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Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)

Report by the Director General

A. Introduction

1. This report of the Director General to the Board of Governors and, in parallel, to the United Nations Security Council (Security Council), is on the Islamic Republic of Iran's (Iran's) implementation of its nuclear-related commitments under the Joint Comprehensive Plan of Action (JCPOA) and on matters related to verification and monitoring in Iran in light of Security Council resolution 2231 (2015).¹ It covers the period since the issuance of the Director General's previous quarterly report.²

2. The estimated cost to the Agency for the implementation of Iran's Additional Protocol and for verifying and monitoring Iran's nuclear-related commitments as set out in the JCPOA is €9.8 million per annum, of which €4.3 million is funded by extrabudgetary contributions.³ As of 21 August 2023, extrabudgetary funding had been pledged sufficient to meet the cost of JCPOA-related activities for the remainder of 2023 and until mid-May 2024.⁴

¹ The background to the matters outlined in this report can be found in previous quarterly reports of the Director General (most recently in GOV/2021/39).

² GOV/2023/24.

³ These figures have been adjusted to reflect current costs and the latest 2023 budget update.

⁴ The additional costs that the Agency has been incurring since 23 February 2021, while Iran has not been implementing its nuclear-related commitments under the JCPOA, will be communicated in due course once they have been assessed.

B. JCPOA Verification and Monitoring Activities

3. Between 16 January 2016 (JCPOA Implementation Day) and 23 February 2021, the Agency verified and monitored Iran's implementation of its nuclear-related commitments in accordance with the modalities set out in the JCPOA,⁵ consistent with the Agency's standard safeguards practices, and in an impartial and objective manner.^{6,7}

4. From 8 May 2019 onwards, however, Iran stopped implementing its nuclear-related commitments under the JCPOA on a step-by-step basis until, on 23 February 2021, it stopped implementing them altogether, including the Additional Protocol (see Annex I). This seriously affected the Agency's JCPOA-related verification and monitoring. The situation was exacerbated in June 2022 by Iran's decision to remove all of the Agency's JCPOA-related surveillance and monitoring equipment.

B.1. Agency monitoring and surveillance equipment

5. As previously reported,⁸ between 21 February 2021 and 8 June 2022, the Agency and Iran agreed that the information collected by the Agency's monitoring and surveillance equipment installed for JCPOA-related activities would continue to be stored, and that the equipment would continue to operate and be able to collect and store further data.

6. As also previously reported,⁹ in early June 2022, at Iran's request, the Agency removed all of its equipment previously installed in Iran for surveillance and monitoring under the JCPOA. In total, 27 cameras, the on-line enrichment monitor (OLEM) at the Fuel Enrichment Plant (FEP) in Natanz and the Flow-rate Unattended Monitoring (FLUM) equipment installed at the Khondab Heavy Water Production Plant (HWPP) were removed by the Agency. All of the equipment was placed in storage at the respective locations under Agency seals, as agreed with the Atomic Energy Organization of Iran (AEOI).

7. Following the Joint Statement of 4 March 2023,¹⁰ the Agency installed surveillance cameras at workshops in Esfahan where centrifuge rotor tubes and bellows are manufactured but without having access to the data recorded by those cameras (see GOV/2023/26, para. 21).

8. In the event of a full resumption of implementation by Iran of its nuclear-related commitments under the JCPOA, the Agency would not be able to re-establish continuity of knowledge in relation to the production and inventory of centrifuges, rotors and bellows, heavy water and uranium ore concentrate (UOC). Instead, the Agency would need to establish a new baseline in relation to such production and inventories. The Agency is aware that it would face major challenges in doing so, including the difficulty in confirming the accuracy of any declaration by Iran of its production of centrifuges, rotors and bellows, heavy water and UOC for the period when no verification and monitoring equipment had been in operation. In order to try to fill the gaps in its knowledge and minimize the margin of error, the development of specific arrangements with Iran would be indispensable.

⁵ Including the clarifications referred to in para. 3 of GOV/2021/39.

⁶ GOV/2016/8, para. 6.

⁷ Note by the Secretariat, 2016/Note 5.

⁸ GOV/2021/10, Annex I; GOV/INF/2021/31, para. 4; GOV/INF/2021/42, para. 5; GOV/INF/2021/47.

⁹ GOV/INF/2022/14, para. 5.

¹⁰ GOV/2023/9, Annex.

B.2. Activities Related to Heavy Water and Reprocessing

9. In May 2023, the Agency received an updated design information questionnaire (DIQ) for the Khondab Heavy Water Research Reactor (KHRR)¹¹ which showed that the reactor power of 20 MW(th), the fuel enrichment and the preliminary core design were consistent with the “Fundamental Principles” and “Preliminary Characteristics” for the re-design of the research reactor.¹²

10. On 19 August 2023, the Agency confirmed that Iran had not pursued the construction of KHRR based on its original design.¹³ On the same day, the Agency also confirmed that the reactor vessel was neither installed nor present at the facility and that there had been no further progress in the installation of other essential equipment of the facility.¹⁴ Civil construction work was ongoing on all floors of the reactor building. Iran had informed the Agency that the commissioning of KHRR was planned in 2023 using the IR-20 dummy fuel assemblies and that the primary circuit would be commissioned in August 2023.¹⁵ However, the Agency did not observe any indication that the primary circuit had been commissioned. Nor did Iran inform the Agency of any change to the abovementioned plan for the commissioning of the reactor.

11. On 16 August 2023, the Agency also verified that Iran had not produced or tested natural uranium pellets, fuel pins or fuel assemblies specifically designed for the former IR-40 Reactor as originally designed. All existing natural uranium pellets and fuel assemblies have remained in storage under continuous Agency containment and surveillance measures (paras 3 and 10).¹⁶

12. Since 23 February 2021, Iran has neither informed the Agency about the inventory of heavy water in Iran and the production of heavy water at the HWPP,¹⁷ nor allowed the Agency to monitor the quantities of Iran’s heavy water stocks and the amount of heavy water produced at the HWPP (para. 15).¹⁸ As reported previously, no monitoring has taken place since 11 June 2022, when the FLUM equipment at the HWPP was removed.

13. Iran has not carried out activities related to reprocessing at the Tehran Research Reactor (TRR), the Jaber Ibn Hayan Multipurpose Laboratory (JHL) and the Molybdenum, Iodine and Xenon

¹¹ As indicated previously (GOV/2017/24, footnote 10), Iran has changed the name of the facility from the IR-40 Reactor to the Khondab Heavy Water Research Reactor.

¹² As stipulated in ‘Attachment: Arak conceptual design’ in Annex I of the JCPOA.

¹³ The calandria was removed from the reactor and rendered inoperable during preparation for Implementation Day and has been retained in Iran (GOV/INF/2016/1, Arak Heavy Water Research Reactor, paras 3(ii) and 3(iii)).

¹⁴ GOV/2022/62, para 12.

¹⁵ The IR-20 dummy fuel assemblies have been already manufactured based on an Iranian design.

¹⁶ Unless otherwise indicated, the paragraph references in parentheses throughout Sections B and C of this report correspond to the paragraphs of ‘Annex I – Nuclear-related measures’ of the JCPOA.

¹⁷ In June 2017, Iran informed the Agency that the “maximum annual capacity of the Heavy Water Production Plant (HWPP) is 20 Tons” (see GOV/2017/35, footnote 12).

¹⁸ Based on its analysis of commercially available satellite imagery, the Agency assessed that the HWPP continued to operate during the reporting period.

Radioisotope Production (MIX) facility or at any of the other facilities it has declared to the Agency (paras 18 and 21).^{19,20}

B.3. Activities Related to Enrichment and Fuel

14. Iran has continued the enrichment of UF₆ at FEP and the Pilot Fuel Enrichment Plant (PFEP) at Natanz, and at the Fordow Fuel Enrichment Plant (FFEP) at Fordow,²¹ and to conduct enrichment activities that are not in line with its long-term enrichment and enrichment R&D plan, as provided to the Agency on 16 January 2016 (para. 52). As previously reported, Iran has:

- enriched UF₆ up to 5% U-235 since 8 July 2019²² (para. 28);
- enriched UF₆ up to 20% U-235 since 4 January 2021;²³ and
- enriched UF₆ up to 60% U-235 since 17 April 2021.

15. Since 23 February 2021, while the Agency has had regular access to FEP, PFEP and FFEP, it has not been able to perform daily access upon request (paras 51 and 71).

B.3.1. FEP

16. As previously reported,²⁴ in addition to the 30 cascades of IR-1 centrifuges provided for under the JCPOA (para. 27),²⁵ Iran intends to install another 42 cascades at FEP – six of IR-1 centrifuges, 21 of IR-2m centrifuges, 12 of IR-4 centrifuges, and three of IR-6 centrifuges. Iran also intends “to commission B1000 building with capacity of 8 enrichment units”.^{26,27} On 12 July 2023, Iran informed the Agency that it intended to “install some infrastructure” in one enrichment unit that was currently empty. On 8 August 2023, the Agency verified that the installation of cascade sub-headers in this enrichment unit had commenced.

17. On 22 August 2023, the Agency verified at FEP that 36 IR-1 cascades, 21 IR-2m cascades, five IR-4 cascades and three IR-6 cascades were installed, of which 36 IR-1 cascades, eight IR-2m cascades, three IR-4 cascades and three IR-6 cascades were being fed with natural UF₆ to produce UF₆ enriched up to 5% U-235. On the same day, the Agency verified that twelve IR-2m cascades and two IR-4 cascades had yet to be fed with UF₆; the installation of one IR-4 cascade was ongoing; sub-headers in

¹⁹ In an updated DIQ for the MIX facility, dated 19 April 2023, Iran confirmed its plan to extract Mo-99, I-131 and Xe-133 from irradiated targets of natural uranium and uranium enriched up to 20% U-235 (GOV/2021/28, footnote 25). The processes used by Iran are not relevant for reprocessing.

²⁰ In an updated DIQ for the JHL facility, dated 21 May 2022, Iran confirmed its research and development (R&D) plan to extract Caesium (Cs)-137 from irradiated targets. Iran also informed the Agency of its plan to extract Promethium (Pm)-147, Cerium (Ce)-141 and Ce-144 from irradiated targets or from Mo-99 separation process waste and irradiated targets. The processes used by Iran are not relevant for reprocessing.

²¹ Under the JCPOA, “[f]or 15 years the Natanz enrichment site will be the sole location for all of Iran’s uranium enrichment related activities including safeguarded R&D” (para. 72).

²² GOV/INF/2019/9, para. 3.

²³ GOV/INF/2021/2, para. 5.

²⁴ GOV/INF/2022/24, paras 2 and 3.

²⁵ In December 2022 (GOV/2022/39, para.16), Iran completed the installation of 120 additional IR-1 centrifuges in some of these 30 IR-1 cascades.

²⁶ GOV/INF/2022/24, para. 3.

²⁷ Part of Hall B within Building B1000 is used to store excess centrifuges and infrastructure removed from the three enrichment plants, as required under the JCPOA. From previous design information provided to the Agency by Iran, Building B1000 has the same general design as Building A1000, according to which each enrichment unit can accommodate up to 18 cascades of centrifuges.

the remaining IR-4 cascades were installed; installation of sub-headers in two additional cascades was ongoing; and the planned installation of additional enrichment units in the B1000 building had yet to start.

18. Iran has estimated²⁸ that, from 13 May 2023 to 18 August 2023, 1746.3 kg of UF₆ enriched up to 5% U-235 were produced, either from UF₆ enriched up to 2% U-235²⁹ or from natural UF₆.

19. Since 23 February 2021, the Agency has not had access to the data and recordings collected by its surveillance equipment installed at FEP to monitor any withdrawals by Iran of IR-1 centrifuges from those held in storage for the replacement of damaged or failed IR-1 centrifuges installed at FEP. Since 10 June 2022, when this surveillance equipment was removed, no such data and recordings exist (para. 29.1).

B.3.2. PFEP

20. In an updated DIQ in April 2023, Iran informed the Agency that it planned to start the commissioning of six (identified as lines A–F) of the 18 R&D production lines under installation in Building A1000.³⁰ Each R&D production line would be dedicated to R&D activities, with or without the accumulation of product, using full cascades of up to 174 IR-4 or IR-6 centrifuges, small and intermediate cascades of any type of centrifuge or single centrifuges of any type. UF₆ enriched up to 5% U-235 could be produced from these activities.

21. On 27 August 2023, the Agency verified at PFEP that the installation of the aforementioned 18 R&D production lines was progressing and the installation of infrastructure for feeding and withdrawing UF₆ had started. On the same day, the Agency also verified that the installation of centrifuges in this area had not progressed beyond the five IR-4 centrifuges in Line A and 20 IR-6s centrifuges in Line B reported previously.

22. Activities involving R&D lines 1–6 in the original area of PFEP were as follows (paras 32–42):

- **R&D lines 1, 2 & 3:** On 27 August 2023, the Agency verified that Iran has continued to accumulate uranium enriched up to 2% U-235 through feeding natural UF₆ into small and intermediate cascades of up to: 18 IR-1 centrifuges; 87 IR-2m centrifuges; 20 IR-4 centrifuges; six IR-5 centrifuges and 18 IR-5 centrifuges; ten IR-6 centrifuges and 19 IR-6 centrifuges; and 20 IR-6s centrifuges. The following single centrifuges were being tested with natural UF₆ but not accumulating enriched uranium: six IR-2m centrifuges; six IR-4 centrifuges; one IR-5 centrifuge; two IR-6 centrifuges; one IR-7 centrifuge; one IR-8 centrifuge; one IR-8B centrifuge; and one IR-9 centrifuge.
- **R&D production lines 4, 5 and 6:** On 27 August 2023, the Agency verified that Iran was feeding UF₆ enriched up to 5% U-235 into two interconnected cascades in R&D production lines 4 and 6,³¹ comprising up to 164 IR-4 and up to 164 IR-6 centrifuges, respectively, to produce UF₆ enriched up to 60% U-235 and that the tails produced from line 6 were being fed

²⁸ Since 23 February 2021, as the Agency has only been able to verify Iran's production of enriched UF₆ at FEP once the enriched uranium product has been removed from the process, the quantity of nuclear material that remains in the process can only be estimated. Out of the overall production of UF₆ enriched up to 5% U-235 at FEP since 16 February 2021, the Agency has verified 10140.1 kg of UF₆ enriched up to 5% U-235.

²⁹ UF₆ enriched up to 2% U-235 was fed for a short period. Iran estimated that out of the 3358.5 kg of UF₆ enriched up to 2% U-235 fed, 5.5 kg of UF₆ were "dumped" (i.e. not used for the enrichment of UF₆ up to 5% U-235 but remaining in the process). This amount is included in the inventory of low enriched uranium (LEU) at FEP pending its removal from the process and verification by the Agency.

³⁰ GOV/INF/2020/15, para. 2.

³¹ The cascades in lines 4, 5 and 6 were being operated as described in GOV/2022/39, para. 24.

into a cascade of 164 IR-4 and three IR-6 centrifuges in R&D production line 5 to produce UF₆ enriched up to 5% U-235.

23. Iran has estimated that at PFEP from 13 May 2023 to 18 August 2023:

- 208.9 kg of UF₆ enriched up to 2% U-235 were produced in R&D lines 1, 2 and 3;
- 345.6 kg of UF₆ enriched up to 5% U-235 were fed into cascades installed in R&D production lines 4, 5 and 6;
- 166.2 kg of UF₆ enriched up to 5% U-235 were produced in R&D production line 5;
- 172.0 kg of UF₆ enriched up to 2% U-235 were accumulated as tails from R&D production line 5 and from R&D production lines 4 and 6;³² and
- 7.4 kg of UF₆ enriched up to 60% U-235 were produced in R&D production lines 4 and 6.³³⁻³⁴

B.3.3. FFEP

24. As previously reported,³⁵ Iran began to enrich UF₆ in one wing (Unit 2) of FFEP in November 2019. Subsequently, Iran used six IR-1 cascades (configured as individual cascades or as three sets of two interconnected cascades) and two IR-6 cascades (operated as individual cascades) for the production of UF₆ enriched up to 5% U-235 and UF₆ enriched up to 20% U-235.

25. In November 2022, Iran informed the Agency that it intended to install a total of 14 additional IR-6 cascades at FFEP – six to replace the IR-1 cascades already operating in one wing (Unit 2) and eight in the second wing (Unit 1),^{36,37} which had remained dismantled since JCPOA Implementation Day.³⁸ Iran also described a new mode of operation,³⁹ involving the use of the two currently installed IR-6 cascades⁴⁰ in an interconnected mode to produce UF₆ enriched up to 60% U-235 from UF₆ enriched up to 5% U-235 as feed material. All other cascades, including those yet to be installed, would either produce UF₆ enriched up to 20% U-235 from UF₆ enriched up to 5% U-235 or would be used to enrich natural uranium up to 5% U-235.⁴¹

26. In November 2022, the Agency verified that Iran had started the installation of Unit 1 at FFEP.⁴² The Agency also verified that Iran had implemented the aforementioned new mode of production for

³² The combined tails from line 5 and tails from lines 4 and 6 have an estimated enrichment below 2% U-235.

³³ From mid-June 2023 onwards, Iran has reduced by approximately two-thirds the production rate of UF₆ enriched up to 60% U-235.

³⁴ Out of the overall production at PFEP using R&D production lines 4, 5 and 6, since 14 April 2021, the Agency verified that the following amounts of UF₆ had been produced: 1736.7 kg of UF₆ enriched up to 5% U-235, 25.1 kg of UF₆ enriched up to 20% U-235 and 142.7 kg of UF₆ enriched up to 60% U-235.

³⁵ GOV/2019/55, paras 14 and 15.

³⁶ GOV/INF/2022/24, para. 8.

³⁷ As previously reported (GOV/2023/8, para.37), Iran later clarified that the eight cascades planned in Unit 1 could contain either IR-1 or IR-6 centrifuges.

³⁸ 16 January 2016.

³⁹ See GOV/2022/6, para. 28.

⁴⁰ One of these cascades has modified sub-headers that would enable Iran to change the operating configuration of the cascade more easily.

⁴¹ GOV/INF/2022/24, para. 8.

⁴² GOV/INF/2022/24, para. 9.

enriching UF₆ up to 60% U-235.⁴³ The Agency then increased the frequency and intensity of its verification activities at FFEP.⁴⁴

27. In January 2023, the Agency detected at FFEP that the two IR-6 cascades were interconnected in a way that was substantially different from the design information declared by Iran in the most recently updated DIQ.^{45,46} Consequently, in February 2023, the Agency informed Iran of its intention to further increase the frequency and intensity of its verification activities at FFEP in accordance with the Safeguards Agreement, to which Iran agreed. Later in February 2023, Iran provided the Agency with an updated DIQ for FFEP which the Agency then verified.

28. In January 2023, the Agency found high enriched uranium (HEU) particles containing up to 83.7% U-235. However, the Agency accepted Iran's explanation for the origin of these particles and found no indication of the accumulation and collection of nuclear material enriched above 60% U-235 at FFEP. Following the annual physical inventory verification (PIV) conducted at the end of April - beginning of May 2023, and the initial results of the subsequent material balance evaluation, the Agency found no indication of the diversion of declared nuclear material.

29. On 6 June 2023, the Agency verified that Iran had reverted to using the previous mode of production of UF₆ enriched up to 60% U-235.⁴⁷

30. On 26 August 2023, the Agency verified in Unit 1 that installation of the necessary infrastructure for the planned eight new cascades, containing either IR-1 or IR-6 centrifuges, was ongoing. Installation of centrifuges had yet to begin. On the same day, the Agency verified in Unit 2 that Iran was continuing to feed UF₆ enriched up to 5% U-235 into: up to 1044 IR-1 centrifuges in three sets of two interconnected cascades to enrich UF₆ up to 20% U-235; and into one set of two interconnected cascades of 166 IR-6 centrifuges to enrich UF₆ up to 60% U-235.

31. Iran has estimated that from 13 May 2023 to 18 August 2023:

- 13.2 kg of UF₆ enriched up to 60% U-235 were produced;^{48,49}
- 63.3 kg of UF₆ enriched up to 20% U-235 were produced;⁵⁰
- 643.7 kg of UF₆ enriched up to 5% U-235 were fed into cascades at FFEP;⁵¹ and

⁴³ Under this way of operating, it was the IR-6 cascade without the modified sub-headers in which the product was enriched up to 60% U-235.

⁴⁴ GOV/INF/2023/1, para. 9.

⁴⁵ GOV/INF/2023/1, para. 4; GOV/2023/8, para. 31.

⁴⁶ Under this way of operating, it was the IR-6 cascade with the modified sub-headers in which the UF₆ product was enriched up to 60% U-235.

⁴⁷ Under this way of operating, it is the IR-6 cascade without the modified sub-headers in which the product is enriched up to 60% U-235 (GOV/2023/8, para. 29).

⁴⁸ From early June 2023 onwards, Iran has reduced by approximately two-thirds the production rate of UF₆ enriched up to 60% U-235.

⁴⁹ On 18 August 2023, the Agency verified that 56.0 kg of UF₆ enriched up to 60% U-235 had been produced since 21 November 2022.

⁵⁰ Out of the overall production of UF₆ enriched up to 20% U-235 at FFEP since 16 February 2021, the Agency verified 747.8 kg of UF₆ enriched up to 20% U-235.

⁵¹ Iran estimated that 4.9 kg of UF₆ enriched up to 5% U-235 were “dumped” (i.e. not used for the enrichment of UF₆ up to 20% U-235 but remaining in the process). This amount is included in the inventory of LEU at FFEP. Upon its removal from the process it will be verified by the Agency.

- 562.4 kg of UF₆ enriched up to 2% U-235 were accumulated as tails.

B.3.4. FFPF

32. On 30 May 2023, the Agency verified the receipt at FFPF of 64.5 kg of uranium in the form of UF₆ enriched up to 20% U-235 from PFEP.

33. On July 2023, the Agency verified that the new control fuel assembly, containing 1.06 kg of uranium in the form of U₃O₈ enriched up to 20% U-235, and the new standard fuel assembly,⁵² containing 1.44 kg of uranium in the form of U₃O₈ enriched up to 20% U-235, both fabricated out of the fuel items received from the Russian Federation, had been shipped to TRR under Agency seals on 15 July 2023.⁵³

34. On 14 August 2023, the Agency verified that no progress had been made regarding the remaining two stages of the process⁵⁴ for the production of UF₄ from UF₆. Installation of the equipment for the first stage of the process had been completed but had yet to undergo testing using nuclear material. Since the Director General's previous quarterly report, Iran has not produced any uranium metal.

35. On 19 July 2023, the Agency verified the receipt at FFPF of 30.92 kg of uranium in the form of UF₆ enriched up to 60% U-235 from PFEP.

36. On 20 August 2023, the Agency verified at the storage area of FFPF a total of 100.52 kg of uranium in the form of UF₆ enriched up to 60% U-235 and 454.64 kg of uranium in the form of UF₆ enriched up to 20% U-235.⁵⁵

B.3.5. UCF

37. In March 2022, the Agency verified at the Uranium Conversion Facility (UCF) the dissolution of 302.7 kg of natural uranium, as declared by Iran, in the form of solid waste and items of uranium metal transferred from the Jaber Ibn Hayan Multipurpose Laboratory (JHL). A discrepancy in the amount of nuclear material verified by the Agency compared to the amount declared by Iran needs to be resolved (for more details see GOV/2023/43, Section D.1).

38. As of 28 August 2023, the Agency verified that no nuclear material had been introduced into the production area of the UCF at Esfahan, where installation of equipment for the production of uranium metal had been completed and which was ready to operate.⁵⁶

B.3.6. TRR

39. Since the previous quarterly report, the Agency has verified that Iran has not irradiated any LEU targets at TRR. On 19 August 2023, the Agency verified the receipt of one control fuel assembly and one standard fuel assembly from FFPF.

40. As of 19 August 2023, the Agency verified that all previously irradiated TRR fuel elements in Iran had a measured dose rate of no less than 1 rem/hour (at one metre in air), except one control fuel

⁵² A TRR standard fuel assembly is made of 19 fuel plates while a control fuel assembly is made of 14 fuel plates.

⁵³ GOV/2023/24, para. 45.

⁵⁴ GOV/INF/2021/3, para. 5.

⁵⁵ All this nuclear material is under Agency containment and surveillance.

⁵⁶ GOV/2023/24, para. 49.

assembly.⁵⁷ The Agency also verified that all of the following targets, which had been irradiated, were still in the TRR reactor pond:

- 264 HEU targets, containing a total of 1.6 kg of uranium enriched up to 60% U-235 in the form of U₃O₈;
- 90 LEU targets, containing 1.36 kg uranium enriched up to 20% U-235 in the form of U₃O₈; and
- three LEU targets containing 0.07 kg of uranium enriched up to 20% U-235 in the form of uranium silicide.

On the same day, the Agency observed that the two TRR uranium silicide fuel plates were still being irradiated.⁵⁸

41. On 19 August 2023, the Agency verified that 14 fresh TRR standard fuel assemblies and two control fuel assemblies, previously received from FFPF, had yet to be irradiated.

B.3.7. EUPP

42. On 22 August 2023, the Agency observed at the Enriched Uranium Powder Plant (EUPP) at Esfahan that there was progress with the installation of equipment for the first stage of the process for converting UF₆ to UO₂ using the ‘integrated dry route’.⁵⁹ The main process reactor had yet to be installed.

B.3.8. FMP

43. On 22 August 2023, the Agency verified at the Fuel Manufacturing Plant (FMP) at Esfahan 166.1 kg of uranium in the form of UO₂ powder and fuel pellets and fuel pins enriched up to 3.5% U-235, some of which is intended for KHRR.⁶⁰

B.4. Centrifuge Manufacturing, Mechanical Testing and Component Inventory

44. Between 23 February 2021 and 9–11 June 2022, the Agency did not have access to the data and recordings collected by its surveillance equipment installed to monitor Iran’s mechanical testing of centrifuges as specified in the JCPOA, and since 9–11 June 2022, when this surveillance equipment was removed, no such monitoring has taken place (paras 32 and 40).

45. Since 23 February 2021, Iran has no longer provided declarations to the Agency of its production and inventory of centrifuge rotor tubes, bellows and rotor assemblies, nor has it permitted the Agency to verify the items in the inventory (para. 80.1). Previously, the centrifuge component manufacturing equipment declared by Iran had also been used for activities beyond those specified in the JCPOA, such as the manufacturing of centrifuges installed in the cascades described above.

46. Since 23 February 2021, the Agency has not had access to the data and recordings collected by its surveillance equipment installed to monitor the manufacturing of rotor tubes and bellows, and since

⁵⁷ The amount of uranium in the irradiated fuel assembly has been included in the enriched uranium stockpile.

⁵⁸ GOV/2022/24, para. 29 and GOV/2022/39, para. 40.

⁵⁹ The integrated dry route is a process used for the conversion of UF₆ to UO₂F₂ powder and then UO₂F₂ powder to UO₂ powder.

⁶⁰ According to Iran, the remainder is intended for a new critical assembly under construction at the AEOI site in Tehran (see GOV/2017/48, para. 25).

9–11 June 2022, when this surveillance equipment was removed, no such monitoring has taken place. Consequently, the Agency has been unable to verify whether Iran has produced any IR-1 centrifuges, including IR-1 centrifuge rotor tubes, bellows or rotor assemblies to replace those that have been damaged or failed (para. 62) and has no information on the inventory of rotor tubes, bellows and rotor assemblies relevant to any type of centrifuge manufactured in Iran. Nor can the Agency confirm the extent to which Iran is continuing to manufacture centrifuge rotor tubes using carbon fibre that had not been subject to previous continuous Agency containment and surveillance measures.^{61,62}

47. Following the Joint Statement of 4 March 2023,⁶³ the Agency installed surveillance cameras at workshops in Esfahan where centrifuge rotor tubes and bellows are manufactured but without having access to the data recorded by those cameras (see GOV/2023/43, para. 17).

B.5. Enriched Uranium Stockpile

48. Since 1 July 2019, the Agency has verified that Iran's total enriched uranium stockpile has exceeded 300 kg of UF₆ enriched up to 3.67% U-235 (or the equivalent in different chemical forms) (para. 56).⁶⁴ The quantity of 300 kg of UF₆ corresponds to 202.8 kg of uranium.⁶⁵

49. Since 16 February 2021, the Agency has not been able to verify Iran's total enriched uranium stockpile⁶⁶ precisely on any given day, needing to rely instead on a small proportion of the total being based on Iran's estimates. Based on the information provided by Iran as described in the previous paragraphs, the Agency has estimated that, as of 19 August 2023, Iran's total enriched uranium stockpile was 3795.5 kg. This figure represents a decrease of 949.0 kg since the previous quarterly report. The estimated stockpile comprised: 3441.3 kg of uranium in the form of UF₆; 206.9 kg of uranium in the form of uranium oxide and other intermediate products; 54.0 kg of uranium in fuel assemblies and rods; and 93.3 kg of uranium in liquid and solid scrap.

50. As of 19 August 2023, the estimated total enriched uranium stockpile in the form of UF₆ of 3441.3 kg comprised:

- 833.0 kg of uranium enriched up to 2% U-235 (–1626.6 kg since the previous quarterly report);
- 1950.9 kg of uranium enriched up to 5% U-235 (+610.7 kg);
- 535.8 kg of uranium enriched up to 20% U-235 (+64.9 kg); and
- 121.6 kg of uranium enriched up to 60% U-235 (+7.5 kg).⁶⁷

The changes to the inventory of enriched uranium since the previous report are summarised in Annex 2.

51. As of 19 August 2023, the Agency verified that the inventory of uranium enriched up to 20% U-235 in forms other than UF₆ was 33.0 kg, consisting of 27.2 kg of uranium in the form of fuel

⁶¹ GOV/INF/2019/12, para. 6.

⁶² Decision of the Joint Commission of 14 January 2016 (INFCIRC/907).

⁶³ GOV/2023/9, Annex.

⁶⁴ GOV/INF/2019/8, paras 2 and 3.

⁶⁵ Considering the standard atomic weight of uranium and fluorine.

⁶⁶ Comprising enriched uranium produced at FEP, PFEP and FFEP and used as feed material at PFEP and FFEP.

⁶⁷ During the reporting period, the Agency verified that Iran mixed 6.4 kg of uranium enriched up to 60% U-235 (contained in two 5B cylinders) with 15.8 kg of uranium enriched up to 5% U-235 to produce 22.2 kg of uranium enriched up to 20% U-235.

assemblies,⁶⁸ 5.1 kg of uranium in the form of intermediate products, and 0.7 kg of uranium in the form of liquid and solid scrap.

52. As of 19 August 2023, the Agency verified that the inventory of uranium enriched up to 60% U-235 in forms other than UF₆ remains as 2.0 kg of uranium as previously reported, consisting of 1.6 kg of uranium in the form of mini-plates,⁶⁹ verified at TRR on 19 August 2023, and 0.4 kg of uranium in the form of liquid and solid scrap, verified at FPPF on 19 August 2023.

C. Transparency Measures

53. Between 23 February 2021 and 10 June 2022, the Agency did not have access to the data from its on-line enrichment monitors and electronic seals, or access to the measurement recordings registered by its installed measurement devices. On 10 June 2022 this monitoring equipment was removed and placed in storage at the respective locations under Agency seals, and therefore ceased operation.

54. Since 23 February 2021, the Agency has not been provided with any information relating to the transfer to UCF of UOC produced in Iran or obtained from any other source (paras 68 and 69) and has not had access to the data and recordings collected by its surveillance equipment installed to monitor the production of UOC. Since 11 June 2022, this surveillance equipment has not been in operation and so no such data and recordings exist.

55. The Agency has stressed that the de-designation of experienced Agency inspectors and denials of visas for Agency officials dealing with Iran run counter to the co-operative relationship that should prevail between the Agency and Iran, and, more specifically, for the renewed positive approach expressed in the first paragraph of the Joint Statement of 4 March 2023. Iran has continued to provide proper working space for the Agency at nuclear sites and facilitated the use of working space at locations near nuclear sites in Iran (para. 67.2).

D. Other Relevant Information

56. Since 23 February 2021, Iran has no longer provisionally applied the Additional Protocol to its Safeguards Agreement in accordance with Article 17(b) of the Additional Protocol (para. 64). Consequently, for more than two and a half years Iran has not provided updated declarations and the Agency has not been able to conduct any complementary access under the Additional Protocol to any sites and locations in Iran.

57. In addition, Iran is still not implementing modified Code 3.1 of the Subsidiary Arrangements to its Safeguards Agreement (para. 65). Implementation of modified Code 3.1 is a legal obligation for Iran under the Subsidiary Arrangements to its Safeguards Agreement which, in accordance with Article 39 of Iran's Safeguards Agreement, cannot be modified unilaterally and there is no mechanism in the

⁶⁸ The Agency verified that four fuel assemblies, containing 5.5 kg of uranium enriched up to 20% U-235 had been loaded in the reactor core to be used as fuel for the reactor operation. The dose rate of these fuel assemblies exceeds the level established by the Joint Commission under the JCPOA, thus the corresponding amount of enriched uranium has been removed from the enriched uranium stockpile.

⁶⁹ Irradiated at TRR and stored in the reactor pool.

Safeguards Agreement for the suspension of implementation of provisions agreed to in the Subsidiary Arrangements.

58. During this reporting period, the Agency was unable to verify Iran's other JCPOA nuclear-related commitments, including those set out in Sections D, E, S and T of Annex I of the JCPOA.

59. During this reporting period, the Agency has not attended any meetings of the Procurement Working Group of the Joint Commission (JCPOA, Annex IV – Joint Commission, para. 6.4.6).

E. Summary

60. The Agency's JCPOA-related verification and monitoring has been seriously affected by Iran's decision to stop implementing its nuclear-related commitments under the JCPOA. The situation was exacerbated by Iran's subsequent decision to remove all of the Agency's JCPOA-related surveillance and monitoring equipment.

61. The Agency has not been able to perform JCPOA verification and monitoring activities in relation to the production and inventory of centrifuges, rotors and bellows, heavy water and UOC for more than two and a half years. In the event of a full resumption of implementation by Iran of its nuclear-related commitments under the JCPOA, the Agency would not be able to re-establish continuity of knowledge in relation to the production and inventory of centrifuges, rotors and bellows, heavy water and UOC. Instead, the Agency would need to establish a new baseline in relation to such production and inventories. This would pose major challenges, including the difficulty in confirming the accuracy of any revised declarations by Iran for the period when no verification and monitoring equipment had been in operation.

62. Iran's decision to remove all of the Agency's equipment previously installed in Iran for JCPOA-related surveillance and monitoring activities has also had detrimental implications for the Agency's ability to provide assurance of the peaceful nature of Iran's nuclear programme.

63. It is also more than two and a half years since Iran stopped provisionally applying its Additional Protocol and, therefore, since it provided an updated declaration and the Agency was able to conduct complementary access to any sites and locations in Iran.

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

Annex I

Impact on Agency verification and monitoring resulting from Iran stopping implementation of its nuclear-related commitments as envisaged in the JCPOA⁷⁰

The Agency is unable to:

Monitor or verify Iranian production and inventory of heavy water	Para. 14 and para. 15
Verify that use of shielded cells, referred to in the decision of the Joint Commission of 14 January 2016 (INFCIRC/907), are being operated as approved by the Joint Commission	Para. 21
Monitor and verify that all centrifuges and associated infrastructure in storage remain in storage or have been used to replace failed or damaged centrifuges	Para. 70
Perform daily access upon request to the enrichment facilities at Natanz and Fordow	Para. 71 and para. 51
Verify in-process material at enrichment facilities to enable an accurate stockpile of enriched uranium to be calculated	Para. 56
Verify whether or not Iran has conducted mechanical testing of centrifuges as specified in the JCPOA	Para. 32 and para. 40
Monitor or verify Iranian production and inventory of centrifuge rotor tubes, bellows or assembled rotors	Para. 80.1
Verify whether produced rotor tubes and bellows are consistent with the centrifuge designs described in the JCPOA	Para. 80.2
Verify whether produced rotor tubes and bellows have been used to manufacture centrifuges for the activities specified in the JCPOA	Para. 80.2
Verify whether rotor tubes and bellows have been manufactured using carbon fibre which meets the specifications agreed under the JCPOA	Para. 80.2
Monitor or verify Iranian production of UOC	Para. 69
Monitor or verify Iranian procurement of UOC from any other source	Para. 69
Monitor or verify whether UOC produced in Iran or obtained from any other source has been transferred to UCF	Para. 68
Verify Iran's other JCPOA nuclear-related commitments, including those set out in Sections D, E, S and T of Annex I of the JCPOA	
Receive any updated declarations from Iran or conduct any complementary access to any sites and locations in Iran	Additional Protocol

⁷⁰ Implementation of modified Code 3.1 is a legal obligation and is not reflected in the table.

Annex II

Enriched UF₆ Feed, Production and Inventory since the Director General's previous Quarterly Report

Facility	Centrifuge Type	Installed Cascades ⁷¹	Total Planned Cascades	Feed Enrichment Level (% U-235)	Quantity Fed (kgUF ₆)	Product Enrichment Level (% U-235)	Quantity produced (kgUF ₆)
FEP	IR-1	36	36	Natural	-	<5%	1746.3
	IR-2m	21	21				
	IR-4	5	12	<2%	3358.5		
	IR-6	3	3				
FFEP	IR-1	6	16 ⁷²	<5%	643.7	<2%	562.4
	IR-6	2				<20%	63.3
						<60%	13.2
PFEP	IR-4 (Line 4)	1	1	<5%	345.6	<60%	7.4
	IR-6 (Line 6)	1	1				
	IR-4 and IR-6 (Line 5)	1	1	Tails from Lines 4 & 6	N/A	<5%	166.2
						<2%	172.0
Various (Lines 1, 2 and 3)			Natural	-	<2%	208.9	

Enrichment level (% U-235)	Inventory as at 13 May 2023 (kgU)	Quantity Fed (kgU)	Quantity Produced (kgU)	Inventory as at 19 August 2023 (kgU)
<2%	2459.6	2267.0	636.7	833.0 ⁷³
<5%	1340.2	667.8	1290.9	1950.9 ⁷⁴
<20%	470.9		42.7	535.8 ⁷⁵
<60%	114.1		13.9	121.6 ⁷⁶

⁷¹ Different numbers of cascades were fed during the reporting period.

⁷² See footnote 37.

⁷³ See footnote 29.

⁷⁴ See footnotes 51 and 67.

⁷⁵ See footnote 67.

⁷⁶ See footnote 67.

Annex III

List of acronyms

AEOI	Atomic Energy Organization of Iran
DIQ	Design Information Questionnaire
DIV	Design Information Verification
EUPP	Enriched Uranium Powder Plant
FEP	Fuel Enrichment Plant
FLUM	Flow-rate Unattended Monitoring
FMP	Fuel Manufacturing Plant
FPFP	Fuel Plate Fabrication Plant
FFEP	Fordow Fuel Enrichment Plant
HWPP	Heavy Water Production Plant
JCPOA	Joint Comprehensive Plan of Action
JHL	Jaber Ibn Hayan Multipurpose Laboratory
KHRR	Khondab Heavy Water Research Reactor
MIX facility	Molybdenum, Iodine and Xenon Radioisotope Production facility
OLEM	On-Line Enrichment Monitor
PFEP	Pilot Fuel Enrichment Plant
PIV	Physical Inventory Verification
TRR	Tehran Research Reactor
UCF	Uranium Conversion Facility
UOC	Uranium Ore Concentrate