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(GOV/2023/7)

## 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.<sup>1</sup> As of 15 February 2023, extrabudgetary funding had been pledged sufficient to meet the cost of JCPOA-related activities for the remainder of 2023 and until mid-June 2024.<sup>2</sup>

## 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,<sup>3</sup> consistent with the Agency's standard safeguards practices, and in an impartial and objective manner.<sup>4,5</sup> From 8 May 2019 onwards, however, Iran reduced the implementation 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). This has seriously affected the Agency's verification and monitoring in relation to the JCPOA.

5. The Agency reports the following for the period since the issuance of the Director General's previous quarterly report<sup>6</sup> and three subsequent updates (see Annex 2).

### C.1. Agency monitoring and surveillance equipment under the JCPOA

6. As previously reported,<sup>7</sup> 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.

7. As also previously reported,<sup>8</sup> 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

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

<sup>2</sup> 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.

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

<sup>4</sup> GOV/2016/8, para. 6.

<sup>5</sup> Note by the Secretariat, 2016/Note 5.

<sup>6</sup> GOV/2022/62.

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

<sup>8</sup> GOV/INF/2022/14, para. 5.

was placed in storage at the respective locations under Agency seals, as agreed with the Atomic Energy Organization of Iran (AEOI).

8. As a consequence, 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 uranium ore concentrate (UOC) for two years, including the last nearly nine months when there has been no surveillance and monitoring equipment in operation following its removal in June last year.

9. 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 JCPOA activities 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 equipment between 21 February 2021 and 8 June 2022, currently under Agency seal in Iran, by comparing it to the declarations provided by Iran. 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.

10. 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 UOC between 21 February 2021 and 8 June 2022, the Agency would still face significant challenges to confirm the consistency of Iran's related declarations since then, during which time no surveillance and monitoring equipment was operating. Therefore, any such understanding of Iran's activities would contain a significant degree of uncertainty and the longer the current situation persists the greater this uncertainty becomes.

11. 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. 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. The Agency would be prepared to work on specific arrangements with Iran, which would be indispensable in addressing this issue.

## **C.2. Activities Related to Heavy Water and Reprocessing**

12. As of 8 February 2023, the Agency verified that Iran had not pursued the construction of the Arak heavy water research reactor (IR-40 Reactor) based on its original design.<sup>9,10</sup> On the same day, the Agency observed that there had been no further progress in the installation of essential equipment of the facility, compared to the status previously reported,<sup>11</sup> although civil construction work was ongoing at all floors of the reactor building. On 19 February 2023, the Agency also verified that Iran had not produced or tested natural uranium pellets, fuel pins or fuel assemblies specifically designed for the support of the IR-40 Reactor as originally designed. All existing natural uranium pellets and fuel

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<sup>9</sup> 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)).

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

<sup>11</sup> GOV/2022/62, para 12.

assemblies have remained in storage under continuous Agency monitoring (paras 3 and 10).<sup>12</sup>

13. 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,<sup>13</sup> 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).<sup>14</sup> As previously mentioned no monitoring has taken place since 11 June 2022, when the FLUM equipment at the HWPP was removed.

14. 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).<sup>15,16</sup>

### C.3. Activities Related to Enrichment and Fuel

15. Iran has continued the enrichment of UF<sub>6</sub> 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.<sup>17</sup> As previously reported, Iran has:

- enriched UF<sub>6</sub> up to 5% U-235 since 8 July 2019<sup>18</sup> (para. 28);
- enriched UF<sub>6</sub> up to 20% U-235 since 4 January 2021;<sup>19</sup> and
- enriched UF<sub>6</sub> up to 60% U-235 since 17 April 2021.

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).

16. 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).

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<sup>12</sup> 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.

<sup>13</sup> 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).

<sup>14</sup> Based on its analysis of commercially available satellite imagery, the Agency assessed that the HWPP continued to operate during the reporting period.

<sup>15</sup> In an updated DIQ for the MIX facility, dated 9 May 2021, Iran informed the Agency of 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).

<sup>16</sup> In an updated DIQ for the JHL facility, dated 5 January 2021, Iran had informed the Agency of its research and development (R&D) plan to extract caesium (Cs-137) from irradiated targets.

<sup>17</sup> 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).

<sup>18</sup> GOV/INF/2019/9, para. 3.

<sup>19</sup> GOV/INF/2021/2, para. 5.

17. 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).

### C.3.1. FEP

18. As previously reported,<sup>20</sup> in addition to the 30 cascades of IR-1 centrifuges provided for under the JCPOA (para. 27), Iran has informed the Agency that it intends to install another 42 cascades at FEP – 6 of IR-1 centrifuges, 21 of IR-2m centrifuges, 12 of IR-4 centrifuges, and 3 of IR-6 centrifuges. In August 2022, Iran also informed the Agency that it intended to increase the number of IR-1 centrifuges installed in some of the 30 cascades of IR-1 centrifuges that had remained in the same configuration since JCPOA Implementation Day (para. 27).<sup>21</sup> In December 2022, installation of these additional IR-1 centrifuges, of which there were 120 in total, had been completed as planned.

19. As previously reported,<sup>22</sup> on 19 November 2022, Iran informed the Agency that it intended “to commission B1000 building with capacity of 8 enrichment units”.<sup>23</sup>

20. Iran has estimated<sup>24</sup> that, from 22 October 2022 to 11 February 2023, 1657.4 kg of UF<sub>6</sub> enriched up to 5% U-235 were produced<sup>25</sup> either from UF<sub>6</sub> enriched up to 2% U-235 (1967.0 kg of UF<sub>6</sub>)<sup>26</sup> or from natural UF<sub>6</sub>.<sup>27</sup>

21. On 21 February 2023, the Agency verified at FEP that 36 IR-1 cascades, eight IR-2m cascades, three IR-4 cascades and three IR-6 cascades were being fed with natural UF<sub>6</sub> to produce UF<sub>6</sub> enriched up to 5% U-235. On the same day, the Agency verified that the installation of one other IR-4 cascade had been completed; the installation of the other 13 IR-2m cascades had been completed; the installation of centrifuges in the remaining eight IR-4 cascades had yet to begin; the installation of sub-headers for six of the remaining IR-4 cascades had yet to begin; and the planned installation of additional enrichment units in B1000 building had yet to start.<sup>28</sup>

22. 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. On 10 June 2022 this surveillance equipment was removed and no data has since been recorded for

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<sup>20</sup> GOV/INF/2022/24, paras 2 and 3.

<sup>21</sup> GOV/2022/62, para. 18.

<sup>22</sup> GOV/INF/2022/24, para. 3.

<sup>23</sup> 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.

<sup>24</sup> Since 23 February 2021, as the Agency has only been able to verify Iran’s production of enriched UF<sub>6</sub> 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.

<sup>25</sup> Out of the overall production of UF<sub>6</sub> enriched up to 5% U-235 at FEP since 16 February 2021, the Agency has verified 6530.0 kg of UF<sub>6</sub> enriched up to 5% U-235.

<sup>26</sup> UF<sub>6</sub> enriched up to 2% U-235 was fed for a short period.

<sup>27</sup> Iran estimated that 60.0 kg of UF<sub>6</sub> enriched up to 2% U-235 were dumped (i.e. not used for the enrichment of UF<sub>6</sub> 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.

<sup>28</sup> This is in line with the updated DIQ for FEP of November 2022, referred to in paragraph 19.

verification and monitoring (para. 29.1).

### C.3.2. PFEP

23. Since the previous quarterly report, Iran has made little progress with the planned transfer of its enrichment R&D activities to a segregated area of Building A1000 at FEP, to create a new area of PFEP (paras 27 and 40–42).<sup>29</sup> On 7 February 2023, the Agency verified that the removal of infrastructure and equipment at FEP in preparation for the planned installation of a new feed and withdrawal area for the new enrichment R&D activities in Building A1000<sup>30</sup> had been completed. On 21 February 2023, the Agency verified that installation of the infrastructure for 18 cascades for R&D activities in this new, segregated area of PFEP was progressing.<sup>31</sup>

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

- **R&D production lines 4, 5 and 6:** On 22 February 2023, the Agency verified that Iran was feeding UF<sub>6</sub> enriched up to 5% U-235 into two interconnected cascades in R&D production lines 4 and 6,<sup>32</sup> comprising up to 164 IR-4 and up to 164 IR-6 centrifuges, respectively, to produce UF<sub>6</sub> enriched up to 60% U-235 and that the tails produced from line 6 were being fed into the cascades of IR-4, IR-5, IR-6 and IR-6s centrifuges in R&D production line 5 to produce UF<sub>6</sub> enriched up to 5% U-235. On 8 February 2023, the Agency verified that Iran had started maintenance activities in this cascade, involving the relocation of IR-5 centrifuges and the installation of IR-4 and IR-6 centrifuges in this cascade. As of 21 February 2023, Agency inspectors verified that this maintenance process was still ongoing.<sup>33</sup> The installed IR-4, IR-5 and IR-6 centrifuges had yet to be fed with nuclear material.
- **R&D lines 2 & 3:** Iran has continued to accumulate uranium enriched up to 2% U-235 through feeding natural UF<sub>6</sub>. On 22 February 2023, the Agency verified that Iran had been using, for this purpose, small and intermediate cascades of up to: 14 IR-2m centrifuges; 20 IR-4 centrifuges and six IR-4 centrifuges; six IR-5 centrifuges and five IR-5 centrifuges; ten IR-6 centrifuges and 19 IR-6 centrifuges. The following single centrifuges were being tested with natural UF<sub>6</sub> but not accumulating enriched uranium: five IR-2m centrifuges; one 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 line 1:** On 22 February 2023, the Agency verified that Iran has continued to accumulate uranium enriched up to 2% U-235 through feeding natural UF<sub>6</sub> into an intermediate cascade of 18 IR-1 centrifuges and an intermediate cascade of 76 IR-2m centrifuges in R&D line 1.

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<sup>29</sup> GOV/INF/2020/15, para. 2.

<sup>30</sup> GOV/2022/39, para. 22.

<sup>31</sup> GOV/2021/10, para. 22.

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

<sup>33</sup> GOV/INF/2022/25, para. 4.

25. Iran has estimated that at PFEP from 22 October 2022 to 11 February 2023:

- 201.6 kg of UF<sub>6</sub> enriched up to 2% U-235 were produced in R&D lines 1, 2 and 3;
- 517.4 kg of UF<sub>6</sub> enriched up to 5% U-235 were fed into cascades installed in R&D production lines 4, 5 and 6;
- 103.3 kg<sup>34</sup> of UF<sub>6</sub> enriched up to 5% U-235 were produced in R&D production line 5;
- 396.9 kg of UF<sub>6</sub> enriched up to 2% U-235 were accumulated as tails from R&D production line 5; and
- 17.1 kg of UF<sub>6</sub> enriched up to 60% U-235 were produced in R&D production lines 4 and 6.<sup>35</sup>

### C.3.3. FFEP

26. As previously reported,<sup>36</sup> Iran began to enrich UF<sub>6</sub> 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 UF<sub>6</sub> enriched up to 5% U-235 and UF<sub>6</sub> enriched up to 20% U-235.

27. 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),<sup>37</sup> which had remained dismantled since JCPOA Implementation Day.<sup>38</sup> Iran also described in the updated design information questionnaire (DIQ) a new mode of operation, in addition to those previously declared,<sup>39</sup> involving the use of the two currently installed IR-6 cascades<sup>40</sup> in an interconnected mode to produce UF<sub>6</sub> enriched up to 60% U-235 from UF<sub>6</sub> enriched up to 5% U-235 as feed material. All other cascades, including those yet to be installed, will either produce UF<sub>6</sub> enriched up to 20% U-235 from UF<sub>6</sub> enriched up to 5% U-235 or will be used to enrich natural uranium up to 5% U-235.<sup>41</sup>

28. Following Iran's announcement of its intention to start enriching UF<sub>6</sub> up to 60% U-235 at FFEP and to commission Unit 1, the Agency reminded Iran of its obligation under the Safeguards Agreement to inform the Agency of any change in design information sufficiently in advance for the Agency safeguards procedures to be adjusted accordingly to ensure effective verification.<sup>42</sup>

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

<sup>35</sup> 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 UF<sub>6</sub> had been produced: 1520.9 kg of UF<sub>6</sub> enriched up to 5% U-235, 25.1 kg of UF<sub>6</sub> enriched up to 20% U-235 and 116.7 kg of UF<sub>6</sub> enriched up to 60% U-235.

<sup>36</sup> GOV/2019/55, paras 14 and 15.

<sup>37</sup> GOV/INF/2022/24, para. 8.

<sup>38</sup> 16 January 2016.

<sup>39</sup> See GOV/2022/6, para. 28.

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

<sup>41</sup> GOV/INF/2022/24, para. 8.

<sup>42</sup> GOV/INF/2022/24, para. 10.

29. On 22 November 2022, the Agency verified that Iran had yet to begin installing additional IR-6 cascades at FFEP and had started the installation of Unit 1.<sup>43</sup> The Agency also verified that Iran had implemented the new mode of production for enriching UF<sub>6</sub> up to 60% U-235 by operating the two IR-6 cascades as one set of two interconnected cascades using UF<sub>6</sub> enriched up to 5% U-235 as feed material.<sup>44</sup>

30. As previously reported,<sup>45</sup> the Agency informed Iran on 25 November 2022 of its intention to increase the frequency and intensity of its verification activities at FFEP in accordance with the Safeguards Agreement and subsequently held technical discussions with Iran for this purpose. The Agency subsequently increased the frequency and intensity of its verification activities at FFEP.<sup>46</sup>

31. On 21 January 2023, during a routine inspection without advance notification – also known as an unannounced inspection (UI)<sup>47</sup> – at FFEP, the Agency detected that, while the two IR-6 cascades were still being fed with UF<sub>6</sub> enriched up to 5% U-235 to produce UF<sub>6</sub> 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.<sup>48,49</sup> Subsequently, Iran informed the Agency that it had switched to this way of operating on 16 January 2023, following the Agency's previous UI at FFEP earlier the same day.<sup>50</sup>

32. As previously reported,<sup>51</sup> in a letter dated 23 January 2023, the Agency informed Iran that its failure to declare the change it had made to the interconnection of the two IR-6 cascades in advance of implementing the change was inconsistent with Iran's obligations under Article 45 of its Safeguards Agreement. The Agency again reiterated that any change to facility design had to be declared to the Agency prior to any implementation and requested Iran to provide an updated DIQ for FFEP. 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.

33. In a letter dated 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, and subsequently held discussions, including through correspondence, with Iran for this purpose. At a technical meeting between senior officials in Tehran on 23 February 2023, Iran confirmed that it would facilitate the notified further increase of the frequency and intensity of Agency verification activities at FFEP.

34. During the monthly interim verification (IIV) on 22 January 2023, the Agency took environmental samples from the product sampling point at FFEP, the analytical results of which showed the presence

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<sup>43</sup> GOV/INF/2022/24, para. 9.

<sup>44</sup> 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.

<sup>45</sup> GOV/INF/2022/25, para. 5.

<sup>46</sup> GOV/INF/2023/1, para. 9.

<sup>47</sup> UIs can be conducted within two hours notification.

<sup>48</sup> GOV/INF/2023/1, para. 4.

<sup>49</sup> Under this way of operating, it was the IR-6 cascade with the modified sub-headers in which the UF<sub>6</sub> product was enriched up to 60% U-235.

<sup>50</sup> GOV/INF/2023/1, para. 4.

<sup>51</sup> GOV/INF/2023/1, paras 5 and 6.



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 UF<sub>6</sub> produced at FFEP, as declared by Iran, and requested Iran to clarify the origin of these HEU particles.

35. In a letter dated 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”. Discussions between the Agency and Iran to clarify the matter are ongoing.

36. 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 UF<sub>6</sub> produced at FFEP remained up to 60% U-235. This cylinder has been collecting the HEU product since the start of production of UF<sub>6</sub> enriched up to 60% at FFEP in November 2022.

37. On 28 February 2023, the Agency verified in Unit 1 that installation of the necessary infrastructure for the planned eight new cascades was ongoing. Installation of centrifuges had not begun. In the updated DIQ provided on 25 February 2023, Iran clarified that these new cascades could contain either IR-1 or IR-6 centrifuges.

38. Also on 28 February 2023, the Agency verified in Unit 2 that Iran had yet to begin installing IR-6 centrifuges to replace the IR-1 centrifuges. Iran was continuing to feed UF<sub>6</sub> enriched up to 5% U-235 into: up to 1044 IR-1 centrifuges in three sets of two interconnected cascades to enrich UF<sub>6</sub> up to 20% U-235; and, using the new way of operating as described in paragraph 31 above, into one set of two interconnected cascades of 166 IR-6 centrifuges to enrich UF<sub>6</sub> up to 60% U-235. One IR-1 centrifuge was installed in a single position but was not being fed with nuclear material.<sup>52</sup>

39. Iran has estimated that from 22 October 2022 to 11 February 2023: 816.0 kg of UF<sub>6</sub> enriched up to 5% U-235 were fed into cascades at FFEP;<sup>53,54</sup> 18.9 kg of UF<sub>6</sub> enriched up to 60% U-235 were produced; 71.7 kg of UF<sub>6</sub> enriched up to 20% U-235 were produced;<sup>55</sup> and 879.7 kg of UF<sub>6</sub> enriched up to 2% U-235 were accumulated as tails.

#### **C.3.4. FFPF**

40. On 14 November 2022, the Agency verified the receipt at the Fuel Plate Fabrication Plant (FPFP) of 47.15 kg of uranium in the form of UF<sub>6</sub> enriched up to 20% U-235 from PFEP.

41. On 10 January 2023, the Agency verified that one new control fuel assembly, containing 1.08 kg of uranium in the form of U<sub>3</sub>O<sub>8</sub> enriched up to 20% U-235 has been produced at FFPF; this control fuel assembly was stored at the facility under Agency seal.

42. On 14 February 2023, the Agency verified that all 36 fuel items containing uranium enriched up to 20% U-235 received from the Russian Federation had been fabricated into fuel plates.

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<sup>52</sup> 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, footnote 19).

<sup>53</sup> Natural UF<sub>6</sub> was also fed during this period.

<sup>54</sup> Iran estimated that 8.9 kg of UF<sub>6</sub> enriched up to 5% U-235 were dumped (i.e. not used for the enrichment of UF<sub>6</sub> up to 20% U-235 but remaining in the process); the nuclear material is still in process and has been weighed; its average enrichment could be slightly above the level of the feed material. This amount is included in the inventory of LEU at FFEP.

<sup>55</sup> Out of the overall production of UF<sub>6</sub> enriched up to 20% U-235 at FFEP since 16 February 2021, the Agency verified 631.1 kg of UF<sub>6</sub> enriched up to 20% U-235. On 13 February 2023, the Agency verified that 19.2 kg of UF<sub>6</sub> enriched up to 60% U-235 had been produced since 21 November 2022.

43. On 15 February 2023, the Agency verified the receipt at FPFEP of 16.55 kg of uranium in the form of UF<sub>6</sub> enriched up to 60% U-235 and 16.30 kg of uranium in the form of UF<sub>6</sub> enriched up to 20% U-235 from PFEF.

44. On 25 February 2023, the Agency verified that no progress had been made regarding the remaining two stages of the process<sup>56</sup> for the production of UF<sub>4</sub> from UF<sub>6</sub>. Installation of the equipment for the first stage of the process has been completed but has yet to undergo testing. Since the Director General's previous quarterly report, Iran has not produced any uranium metal.

45. On 15 February 2023, the Agency verified at the storage area of FPFEP a total of 69.55 kg of uranium in the form of UF<sub>6</sub> enriched up to 60% U-235 and 390.45 kg of uranium in the form of UF<sub>6</sub> enriched up to 20% U-235.<sup>57</sup>

### C.3.5. UCF

46. As previously reported, in November 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. On 12 February 2023, the Agency verified that no nuclear material had been introduced into the production area.

47. On 9 March 2022, the Agency verified the receipt at UCF at Esfahan of 302.7 kg of natural uranium, as declared by Iran, in the form of solid waste and items of uranium metal from JHL. Later the same month, the Agency verified at UCF the dissolution of this nuclear material by Iran. The Agency identified a discrepancy in the amount of nuclear material it had verified compared to the amount declared by Iran.

48. During the aforementioned technical meeting between senior Agency officials and senior Iranian officials in Tehran on 23 February 2023, Iran confirmed the discrepancy and agreed to work with the Agency to address it.

### C.3.6. TRR

49. Iran has continued to process irradiated LEU targets for the intended purpose of testing the process for producing fission Mo-99 at the MIX facility. Since the previous quarterly report, the Agency has verified that Iran has irradiated at TRR two LEU targets enriched up to 20% U-235 in the form of U<sub>3</sub>O<sub>8</sub>, transferred from the MIX facility,<sup>58</sup> and then shipped them back to the MIX facility.<sup>59</sup>

50. On 11 February 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 single irradiated fuel plate.<sup>60</sup> 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 U<sub>3</sub>O<sub>8</sub>;

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<sup>56</sup> GOV/INF/2021/3, para. 5.

<sup>57</sup> All this nuclear material is under Agency containment and surveillance.

<sup>58</sup> GOV/2021/51, para. 32.

<sup>59</sup> The Agency confirmed that the second irradiated target made of uranium enriched up to 20% U-235 that was still at TRR when the previous quarterly report was issued, has since also been shipped back to the MIX facility.

<sup>60</sup> One fuel plate containing 75 g of uranium enriched up to 20% U-235 had a dose rate below that limit. Decision of the Joint Commission of 24 December 2015 (INFCIRC/907).

- 90 LEU targets, containing 1.36 kg uranium enriched up to 20% U-235 in the form of U<sub>3</sub>O<sub>8</sub>; 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.<sup>61</sup>

51. On 11 February 2023, the Agency verified that no additional fuel assemblies had been received at TRR and that all 15 TRR fuel assemblies, previously received from FFPF, had yet to be irradiated while two fuel assemblies were irradiated and in the reactor pond.

### **C.3.7. EUPP**

52. On 15 January 2023, the Agency verified at Enriched Uranium Powder Plant (EUPP) the receipt of 207 kg of uranium in the form of UF<sub>6</sub> enriched up to 3.3% U-235.

53. On 8 February 2023, the Agency observed that installation of equipment for the first stage of the process for converting UF<sub>6</sub> to UO<sub>2</sub> using the ‘integrated dry route’<sup>62</sup> was progressing slowly; the main process reactor had yet to be installed.

### **C.3.8. FMP**

54. On 19 February 2023, the Agency verified at the Fuel Manufacturing Plant (FMP) 166.1 kg of uranium in the form of UO<sub>2</sub> powder and fuel pellets and fuel pins enriched up to 3.5% U-235, some of which is intended for KHRR.<sup>63</sup>

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

55. Since 23 February 2021, the Agency has not had 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).

56. 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 installation of the cascades described above (para. 80.2).

57. Since 23 February 2021, the Agency has not had access to the data and recordings collected by its surveillance equipment installed to monitor both 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

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<sup>61</sup> GOV/2022/24, para. 29 and GOV/2022/39, para. 40.

<sup>62</sup> The integrated dry route is a process used for the conversion of UF<sub>6</sub> to UO<sub>2</sub>F<sub>2</sub> powder and then UO<sub>2</sub>F<sub>2</sub> powder to UO<sub>2</sub> powder.

<sup>63</sup> 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).

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.<sup>64,65</sup> On 29 August 2022, at Iran's request, the Agency removed seals that had been attached in December 2021 to one flow forming machine that had been used for the manufacturing of centrifuge components in the past.

58. As previously reported,<sup>66</sup> in January 2022, the Agency installed surveillance cameras at a new location at Esfahan intended for the production of centrifuge rotor tubes and bellows. The Agency removed these surveillance cameras between 9–11 June 2022.

59. As previously reported,<sup>67</sup> on 12 April 2022, the Agency completed the installation of surveillance cameras at a new workshop at a location at the Natanz site intended for the production of centrifuge rotor tubes and bellows, which was due to start the following day.<sup>68</sup> The Agency removed these surveillance cameras between 9–11 June 2022.

## 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 UF<sub>6</sub> enriched up to 3.67% U-235 (or the equivalent in different chemical forms) (para. 56).<sup>69</sup> The quantity of 300 kg of UF<sub>6</sub> corresponds to 202.8 kg of uranium.<sup>70</sup> The changes to the inventory of enriched uranium since the previous report are summarised in Annex 3.

61. Since 16 February 2021, the Agency has not been able to verify Iran's total enriched uranium stockpile, comprising enriched uranium produced at FEP, PFEP and FFEP and consumed as feed material at PFEP and FFEP, for each quarterly Board report.<sup>71</sup> Based on the information provided by Iran as described in the previous paragraphs, the Agency has estimated that, as of 12 February 2023, Iran's total enriched uranium stockpile was 3760.8 kg. This figure represents an increase of 87.1 kg since the previous quarterly report. The estimated stockpile comprised: 3402.0 kg of uranium in the form of UF<sub>6</sub>; 215.3 kg of uranium in the form of uranium oxide and other intermediate products; 58.4 kg of uranium in fuel assemblies and rods; and 85.1 kg of uranium in liquid and solid scrap.

62. As of 12 February 2023, the estimated total enriched uranium stockpile in the form of UF<sub>6</sub> of 3402.0 kg comprised:

- 1555.3 kg of uranium enriched up to 2% U-235 (–289.2 kg since the previous quarterly report);
- 1324.5 kg of uranium enriched up to 5% U-235 (+294.6 kg);
- 434.7 kg of uranium enriched up to 20% U-235 (+48.3 kg); and
- 87.5 kg of uranium enriched up to 60% U-235 (+25.2 kg).

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<sup>64</sup> GOV/INF/2019/12, para. 6.

<sup>65</sup> Decision of the Joint Commission of 14 January 2016 (INFCIRC/907).

<sup>66</sup> GOV/INF/2022/3, paras 2–5.

<sup>67</sup> GOV/INF/2022/10.

<sup>68</sup> GOV/INF/2022/11.

<sup>69</sup> GOV/INF/2019/8, paras 2 and 3.

<sup>70</sup> Considering the standard atomic weight of uranium and fluorine.

<sup>71</sup> Under Iran's Safeguards Agreement, the Agency is able to verify the physical inventory of nuclear material at each declared facility at the annual PIV.

63. As of 12 February 2023, the Agency verified that the inventory of uranium enriched up to 20% U-235 in forms other than UF<sub>6</sub> was 37.7 kg, consisting of 31.6 kg of uranium in the form of fuel assemblies,<sup>72</sup> 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 12 February 2023, the Agency verified that the inventory of uranium enriched up to 60% U-235 in forms other than UF<sub>6</sub> remains as 2.0 kg of uranium as previously reported, consisting of 1.6 kg of uranium in the form of mini-plates<sup>73</sup> verified on 11 February 2023 at TRR and 0.4 kg of uranium in the form of liquid and solid scrap verified on 14 February 2023 at FPPF.

## D. Transparency Measures

65. Since 23 February 2021, the Agency has not:

- had 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 (para. 67.1);
- been provided with any information or access to data from containment and surveillance measures relating to the transfer to UCF of UOC produced in Iran or obtained from any other source (para. 68);
- had access to the data and recordings collected by its surveillance equipment installed to monitor the production of UOC, and since 11 June 2022, when this surveillance equipment was removed, has ceased operation;
- been provided with any information on the production of UOC or on whether it has obtained UOC from any other source (para. 69).

66. 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

67. 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 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.

68. 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

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<sup>72</sup> Since the previous report, 2.7 kg of uranium enriched up to 20% U-235 were received from Russia in the form of fuel meats; of this amount, 1 kg of uranium was used to fabricate one fuel assembly; the remaining 1.7 kg of uranium were fabricated into fuel plates and are still in the fabrication process.

<sup>73</sup> Irradiated at TRR and stored in the reactor pool.

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. Since the Director General's previous report, Iran has made no offer to the Agency to address this issue.

69. 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.

70. 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**

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

72. 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 years, including the past nearly nine months during which time no surveillance and monitoring equipment was installed and operating. This would prevent the Agency from re-establishing continuity of knowledge in relation to the production and inventory of centrifuges, rotors and bellows, heavy water and UOC, in the event of a full resumption of implementation by Iran of its JCPOA nuclear-related commitments. Under such circumstances, any future baseline for the above-mentioned JCPOA verification and monitoring activities would take a considerable time to establish and would have a significant degree of uncertainty. The Agency would be prepared to work on specific arrangements with Iran, which would be indispensable in addressing this issue.

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

74. Regarding the origin of the particles enriched above 60% U-235, identified after the implementation of the new cascade configuration at FFEP, discussions with Iran are still continuing. These events clearly indicate the capability of the Agency to detect and report in a timely manner changes in the operation of nuclear facilities in Iran.

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 JCPOA<sup>74</sup>**

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

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<sup>74</sup> Implementation of modified Code 3.1 is a legal obligation and is not reflected in the table.

## Annex 2

**Three updates since the Director General's previous Quarterly Report**

GOV/INF	Date	Content
2022/24	22 November 2022	Expansion of enrichment activities at FEP and start of enrichment of UF <sub>6</sub> up to 60% U-235 at FFEP.
2022/25	29 November 2022	Planned installation of IR-2m, IR-4 and IR-6 centrifuges in R&D production line 5 at PFEP.
2023/1	1 February 2023	Iran implements substantial change in the design information of FFEP without informing the Agency in advance.



## Annex 3

**Enriched UF<sub>6</sub> Feed, Production and Inventory  
since the Director General's previous Quarterly Report**

Facility	Centrifuge Type	Installed Cascades <sup>75</sup>	Total Planned Cascades	Feed Enrichment Level (% U-235)	Quantity Fed (kg UF <sub>6</sub> )	Product Enrichment Level (% U-235)	Quantity produced (kg UF <sub>6</sub> )
FEP	IR-1	36	36	Natural	-	<5%	1657.4
	IR-2m	21	21				
	IR-4	4	12	<2%	1967.0		
	IR-6	3	3				
FFEP	IR-1	6	0	<5% <sup>76</sup>	816.0	<2%	879.7
	IR-6	2	16			<20%	71.7
						<60%	18.9
PFEP	IR-4 (Line 4)	1	1	<5%	517.4	<60%	18.4
	IR-6 (Line 6)	1	1				
	IR-5 and IR-6s (Line 5)	1	1	Tails from Lines 4 & 6	N/A	<5%	103.3
						<2%	396.9
Various (Lines 1, 2 and 3)			Natural	-	<2%	201.6	

Enrichment level (% U-235)	Inventory as at 22 October 2022 (kgU)	Quantity Fed (kgU)	Quantity Produced (kgU)	Inventory as at 12 February 2023 (kgU)
<2%	1844.5	1327.7	997.8	1555.3 <sup>77</sup>
<5%	1029.9	900.0	1188.5	1324.5 <sup>78</sup>
<20%	386.4		48.4	434.7
<60%	62.3		25.2	87.5

<sup>75</sup> Different numbers of cascades were fed during the reporting period.

<sup>76</sup> See footnote 55.

<sup>77</sup> See footnote 26.

<sup>78</sup> See footnote 56.

## Annex 4

**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