issues related to possible military dimensions to Iran's nuclear programme and the actions required of Iran necessary to resolve these.[39] On 6 May 2011, in light of Iran not having engaged with the Agency on the substance of these issues since August 2008, the Director General sent a letter to H.E. Mr Fereydoun Abbasi, Vice President of Iran and Head of the Atomic Energy Organization of Iran (AEOI), reiterating the Agency's concerns about the existence of possible military dimensions to Iran's nuclear programme and expressing the importance of Iran clarifying these issues. In the same letter, the Director General also requested that Iran provide prompt access to relevant locations, equipment, documentation and persons, and noted that, with Iran's substantive and proactive engagement, the Agency would be able to make progress in its verification of the correctness and completeness of Iran's declarations.

35. Based on the Agency's continued study of information which the Agency has acquired from many Member States and through its own efforts, the Agency remains concerned about the possible existence in Iran of past or current undisclosed nuclear related activities involving military related organizations, including activities related to the development of a nuclear payload for a missile. Since the last report of the Director General on 25 February 2011, the Agency has received further information related to such possible undisclosed nuclear related activities, which is currently being assessed by the Agency. As previously reported by the Director General, there are indications that certain of these activities may have continued beyond 2004.[40] The following points refer to examples of activities for which clarifications remain necessary in seven particular areas of concern:[41]

- Neutron generator and associated diagnostics: experiments involving the explosive compression of uranium deuteride to produce a short burst of neutrons.
- Uranium conversion and metallurgy: producing uranium metal from fluoride compounds and its manufacture into components relevant to a nuclear device.
- High explosives manufacture and testing: developing, manufacturing and testing of explosive components suitable for the initiation of high explosives in a converging spherical geometry.
- Exploding bridgewire (EBW) detonator studies, particularly involving applications necessitating high simultaneity: possible nuclear significance of the use of EBW detonators.
- Multipoint explosive initiation and hemispherical detonation studies involving highly instrumented experiments: integrating EBW detonators in the development of a system to initiate hemispherical high explosive charges and conducting full scale experiments, work which may have benefitted from the assistance of foreign expertise.
- High voltage firing equipment and instrumentation for explosives testing over long distances and possibly underground: conducting tests to confirm that high voltage firing equipment is suitable for the reliable firing of EBW detonators over long distances.

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[38] S/RES/1929, paras 2 and 3.

[39] GOV/2010/10, paras 40–45; GOV/2009/55, paras 18–25; GOV/2008/38, paras 14–21; GOV/2008/15, paras 14–25 and Annex; GOV/2008/4, paras 35–42.

[40] GOV/2010/62, para. 33; GOV/2010/46, para. 39.

[41] GOV/2011/7, Attachment.

- Missile re-entry vehicle redesign activities for a new payload assessed as being nuclear in nature: conducting design work and modelling studies involving the removal of the conventional high explosive payload from the warhead of the Shahab-3 missile and replacing it with a spherical nuclear payload.

H. Design Information

36. The modified Code 3.1 of the Subsidiary Arrangements General Part to Iran's Safeguards Agreement provides for the submission to the Agency of design information for new facilities as soon as the decision to construct, or to authorize construction of, a new facility has been taken, whichever is the earlier. The modified Code 3.1 also provides for the submission of fuller design information as the design is developed early in the project definition, preliminary design, construction, and commissioning phases. Iran remains the only State with significant nuclear activities in which the Agency is implementing a comprehensive safeguards agreement but which is not implementing the provisions of the modified Code 3.1.[42] The Agency is still awaiting receipt from Iran of, inter alia, updated design information for the IR-40 Reactor, and further information pursuant to statements it has made concerning the planned construction of new uranium enrichment facilities and the design of a reactor similar to TRR.[43]

37. In a letter dated 26 April 2011, the Agency requested Iran to confirm the statement reportedly made by H.E. Mr Fereydoun Abbasi, to the effect that Iran plans to build four to five new reactors in Iran in the next few years in order to produce radioisotopes and carry out research.[44] In the same letter, the Agency also requested that, if Iran had taken a decision to construct new nuclear facilities, Iran provide further information regarding the design and scheduling of the construction of the facilities. In its reply of 3 May 2011, Iran stated that it would provide the Agency with the required information in "due time" and in accordance with its Safeguards Agreement.

I. Additional Protocol

38. Iran is not implementing its Additional Protocol, contrary to the relevant resolutions of the Board of Governors and the Security Council.[45] The Agency will not be in a position to provide credible assurance about the absence of undeclared nuclear material and activities in Iran unless and until Iran provides the necessary cooperation with the Agency, including by implementing its Additional Protocol.

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[42] In accordance with Article 39 of Iran's Safeguards Agreement, agreed Subsidiary Arrangements cannot be changed unilaterally; nor is there a mechanism in the Safeguards Agreement for the suspension of provisions agreed to in the Subsidiary Arrangements. Therefore, as previously explained in the Director General's reports (see e.g. GOV/2007/22, 23 May 2007), the modified Code 3.1, as agreed to by Iran in 2003, remains in force. Iran is further bound by operative paragraph 5 of Security Council resolution 1929 (2010) to "comply fully and without qualification with its IAEA Safeguards Agreement, including through the application of modified Code 3.1".

[43] GOV/2010/46, para. 32.

[44] 'Iran will not stop producing 20% enriched uranium', Tehran Times, 12 April 2011.

[45] Iran's Additional Protocol was approved by the Board on 21 November 2003 and signed by Iran on 18 December 2003, although it has not been brought into force. Iran provisionally implemented its Additional Protocol between December 2003 and February 2006.

J. Other Matters

39. On 15–16 April 2011, the Agency conducted a PIV at the Bushehr Nuclear Power Plant (BNPP), during which it verified all nuclear material present and confirmed that the loading of the fuel assemblies into the core had been completed. On 10 May 2011, Iran informed the Agency that the reactor had reached criticality.

K. Summary

40. While the Agency continues to conduct verification activities under Iran's Safeguards Agreement, Iran is not implementing a number of its obligations, including: implementation of the provisions of its Additional Protocol; implementation of the modified Code 3.1 of the Subsidiary Arrangements General Part to its Safeguards Agreement; suspension of enrichment related activities; suspension of heavy water related activities; and clarification of the remaining outstanding issues which give rise to concerns about possible military dimensions to its nuclear programme.

41. While the Agency continues to verify the non-diversion of declared nuclear material at the nuclear facilities and LOFs declared by Iran under its Safeguards Agreement, as Iran is not providing the necessary cooperation, including by not implementing its Additional Protocol, the Agency is unable to provide credible assurance about the absence of undeclared nuclear material and activities in Iran, and therefore to conclude that all nuclear material in Iran is in peaceful activities.[46]

42. The Director General urges Iran to respond positively to his letter of 6 May 2011, and to take steps towards the full implementation of its Safeguards Agreement and its other relevant obligations, in order to establish international confidence in the exclusively peaceful nature of Iran's nuclear programme.

43. The Director General will continue to report as appropriate.

[46] The Board has confirmed on numerous occasions, since as early as 1992, that paragraph 2 of INFCIRC/153 (Corr.), which corresponds to Article 2 of Iran's Safeguards Agreement, authorizes and requires the Agency to seek to verify both the non-diversion of nuclear material from declared activities (i.e. correctness) and the absence of undeclared nuclear activities in the State (i.e. completeness) (see, for example, GOV/OR.864, para. 49). Paragraph 41 reflects the past and current implementation by Iran of its Safeguards Agreement and other obligations.

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(GOV/2011/23)

Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic

Report by the Director General

1. This report of the Director General to the Board of Governors is on the implementation of the NPT Safeguards Agreement in the Syrian Arab Republic[1] (Syria). It includes the Agency's assessment of the nature of the destroyed building at the Dair Alzour site.

A. The Dair Alzour Site

2. On 2 June 2008, the Director General informed the Board of Governors that the Agency had been provided with information alleging that an installation at the Dair Alzour site in Syria, destroyed by Israel in September 2007, had been a nuclear reactor that was not yet operational and into which no nuclear material had been introduced. Information subsequently provided to the Agency further alleged that the reactor was a gas cooled graphite moderated reactor, that it was not configured to produce electricity, that it had been built with the assistance of the Democratic People's Republic of Korea (DPRK), and that there were three other locations in Syria that were functionally related to the Dair Alzour site. By the end of October 2007, large scale clearing and levelling operations had taken place at the site which had removed or obscured the remains of the destroyed building.[2] Syria has maintained, since May 2008, that the destroyed building was a non-nuclear military installation and that Syria had had no nuclear related cooperation with the DPRK.[3]

[1] INFCIRC/407.

[2] GOV/OR.1206, para. 26; GOV/2008/60, para. 16.

[3] GOV/2008/60, para. 1; GOV/2009/36, para. 15.

3. The Agency regrets that information concerning the Dair Alzour site was not provided to it in a timely manner and that force was used before the Agency was given an opportunity to establish the facts in accordance with its responsibilities under Syria's Safeguards Agreement.

4. In June 2008, during the Agency's visit to Syria, the Agency requested supporting documentation concerning the past and current use of the buildings at the Dair Alzour site and at three other locations allegedly functionally related to that site. The Agency also requested clarification about procurement activities by Syrian entities, including the Syrian Atomic Energy Agency (AECS), concerning pumping equipment, and large quantities of graphite and barite. During the visit, Syria stated that the function of the destroyed building was missile related. Syria also stated that the destroyed building could not have been a nuclear facility because of the unreliable and insufficient electricity supplies in the area, the limited availability of human resources in Syria and the unavailability of large quantities of treated water.

5. Environmental samples taken during the visit to the Dair Alzour site in June 2008 contained particles of anthropogenic natural uranium, graphite and stainless steel. Syria maintains that the particles of anthropogenic natural uranium found at the Dair Alzour site originated from the missiles used to destroy the building.[4] Syria also maintains that the pumping equipment and large quantities of graphite and barite that it sought to procure were for civilian and non-nuclear purposes.

6. Syria's statements — concerning the nature of the destroyed building, the Dair Alzour site, the three other locations allegedly functionally related to it, the procurement activities referred to above and the alleged foreign assistance — are limited in detail, are not supported by documentation and have not allowed the Agency to confirm Syria's assertions regarding the non-nuclear nature of the destroyed building. Since the Agency's visit to the Dair Alzour site in June 2008, the Agency has made repeated requests to Syria for:

- information concerning the Dair Alzour site, the infrastructure observed at the site and certain procurement efforts which Syria has stated were related to civilian non-nuclear activities;
- access to technical documentation and any other information related to the construction of the destroyed building;
- access to locations where the debris from the destroyed building, the remains of munitions, the debris from equipment and any salvaged equipment had been and/or are now situated; and
- further access to the Dair Alzour site and access to three other locations allegedly functionally related to the Dair Alzour site.

7. Syria has maintained that, due to the military and non-nuclear nature of the Dair Alzour site and three other locations allegedly functionally related to the Dair Alzour site, it has no obligation to provide more information under its Safeguards Agreement with the Agency.[5] The Agency has explained to Syria that there is no limitation in comprehensive safeguards agreements on Agency access to information, activities or locations simply because they may be military related. The Agency has repeatedly offered to establish the necessary modalities to enable Syria to substantiate its statements while protecting sensitive information related to its activities at the Dair Alzour site and the three other locations.

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[4] GOV/2008/60, para. 8. In this context, it is noted that no additional information has been provided by Israel.

[5] GOV/2009/56, para. 9; GOV/2008/60, para. 14.

8. In a letter dated 18 November 2010, the Director General wrote to H.E. Walid Al-Moualem, Syria's Minister for Foreign Affairs, to request, inter alia, that Syria provide the Agency with prompt access to information and locations previously indicated by the Agency.

9. In a letter dated 6 February 2011 addressed to the Director General, Syria's Minister for Foreign Affairs stated that the Director General of the AECS would continue to work with the Agency to resolve all outstanding technical issues in accordance with Syria's commitments under the Agency's Statute, the Treaty on the Non-Proliferation of Nuclear Weapons and Syria's Safeguards Agreement.

10. Notwithstanding the Minister's statement referred to above, Syria has not engaged substantively with the Agency on the nature of the Dair Alzour site since the Agency's June 2008 visit and, since August 2009, has not responded to the other issues referred to in paragraph 6 above.

B. Assessment of the Dair Alzour Site

11. As further described below, the Agency has assessed that:

- features of the destroyed building are comparable to those of gas cooled graphite moderated reactors of the type and size alleged;
- prior to the bombing, the configuration of the infrastructure at the site, including its connections for cooling and treated water, was able to support the operation of such a reactor and was not consistent with Syria's claims regarding the purpose of the infrastructure; in addition, a number of other features of the site add to its suitability for the construction and operation of a nuclear reactor;
- analysis of samples from the site indicates a connection to nuclear related activities; and
- the features of the destroyed building and the site could not have served the purpose claimed by Syria.

B.1. Features of the Destroyed Building

12. The Agency has assessed that the dimensions, shape and configuration of the destroyed building are comparable to those found in reactors of the alleged type.

13. Based on commercial imagery from 2001 to 2007, the dimensions of the building[6] are comparable to those for nuclear reactors of the type and power alleged, i.e. similar to the 25 MW(th) gas cooled graphite moderated reactor at Yongbyon[7] in the DPRK. The Agency's analysis of a photograph of the bombed building that was provided to the Agency by a Member State corroborates the allegation that Syria attempted to conceal the features of the building's configuration by the addition of wall and roof sections.

14. Analysis of imagery provided by two Member States, taken shortly after the building was destroyed, indicates that internal features of the building correspond to a large central hall, a

[6] The assessment of the dimensions of the destroyed building takes into account the considerable portion of the building that was constructed below ground level.

[7] Officially referred to as the 5 MW(e) Experimental Nuclear Power Plant Number 1.

cylindrical biological shield, a containment structure, heat exchanger shielding structures and a spent fuel pond; all of which would be required for a reactor.[8] The Agency procured a radar image of the building taken shortly after its destruction. Within the limits of the resolution, the image is consistent with those provided to the Agency by the two Member States.

15. The imagery of the destroyed building showed that the feature interpreted as being a containment structure had similar dimensions, shape and layout to other known reactors of the type alleged, and the overall size of the building was sufficient to house the equipment needed for such a nuclear reactor. Photographs of a reactor vessel at the Dair Alzour site released by a Member State simultaneously with the publication of the allegations are not inconsistent with the Agency's assessment of the dimensions of the containment structure. Based on all the information available to the Agency, including the Agency's analysis of these photographs, it is estimated that the reactor core had 843 fuel channels and 79 access ports, and, depending on the heat transfer characteristics of the fuel, the reactor may have had a thermal power of 25 MW or higher.

16. During the June 2008 Agency visit, Syria stated that some equipment which remained functional after the bombing had been removed from the destroyed building. Satellite imagery provided by a Member State confirms Syria's efforts to recover equipment and material from the destroyed building prior to its complete demolition and burial. The efforts included the covering of areas of the destroyed building which may have served to conceal features of the facility during the process. A significant fraction of material and equipment had been removed from the site before the remainder was demolished and buried in the seven weeks following the bombing.

B.2. Site Infrastructure and Site Suitability

17. Based on satellite imagery and the Agency's observations made during the June 2008 visit, the Agency has assessed that the configuration and capacity of the infrastructure at the site prior to the destruction of the building were consistent with the cooling requirements of a 25 MW(th) nuclear reactor. Syria claims that the pumps at the river pump house (RPH) and the Dair Alzour site pump house (SPH) comprised a staged pumping system to supply river water to the civilian water treatment facility (WTF) located approximately 5 km to the east of the Dair Alzour site. Syria's claims in this respect are not supported by the Agency's assessment (see Figure 1 below). Factors considered in the Agency's assessment include:

- Before the destruction of the building, the river water pumping system had the necessary pipes to supply the building with river water. A pipe ran from the building to a point downstream from the RPH. This configuration was consistent with the supply of cooling water to a reactor and the return of water to the river;
- The observed pumping capacity was adequate for cooling 25 MW of thermal power. Additionally, the stated function of the destroyed building (i.e. missile related) would not require connection to the observed river water pumping capacity;
- Before the destruction of the building, the river water pumping system's output was not connected to the WTF; and

[8] The Agency notes that there is a variety in the configuration of known examples of this type of reactor, some with partial underground construction, cooling without cooling towers, different core sizes and different placement of spent fuel ponds. The configuration of the destroyed building falls within this variety of configurations.

- After the destruction of the building, Syria reconfigured the pumping infrastructure to remove sections of the return pipe and to install a new large diameter water pipe connection from the SPH to the WTF.

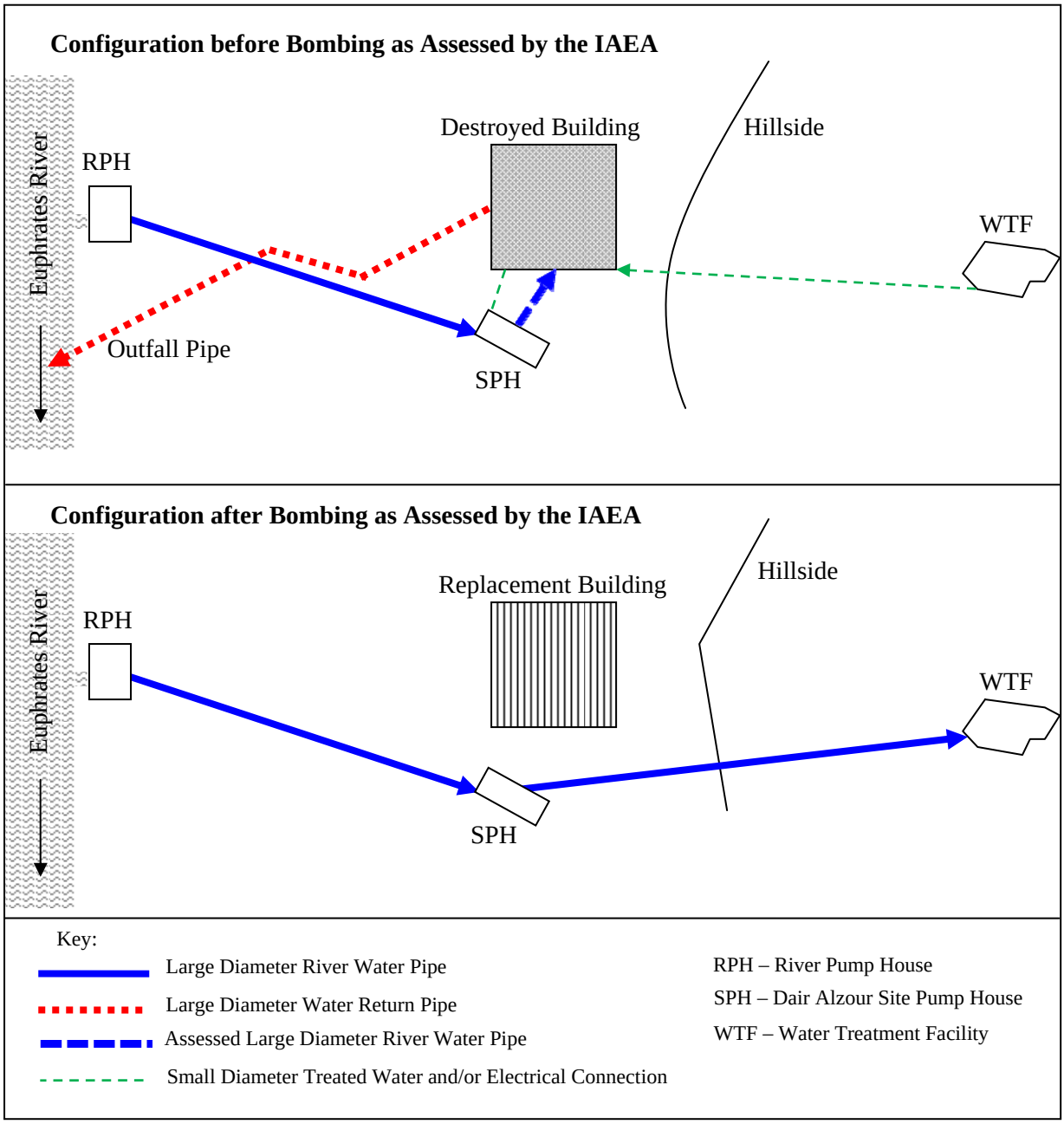

Figure 1. Key infrastructure configurations before bombing and after reconfiguration (not to scale).

18. In contrast to Syria's statements concerning insufficient electricity supplies in the area, the site infrastructure included buried high voltage power distribution and transformer equipment. At the time of the Agency's June 2008 visit, the Agency observed electrical infrastructure and the operation of all the river water pumps at the RPH and SPH. The combined electrical load of the pumps represents a significant fraction of the total electrical power requirement for operation of a reactor of the alleged type. Therefore, the Agency has assessed that the electrical infrastructure at the site was possibly sufficient to meet the needs of such a nuclear reactor.

19. Based on the available information, including 1994 AECS seismology data centred on the Dair Alzour site and 2002 geology data concerning the Dair Alzour region, the site has a number of other features which add to its suitability for the construction and operation of a nuclear reactor. These features of the site include a relatively stable geological platform on which to construct a heavy building, low population density in the area, close proximity to a river for the supply of cooling water, and the availability of services, including treated water and electricity. Such features are normally considered in the site selection process for a nuclear reactor.[9]

B.3. Sampling

20. Assessments of samples taken from the Dair Alzour site indicate a connection to nuclear related activities and the presence of materials that could possibly be used in the construction of gas cooled reactors.

21. The presence of a significant number of particles of anthropogenic natural uranium at the Dair Alzour site indicates a connection to nuclear related activities at the site and increases concerns about possible undeclared nuclear material at the site. The Agency has not been able to determine the origin of the particles. Notwithstanding the lack of response to the Agency's requests for additional information concerning the origin of the particles, the Agency's assessment of Syria's explanation for the presence of the particles is that, based on their morphology and distribution, there is a low probability that they could have originated from the munitions used to destroy the building or by aerial dispersion as suggested by Syria.

22. The Agency has examined the samples retrieved from the Dair Alzour site during the June 2008 visit for indications of the presence of construction materials associated with a gas cooled graphite moderated reactor. The results showed the presence of graphite and stainless steel. The graphite particles were too small to permit an analysis of the purity compared to that normally required for use in a reactor. The types of stainless steel detected at the site were compatible with nuclear use, but not exclusively so.

B.4. Stated Function of the Dair Alzour Site

23. The Agency's assessment of the features observed at the Dair Alzour site prior to the building's bombing and immediately thereafter is that it is unlikely that the purpose of the site was missile assembly, storage or launching. Factors considered in the Agency's assessment included the building's configuration, the construction materials, suitability of openings and hatches for missile handling or launching, the assessment of the water infrastructure described in paragraph 17 above, Syria's declaration of the civilian nature of the water infrastructure on the site and normal missile handling practices.

B.5. Assessment Summary

24. The circumstances relating to the Dair Alzour site are unique, in that the building on the site has been destroyed, the debris from the site has been cleared, several years have now passed, and Syria has not provided the necessary cooperation required by the Agency, as detailed in this report and previous reports. Notwithstanding the loss of substantial information, after considering the initial allegations and Syria's responses thereto, and considering all information available to the Agency, the Agency

[9] IAEA Safety Standards Series, No. NS-R-3, "Site Evaluation for Nuclear Installations"; IAEA Nuclear Energy Series, No. NG-G-3.1, "Milestones in the Development of a National Infrastructure for Nuclear Power".

concludes that the destroyed building was very likely a nuclear reactor[10] and should have been declared by Syria pursuant to Articles 42 and 43 of its Safeguards Agreement and Code 3.1 of the General Part of the Subsidiary Arrangements thereto.

C. Other Activities and Locations Possibly Related to the Dair Alzour Site

25. The Agency does not have sufficient information to provide any assessment concerning the function or operational status of the three other locations that are alleged to be functionally related to the Dair Alzour site.

26. Large quantities of barite were purchased by the AECS between 2002 and 2006. Syria has stated that the material was to be used for shielded radiation therapy rooms at hospitals, without providing any supporting information.[11] However, the end use of the barite as stated in the actual shipping documentation indicates that the material was intended for acid filtration. Additionally, the delivery of the barite was stopped at the request of the AECS after the destruction of the building at the Dair Alzour site and the remaining quantity was left undelivered. Given that barite is frequently used to improve radiation shielding properties of concrete, and the inconsistency concerning the end use of the barite and the involvement of the AECS in its procurement, the Agency cannot exclude the possibility that barite may have been intended for use in the construction of shielded spaces for purposes linked to nuclear fuel cycle related facilities.

D. Activities at Other Locations in Syria

27. As previously reported, particles of anthropogenic uranium of a type not included in Syria's reported inventory were found at the Miniature Neutron Source Reactor (MNSR) in 2008 and in 2009. Syria's initial explanations in June 2009 that the particles had originated either from standard reference materials used in neutron activation analysis or from a shielded transport container were not supported by the results of sampling carried out by the Agency.[12] During the November 2009 inspection, and contrary to its earlier statements, Syria explained that the anthropogenic particles had originated from previously unreported activities performed at the MNSR related to the preparation of tens of grams of uranyl nitrate using yellowcake produced at Homs.[13] At the March 2010 physical

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[10] Since the early years of implementation of comprehensive safeguards by the Agency, it has been recognized that securing absolute proof of compliance (or otherwise) of a State with the terms of its Safeguards Agreement is not possible, and that "reasonable" inferences must be drawn in making conclusions, taking into account all the available information (GOV/2107, para. 3(2); GOV/2863, paras 31 and 32).

[11] GOV/2009/36, para. 14; GOV/2009/56, para. 5.

[12] GOV/2009/75, para. 6.

[13] A pilot plant for the purification of phosphoric acid was constructed and commissioned in 1997 at Homs, Syria, with the support of the United Nations Development Programme and the IAEA. Yellowcake was also produced as a result of the acid purification process. During a July 2004 visit to the Homs phosphoric acid purification plant, Agency inspectors observed some hundreds of kilograms of yellowcake.

inventory verification (PIV), another small quantity of undeclared uranyl nitrate was identified by the Agency at the MNSR. Syria explained that the unreported activities had taken place in a different location in the MNSR than previously declared to the Agency.[14] As reported earlier, Syria submitted inventory change reports in June 2010 for the newly declared material shown to the Agency during the PIV. However, inconsistencies between Syria's declarations and the Agency's findings remained unresolved at that stage.

28. As previously reported, during a meeting on 3 September 2010 to resolve the inconsistencies, agreement was reached with Syria on a plan of action which included, inter alia, actions related to the amounts and use of nuclear material at the MNSR, scientific publications concerning uranium conversion experiments different from those declared by Syria to have occurred at the MNSR, indications of nuclear material under the control of the Waste Management Department of the AECS, and the Agency's requests for access to Homs. Syria's initial response to the plan of action did not provide the necessary clarifications.[15]

29. On 8 March 2011, the arrangements for a visit to Homs by the Agency on 1 April 2011 were finalized. The Agency visited the Phosphoric Acid Pilot Plant and associated locations on that date and performed all of its planned sampling and other activities. The Agency took environmental samples from specified locations and destructive analysis samples from specific batches of the yellowcake by-product of the phosphoric acid purification. The AECS provided some documentation requested by the Agency and made arrangements for relevant research staff to be present for the discussion of the uranium conversion experiments indicated in paragraph 28 above.

30. Analytical results from the samples taken during the visit to Homs are not inconsistent with Syria's statements concerning the origin of the uranyl nitrate prepared during experiments at the MNSR and the origin of the anthropogenic natural uranium particles found at the MNSR.

31. On 19 April 2011, the Agency carried out a PIV at the MNSR where routine verification activities were performed, including the verification of previously undeclared waste material.[16]

32. Based on the information provided by Syria, and the results of the Agency's verification activities, the Agency has concluded that Syria's statements concerning the origin of the anthropogenic uranium particles found at the MNSR are not inconsistent with the Agency's findings. Therefore, the matter will be addressed in the routine implementation of safeguards.

E. Conclusion

33. The Agency regrets that Syria has not cooperated since June 2008 in connection with the unresolved issues related to the Dair Alzour site and the three other locations allegedly functionally related to it. Based on all the information available to the Agency and its technical evaluation of that information, the Agency assesses that it is very likely that the building destroyed at the Dair Alzour site was a nuclear reactor which should have been declared to the Agency. Concerning the three other

[14] GOV/2010/47, para. 10.

[15] GOV/2010/63, paras 10, 11 and 12.

[16] GOV/2010/63, para. 12.

locations, the Agency is unable to provide any assessment concerning their nature or operational status.

34. Concerning the MNSR, Syria has cooperated with the Agency by providing the requested access to Homs. Syria's statements concerning the previously unreported conversion activities at the MNSR and origin of the anthropogenic uranium particles found at the MNSR are not inconsistent with the results of the Agency's verification activities. The matter will be addressed in the routine implementation of safeguards.