

Derestricted 7 June 2023

(This document has been derestricted at the meeting of the Board on 7 June 2023)



IAEA

Atoms for Peace and Development

Board of Governors

GOV/2023/24

Date: 31 May 2023

Original: English

For official use only

Item 6 of the provisional agenda
(GOV/2023/21)

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). It also provides information on financial matters, and the Agency's consultations and exchanges of information with the Joint Commission, established by the JCPOA.

B. Background

2. The background to the matters outlined in this report can be found in previous quarterly reports of the Director General on this subject, most recently in GOV/2021/39 (paras 2–21) of 7 September 2021, as updated in subsequent reports.

3. 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.¹ As of 23 May 2023, extrabudgetary funding had been pledged sufficient to meet the cost of JCPOA-related activities for the remainder of 2023 and until mid-May 2024.²

C. JCPOA Verification and Monitoring Activities

4. 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,³ consistent with the Agency’s standard safeguards practices, and in an impartial and objective manner.^{4,5} From 8 May 2019 onwards, however, Iran stopped implementing certain of its nuclear-related commitments under the JCPOA on a step-by-step basis and, from 23 February 2021 onwards, stopped the implementation of those commitments, including the Additional Protocol (see Annex I) altogether. This seriously affected the Agency’s verification and monitoring in relation to the JCPOA: a situation that was exacerbated in June 2022 by Iran’s decision to remove all of the Agency’s equipment previously installed in Iran for JCPOA-related surveillance and monitoring activities. In May 2023, in line with the Joint Statement of 4 March 2023, the Agency installed surveillance cameras at workshops in Esfahan where centrifuge rotor tubes and bellows are manufactured.

5. The Agency reports the following for the period since the issuance of the Director General’s previous quarterly report.⁶

C.1. Agency monitoring and surveillance equipment

6. As previously reported,⁷ 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 activities in relation to the JCPOA would continue to be stored and that the equipment would continue to operate and be able to collect and store further data with the aim of enabling the Agency to recover and re-establish the necessary continuity of knowledge.

¹ These figures have been adjusted to reflect current costs and the latest 2023 budget update.

² 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.

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

⁴ GOV/2016/8, para. 6.

⁵ Note by the Secretariat, 2016/Note 5.

⁶ GOV/2023/8.

⁷ GOV/2021/10, Annex I; GOV/INF/2021/31, para. 4; GOV/INF/2021/42, para. 5; GOV/INF/2021/47.

7. As also previously reported,⁸ following a request from Iran on 8 June 2022, from 9–11 June 2022, 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).

8. Following discussions between the Director General and Vice-President Eslami on 4 March 2023, a Joint Statement⁹ was agreed, covering, inter alia, verification and monitoring activities. At a technical meeting between Agency and Iranian officials in Tehran on 14 March 2023, modalities for some of these verification and monitoring activities were agreed.

9. On 2 and 3 May 2023, the Agency installed surveillance cameras at workshops in Esfahan where centrifuge rotor tubes and bellows are manufactured.

10. In the event of a full resumption of implementation by Iran of its nuclear-related commitments under the JCPOA, the Agency would need to establish an understanding of Iran's above-mentioned activities in areas subject to its commitments under the JCPOA since 21 February 2021. In order to achieve that, the Agency would need to confirm the integrity, comprehensiveness and accuracy of the data recorded by its surveillance and monitoring equipment between 21 February 2021 and 8 June 2022, by comparing it to the declarations provided by Iran. A similar exercise would need to be conducted in relation to the data recorded by the Agency's surveillance equipment since early May 2023. In addition, Iran would need to provide all related records to the Agency, the consistency of which the Agency would then need to confirm through the application of additional safeguards measures, including those available under the AP.

11. Moreover, even if the Agency were able to re-establish a satisfactory understanding of Iran's production and inventory of centrifuges, rotors and bellows, heavy water and uranium ore concentrate (UOC) when its surveillance and monitoring equipment was operating, the Agency would still face significant challenges to confirm the consistency of Iran's related declarations during the period after June 2022 when no such equipment was operating.¹⁰ Therefore, any such understanding of Iran's activities would involve a significant degree of uncertainty.

12. In summary, 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 for the above-mentioned JCPOA verification and monitoring activities and is aware that it would face major challenges in doing so. The Agency would not be able to exclude the possibility that prior to the establishment of any new baseline Iran's production of centrifuges, rotors and bellows, heavy water and UOC had been significantly higher than that previously observed by the Agency at the declared locations. In order to address the gaps in continuity of knowledge, work is needed to develop specific arrangements with Iran, including for the provision of the declarations and additional records mentioned above, which would be indispensable in addressing this issue.

⁸ GOV/INF/2022/14, para. 5.

⁹ GOV/2023/9, Annex.

¹⁰ As referred to in paragraph 9, some surveillance cameras were installed at workshops in Esfahan around 11 months after cameras had been removed.

C.2. Activities Related to Heavy Water and Reprocessing

13. On 2 May 2023, the Agency received an updated design information questionnaire (DIQ) for the Khondab Heavy Water Research Reactor (KHRR). The examination of the DIQ update shows that the reactor power of 20 MW(th), the fuel enrichment and the preliminary core design are consistent with the “Fundamental Principles” and “Preliminary Characteristics” for the re-design of the research reactor.¹¹ Iran declared that commissioning of the reactor is expected in 2023 and that its operation is expected to start in 2024.

14. On 17 May 2023, the Agency confirmed during the Design Information Verification (DIV) that Iran had not pursued the construction of the Arak heavy water research reactor (formerly declared as the IR-40 Reactor) based on its original design.^{12,13} On the same day, the Agency also confirmed that the reactor vessel is 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, compared to the status previously reported.¹⁴ Civil construction work was ongoing at all floors of the reactor building. Iran informed the Agency during the DIV that the commissioning of KHRR is planned in 2023 and that the primary circuit will be commissioned in the next 2-3 months. The commissioning of the reactor will be performed while using the IR-20 dummy fuel assemblies.¹⁵

15. On 20 May 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

16. 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.

¹¹ As stipulated in ‘Attachment: Arak conceptual design’ in Annex I of the JCPOA.

¹² 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)).

¹³ As indicated previously (GOV/2017/24, footnote 10), Iran has changed the name of the facility to the Khondab Heavy Water Research Reactor (KHRR).

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 D, E and F 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.

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

C.3. Activities Related to Enrichment and Fuel

18. Since 23 February 2021, the Agency has not had access to the data and recordings collected by its surveillance equipment being used to monitor centrifuges and associated infrastructure in storage, and since 10 June 2022, when this equipment was removed, no such monitoring has taken place (paras 29, 47, 48 and 70).

19. 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).

20. Iran has continued the enrichment of UF₆ at the Fuel Enrichment Plant (FEP) and the Pilot Fuel Enrichment Plant (PFEP) at Natanz, and at the Fordow Fuel Enrichment Plant (FFEP) at Fordow.²¹ 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.

21. Iran has continued to conduct enrichment activities that are not in line with its long-term enrichment and enrichment research and development (R&D) plan, as provided to the Agency on 16 January 2016 (para. 52).

C.3.1. FEP

22. As previously reported,²⁴ in addition to the 30 cascades of IR-1 centrifuges provided for under the JCPOA (para. 27),²⁵ Iran has informed the Agency that it 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. In addition, on 19 November 2022,²⁶ Iran informed the Agency that it intended “to

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).

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.

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.

commission B1000 building with capacity of 8 enrichment units”.²⁷

23. On 23 May 2023, the Agency verified at FEP that 36 IR-1 cascades, 21 IR-2m cascades, four IR-4 cascades and three IR-6 cascades were installed, of which 36 IR-1 cascades, nine IR-2m cascades, two 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 and one IR-4 cascades had not yet been fed with UF₆; the installation of one IR-4 cascade was ongoing; sub-headers in the remaining IR-4 cascades were installed and the planned installation of additional enrichment units in the B1000 building had yet to start.

24. Iran has estimated²⁸ that, from 12 February 2023 to 12 May 2023, 1219.2 kg of UF₆ enriched up to 5% U-235 were produced²⁹ from natural UF₆.

25. 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. No data has been recorded for verification and monitoring since 10 June 2022 when this surveillance equipment was removed (para. 29.1).

C.3.2. PFEP

26. On 27 April 2023, Iran informed the Agency that updates to the DIQ for PFEP related to the commissioning of a segregated area within Building A1000 were available at the facility. The preliminary examination of these DIQ updates shows that Iran plans to: start the commissioning of six (identified as lines A–F) of the 18 R&D production lines under installation in Building A1000. Each R&D production line will 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 can be generated from these activities.

27. Since the previous quarterly report, Iran has made some further progress with the planned transfer of its enrichment R&D activities to a segregated area of Building A1000, to create a new area of PFEP (paras 27 and 40–42).³⁰ On 23 May 2023, the Agency verified that the installation of the infrastructure for 18 cascades for R&D activities in the segregated area of Building A1000³¹ allocated to PFEP was progressing, although installation of infrastructure for feeding or withdrawing UF₆ had yet to start. On the same day, the Agency also verified the installation of five IR-4 centrifuges in Line A and 20 IR-6s centrifuges in Line B.

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 received by the Agency, Building B1000 has the same general design as Building A1000, according to which each enrichment unit can accommodate up to 18 cascades of centrifuges.

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.

²⁹ Out of the overall production of UF₆ enriched up to 5% U-235 at FEP since 16 February 2021, the Agency has verified 8046.3 kg of UF₆ enriched up to 5% U-235.

³⁰ GOV/INF/2020/15, para. 2.

³¹ GOV/2022/39, para. 22.

28. 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 23 May 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; seven IR-2m centrifuges and 82 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: five IR-2m centrifuges; six IR-4 centrifuge; one IR-5 centrifuge; five 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 23 May 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 6,³² 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 into a cascade of 166 IR-4 and three IR-6 centrifuges in R&D production line 5 to produce UF₆ enriched up to 5% U-235.³³
29. Iran has estimated that at PFEP from 12 February 2023 to 12 May 2023:
- 237.8 kg of UF₆ enriched up to 2% U-235 were produced in R&D lines 1, 2 and 3;
 - 423.2 kg of UF₆ enriched up to 5% U-235 were fed into cascades installed in R&D production lines 4, 5 and 6;
 - 2.6 kg³⁴ of UF₆ enriched up to 5% U-235 were produced in R&D production line 5;³⁵
 - 403.9 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;³⁶ and
 - 16.6 kg of UF₆ enriched up to 60% U-235 were produced in R&D production lines 4 and 6.³⁷

C.3.3. FFEP

30. As previously reported,³⁸ 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.

³² The cascades in lines 4, 5 and 6 were being operated as described in GOV/2022/39, para. 24.

³³ On 17 May 2023 the Agency verified that the refurbishment of line 5 had been completed and that passivation with UF₆ was ongoing. According to Iran, feeding of line 5 with tails from lines 4 and 6 had resumed on 18 May 2023.

³⁴ This amount includes UF₆ enriched up to 5% U-235 in tails from R&D production lines 4 and 6 not fed into R&D production line 5.

³⁵ During the reporting period R&D production line 5 was only shortly in operation due to refurbishment activities (see GOV/2023/8, para. 24).

³⁶ The combined tails from line 5 and tails from lines 4 and 6 have an estimated enrichment below 2% U-235.

³⁷ 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: 1553.3 kg of UF₆ enriched up to 5% U-235, 25.1 kg of UF₆ enriched up to 20% U-235 and 134.5 kg of UF₆ enriched up to 60% U-235 (including the Agency verified amount of 17.8 kg UF₆ instead of the operator estimated amount of 16.6 kg UF₆ produced during the reporting period).

³⁸ GOV/2019/55, paras 14 and 15.

31. On 20 November 2022, Iran informed the Agency in an updated DIQ 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),^{39,40} which had remained dismantled since JCPOA Implementation Day.⁴¹ Iran also described in the updated DIQ a new mode of operation,⁴² involving the use of the two currently installed IR-6 cascades⁴³ in an interconnected mode to produce UF₆ enriched up to 60% U-235 from UF₆ enriched up to 5% U-235 as feed material. According to the updated DIQ, 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-235.⁴⁴

32. On 22 November 2022, the Agency verified that Iran had started the installation of Unit 1 at FFEP.⁴⁵ The Agency also verified that Iran had implemented the new mode of production for enriching UF₆ up to 60% U-235 by operating the two IR-6 cascades as one set of two interconnected cascades using UF₆ enriched up to 5% U-235 as feed material.⁴⁶ As previously reported, the Agency then increased the frequency and intensity of its verification activities at FFEP.⁴⁷

33. On 21 January 2023, the Agency detected at FEP that, while the two IR-6 cascades were still being fed with UF₆ enriched up to 5% U-235 to produce UF₆ enriched up to 60% U-235, they were interconnected in a way that was substantially different from the design information declared by Iran in the most recently updated DIQ.^{48,49}

34. On 1 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 at a technical meeting between senior officials in Tehran on 23 February 2023.

35. On 25 February 2023, Iran provided the Agency with an updated DIQ for FFEP following which the Agency verified the updated design information as set out therein.

36. As previously reported, on 22 January 2023, the Agency took environmental samples from the product sampling point at FFEP, the analytical results of which showed the presence of high enriched uranium (HEU) particles containing up to 83.7% U-235. The Agency informed Iran that these findings were inconsistent with the level of enrichment of the UF₆ produced at FFEP, as declared by Iran, and

³⁹ GOV/INF/2022/24, para. 8.

⁴⁰ 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.

⁴¹ 16 January 2016.

⁴² See GOV/2022/6, para. 28.

⁴³ One of these cascades has modified sub-headers that would enable Iran to change the operating configuration of the cascade more easily.

⁴⁴ GOV/INF/2022/24, para. 8.

⁴⁵ GOV/INF/2022/24, para. 9.

⁴⁶ 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.

⁴⁷ GOV/INF/2023/1, para. 9.

⁴⁸ GOV/INF/2023/1, para. 4; GOV/2023/8, para. 31.

⁴⁹ 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.

requested Iran to clarify the origin of these HEU particles.

37. On 20 February 2023, Iran informed the Agency that “unintended fluctuations in enrichment levels may have occurred during transition period at the time of commissioning the process of [60%] product (November 2022) or while replacing the feed cylinder”.

38. On 26 February 2023, the Agency took destructive analysis samples from the cylinder containing the HEU product at FFEP, the results of which showed that the enrichment level of UF₆ produced at FFEP remained up to 60% U-235. This cylinder had been collecting the HEU product since the start of production of UF₆ enriched up to 60% at FFEP in November 2022.

39. Between 22 February and 19 March 2023, during several meetings that took place at the facility and in Tehran, Iran provided to the Agency additional information and supporting operational data in relation to the presence at FFEP of particles enriched up to 83.7% U-235. The consistency of the information and supporting operational data provided by Iran was independently evaluated by the Agency versus its own verification results and using all the relevant available information and tools.

40. In a letter dated 30 March 2023, the Agency indicated that on the basis of its evaluation, the Agency assessed that the information provided was not inconsistent with Iran's explanation for the origin of these particles and that the Agency had no further questions on the matter at that stage. The Agency also found no indication of the accumulation and collection of nuclear material enriched above 60% U-235 at FFEP and it will be able to confirm that no diversion of nuclear material took place at the facility only on the basis of the outcome of the next physical inventory verification (PIV). The annual PIV was successfully carried out at the end of April - beginning of May 2023, the evaluation of which is still ongoing.

41. On 26 April 2023 the Agency verified that the temporary set-up that had been used for R&D on stable isotope separation had been dismantled and removed from FFEP.⁵⁰

42. On 24 May 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.

43. Iran has estimated that from 12 February 2023 to 12 May 2023:

- 775.0 kg of UF₆ enriched up to 5% U-235 were fed into cascades at FFEP;⁵¹
- 22.9 kg of UF₆ enriched up to 60% U-235 were produced;⁵²

⁵⁰ In January 2018, Iran informed the Agency about a temporary setup for a single IR-1 centrifuge position for “separation of stable isotopes” in Unit 2 (see GOV/2018/7, para. 13, footnote 19).

⁵¹ Iran estimated that 0.7 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); its average enrichment could be slightly above the level of the feed material. This amount is included in the inventory of LEU at FFEP.

⁵² On 14 May 2023, the Agency verified that 42.8 kg of UF₆ enriched up to 60% U-235 had been produced since 21 November 2022.

- 53.6 kg of UF₆ enriched up to 20% U-235 were produced;⁵³ and
- 697.9 kg of UF₆ enriched up to 2% U-235 were accumulated as tails.

C.3.4. FFPF

44. On 10 January 2023, the Agency verified that one new control fuel assembly, containing 1.08 kg of uranium in the form of U₃O₈ enriched up to 20% U-235, has been produced at FFPF. This control fuel assembly was shipped under Agency seal to TRR on 12 March 2023.

45. On 14 February 2023, the Agency verified that all 36 fuel items containing a total of 2.72 kg of uranium enriched up to 20% U-235 received from the Russian Federation had been fabricated into 36 fuel plates. Out of these 36 plates, one new control fuel assembly, containing 1.06 kg of uranium in the form of U₃O₈ enriched up to 20% U-235, and one new standard fuel assembly, containing 1.44 kg of uranium in the form of U₃O₈ enriched up to 20% U-235, were manufactured.⁵⁴

46. On 4 March 2023, the Agency verified the receipt of 16.11 kg of uranium in the form of UF₆ enriched up to 20% U-235. On 5 March 2023, the Agency verified the shipment of one cylinder containing 16.30 kg of UF₆ enriched up to 20% U-235 to PFEP, in order to transfer the nuclear material in a new cylinder. The Agency was informed that it was no longer safe to store UF₆ in the original cylinder.

47. On 13 May 2023, the Agency verified at the storage area of FFPF a total of 69.55 kg of uranium in the form of UF₆ enriched up to 60% U-235 and 390.26 kg of uranium in the form of UF₆ enriched up to 20% U-235.⁵⁵ On the same day, the Agency also verified that both the TRR control fuel assembly and the standard fuel assembly were still stored under Agency seals at FFPF. The three remaining fuel plates, containing 0.23 kg uranium enriched up to 20% U-235, were also verified on the same day.

48. On 24 May 2023, the Agency verified that no progress had been made regarding the remaining two stages of the process⁵⁶ for the production of UF₄ from UF₆. Installation of the equipment for the first stage of the process has been completed but has yet to undergo testing using nuclear material. Since the Director General's previous quarterly report, Iran has not produced any uranium metal.

C.3.5. UCF

49. As previously reported, in May 2021, the Agency verified at the Uranium Conversion Facility (UCF) at Esfahan that installation of equipment for the production of uranium metal had been completed and that it was ready to operate with either natural or depleted uranium. As of 17 May 2023, the Agency verified that no nuclear material had been introduced into the production area.

50. As previously reported, in March 2022, the Agency verified at 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). The Agency then identified a discrepancy that needs to be resolved in the amount of nuclear material it had verified compared to the amount declared by Iran (for more details see GOV/2023/26, Section C.1.2).

⁵³ Out of the overall production of UF₆ enriched up to 20% U-235 at FFEP since 16 February 2021, the Agency verified 678.9 kg of UF₆ enriched up to 20% U-235.

⁵⁴ A TRR standard fuel assembly is made of 19 fuel plates while a control fuel assembly is made of 14 fuel plates.

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

⁵⁶ GOV/INF/2021/3, para. 5.

C.3.6. TRR

51. Since the previous quarterly report, the Agency has verified that Iran has not irradiated any LEU targets at TRR. On 12 March 2023, the Agency verified the receipt of one control fuel assembly from FFPF. On 18 April 2023, the Agency verified the transfer of the single irradiated fuel plate⁵⁷ to the MIX facility to start the testing of the Cs-137 extraction process.

52. On 20 May 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 irradiated standard fuel assembly.⁵⁸ The Agency also verified that all of the following targets had been irradiated and were 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 new TRR uranium silicide fuel plates were still being irradiated.⁵⁹

53. On 20 May 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 while one fuel assembly was irradiated and remained in the reactor pond.

C.3.7. EUPP

54. On 9 May 2023, the Agency observed that there was no significant progress with the installation of equipment for the first stage of the process for converting UF₆ to UO₂ using the ‘integrated dry route’;⁶⁰ the main process reactor had yet to be installed.

C.3.8. FMP

55. On 20 May 2023, the Agency verified at the Fuel Manufacturing Plant (FMP) 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.⁶¹

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

56. 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

⁵⁷ One fuel plate containing 75 g of uranium enriched up to 20% U-235 had a dose rate below the level established by the Joint Commission under the JCPOA, not to count against the enriched uranium stockpile. Decision of the Joint Commission of 24 December 2015 (INFCIRC/907).

⁵⁸ The amount of uranium in the irradiated fuel assembly has been included in the enriched uranium stockpile.

⁵⁹ GOV/2022/24, para. 29 and GOV/2022/39, para. 40.

⁶⁰ The integrated dry route is a process used for the conversion of UF₆ to UO₂F₂ powder and then UO₂F₂ powder to UO₂ powder.

⁶¹ 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).

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).

57. 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.

58. 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 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 Iranian centrifuge. 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.^{62,63}

59. On 2 and 3 May 2023, surveillance cameras were installed at workshops in Esfahan where centrifuge rotor tubes and bellows are manufactured.

C.5. Enriched Uranium Stockpile

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

61. 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 13 May 2023, Iran's total enriched uranium stockpile was 4744.5 kg. This figure represents an increase of 983.7 kg since the previous quarterly report. The estimated stockpile comprised: 4384.8 kg of uranium in the form of UF₆; 207.5 kg of uranium in the form of uranium oxide and other intermediate products; 59.5 kg of uranium in fuel assemblies and rods; and 92.7 kg of uranium in liquid and solid scrap.

62. As of 13 May 2023, the estimated total enriched uranium stockpile in the form of UF₆ of 4384.8 kg comprised:

- 2459.6 kg of uranium enriched up to 2% U-235 (+904.3 kg since the previous quarterly report);

⁶² GOV/INF/2019/12, para. 6.

⁶³ Decision of the Joint Commission of 14 January 2016 (INFCIRC/907).

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.

- 1340.2 kg of uranium enriched up to 5% U-235 (+15.7 kg);
- 470.9 kg of uranium enriched up to 20% U-235 (+36.2 kg); and
- 114.1 kg of uranium enriched up to 60% U-235 (+26.6 kg).

63. As of 13 May 2023, the Agency verified that the inventory of uranium enriched up to 20% U-235 in forms other than UF₆ was 38.8 kg, consisting of 32.7 kg of uranium in the form of fuel assemblies,⁶⁷ 5.7 kg of uranium in the form of intermediate products, and 0.4 kg of uranium in the form of liquid and solid scrap.

64. As of 13 May 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-plates⁶⁸ verified on 20 May 2023 at TRR and 0.4 kg of uranium in the form of liquid and solid scrap verified on 13 May 2023 at FPPF.

D. Transparency Measures

65. 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.

66. 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.

67. Iran has continued to issue long-term visas to Agency inspectors designated for Iran as requested by the Agency, provided 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).

E. Other Relevant Information

68. 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 two and a quarter years Iran has not provided updated declarations and the Agency

⁶⁷ The dose rate of one irradiated fuel assembly, containing 1.1 kg of uranium enriched up to 20% U 235, was measured and found to be below the level established by the Joint Commission under the JCPOA, not to count against the enriched uranium stockpile.

⁶⁸ Irradiated at TRR and stored in the reactor pool.

has not been able to conduct any complementary access under the Additional Protocol to any sites and locations in Iran.

69. In addition, Iran has not implemented modified Code 3.1 of the Subsidiary Arrangements to Iran's Safeguards Agreement during this reporting period (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 Safeguards Agreement for the suspension of implementation of provisions agreed to in the Subsidiary Arrangements.

70. 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.

71. 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).

F. Summary

72. From 8 May 2019 onwards, Iran stopped implementing certain of its nuclear-related commitments under the JCPOA on a step-by-step basis and, from 23 February 2021 onwards, stopped implementing those commitments, including the Additional Protocol, altogether. This has seriously affected the Agency's verification and monitoring in relation to the JCPOA.

73. 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 two and one quarter years, including the period after June 2022 when no surveillance and monitoring equipment was installed and operating. In the event of a full resumption of implementation by Iran of its nuclear-related commitments under the JCPOA, therefore, 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 for the above-mentioned JCPOA verification and monitoring activities, and is aware that it would face major challenges in doing so and that any new baseline would involve a significant degree of uncertainty.

74. In line with the Joint Statement of 2023, the Agency installed surveillance cameras at workshops at one location where centrifuge rotor tubes and bellows are manufactured. The process of implementing the activities set out in the Joint Statement needs to be sustained and uninterrupted in order that all of the commitments contained therein are fulfilled. In addition, the Agency has informed Iran that for these activities to be effective the Agency needs to re-establish a satisfactory understanding of Iran's inventory of centrifuge rotor tubes and bellows, including those in assembled centrifuges. In light of the prolonged period between February 2021 and June 2022 during which the data recorded by the cameras were not reviewed by the Agency, it is indispensable that the Agency and Iran should agree on an approach without delay that would provide the Agency with access to these data recordings and to those since 2-3 May 2023.

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

Annex 1

Impact on Agency verification and monitoring resulting from Iran stopping implementation of its nuclear-related commitments as envisaged in the JCPOA⁶⁹

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

⁶⁹ Implementation of modified Code 3.1 is a legal obligation and is not reflected in the table.

Annex 2

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

Facility	Centrifuge Type	Installed Cascades ⁷⁰	Total Planned Cascades	Feed Enrichment Level (% U-235)	Quantity Fed (kg UF ₆)	Product Enrichment Level (% U-235)	Quantity produced (kg UF ₆)
FEP	IR-1	36	36	Natural	-	<5%	1219.2
	IR-2m	21	21				
	IR-4	4	12				
	IR-6	3	3				
FFEP	IR-1	6	16 ⁷¹	<5%	775.0 ⁷²	<2%	697.9
	IR-6	2				<20%	53.6
						<60%	22.9
PFEP	IR-4 (Line 4)	1	1	<5%	423.2	<60%	16.6
	IR-6 (Line 6)	1	1				
	IR-4 and IR-6 (Line 5)	1	1	Tails from Lines 4 & 6	N/A	<5%	2.6
						<2%	403.9
Various (Lines 1, 2 and 3)			Natural	-	<2%	237.8	

Enrichment level (% U-235)	Inventory as at 12 February 2023 (kgU)	Quantity Fed (kgU)	Quantity Produced (kgU)	Inventory as at 12 May 2023 (kgU)
<2%	1555.3		904.2	2459.6
<5%	1324.5	808.8	824.7	1340.2
<20%	434.7		36.2	470.9
<60%	87.5		26.7	114.1

⁷⁰ Different numbers of cascades were fed during the reporting period.

⁷¹ See footnote 40.

⁷² See footnote 51.

Annex 3

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
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