

# Board of Governors

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(GOV/2004/51)

## Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya

*Report by the Director General*

### **A. Introduction**

1. On 1 June 2004, the Director General submitted to the Board of Governors for its consideration a report (GOV/2004/33) on a number of safeguards issues that needed to be clarified and actions that needed to be taken in connection with the implementation of the Agreement between the Socialist People's Libyan Arab Jamahiriya (hereinafter referred to as Libya) and the International Atomic Energy Agency (IAEA) for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/282) (the Safeguards Agreement).<sup>1</sup>
2. In that report, the Director General stated that Libya had failed to meet its obligations under its Safeguards Agreement with respect to the reporting of nuclear material imported into Libya and the subsequent processing and use of the material and the declaration of facilities and other locations where the material was stored and processed, and that Libya had received documents on nuclear weapon design and fabrication information. The report described these failures and the actions being taken by Libya to correct them. In his report, the Director General also referred to the Agency's on-going activities to verify the correctness and completeness of Libya's declarations and the measures the Agency intended to take in order to pursue and resolve questions that remained open.
3. The Director General's report (GOV/2004/33, paragraph 14) also noted the matters that needed further action: understanding of Libya's plans to produce and/or acquire UF<sub>6</sub> (uranium hexafluoride) and confirmation of the origin of the UF<sub>6</sub> received by Libya in 2000 and 2001; resolution of the issue

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<sup>1</sup> The Director General first reported to the Board of Governors on this matter in GOV/2003/82 of 22 December 2003, and again in GOV/2004/12 of 20 February 2004.

of the sources of low enriched and high enriched uranium contamination found on gas centrifuge equipment in Libya; assessment of Libya's gas centrifuge enrichment activities and of the results of environmental and nuclear material samples; verification of uranium ore concentrate holdings in Libya; and assessment of the full history of the Libyan nuclear weapon related activities, including organizational arrangements and supporting documentation.

4. At the conclusion of the Board's consideration of the Director General's report, the Board welcomed the cooperation of Libya and the steps taken to facilitate the Agency's activities. The Board noted that there were some matters that required further action and called for Libya as well as all other countries concerned to provide the necessary information to enable outstanding issues to be addressed. The Board requested the Director General to present a report on those pending matters to the September Board session, or earlier as appropriate.

5. This report contains a chronology of events and describes the Agency's verification findings during the period from June through mid-August 2004.

## **B. Chronology from June 2004**

- On 30 June 2004, the Agency provided Libyan authorities with written comments on the declarations submitted by Libya on 26 May 2004 required under Article 2 of its Additional Protocol.
- From 19 to 22 July 2004, the Agency held discussions with Libyan representatives on Libya's initial Additional Protocol declarations and uranium conversion programmes, and also discussed the Agency's plans to visit the Welding Institute near Tripoli and to conduct complementary access at the Renewable Energies and Water Desalination Centre (REWDC).<sup>2</sup>
- From 25 to 28 July 2004, the Agency verified Libya's declared "yellowcake"<sup>3</sup> holdings at Sabha.
- On 2 August 2004, the Agency received revised declarations pursuant to Article 2 of Libya's Additional Protocol.
- On 13 August 2004, the Agency sent the latest results of environmental sample analyses to Libyan authorities for comments.
- On 16 August 2004, the Agency met with senior Libyan officials in Vienna to review progress and to agree on the actions to be taken regarding the investigation of Libya's past nuclear activities. During this meeting the Agency was given revised accounting reports for the uranium conversion research and development facility at REWDC, as well as additional revisions to Libya's declarations pursuant to Article 2 of its Additional Protocol.

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<sup>2</sup> Formerly known as the Tajura Nuclear Research Centre.

<sup>3</sup> Yellowcake is another term for uranium ore concentrate.

## **C. Summary of Verification Findings**

6. On 29 December 2003, Libya provided the Agency a brief “time line” describing a series of past nuclear related activities that had not been previously reported to the Agency. Since then the Agency has met many times with senior Libyan officials and conducted several inspections and visits to facilities and locations in Libya in an effort to fully understand the history and technical features of Libya’s past nuclear activities. In response to Agency requests, Libya has provided detailed supplementary information on several aspects of its past nuclear activities (particularly concerning uranium conversion activities). The information provided by Libya has been checked against information from other sources and, to the extent possible, directly verified by Agency inspections, complementary accesses and other visits.

7. Some aspects of Libya’s past nuclear activities can be fully understood and confirmed only with the cooperation of foreign sources. Nearly all of the equipment involved in Libya’s past nuclear activities was obtained from abroad, often with the involvement of private intermediaries. The Agency is pursuing discussions with some of the private intermediaries involved, and several Member States are supporting the Agency’s investigations. These lines of enquiry are by nature somewhat slow to develop (e.g. due to on-going legal actions), and will continue for some time.

8. New information and findings, obtained since May 2004, are summarized below. Some of the open issues identified in GOV/2004/33 have now been resolved and the remaining issues will be pursued further by the Agency.

### **C.1. Imports of Nuclear Material**

#### **C.1.1. Imports of Uranium Ore Concentrate**

9. In its December 2003 time line, Libya stated that a total of 2263 tonnes of yellowcake had been imported between 1978 and 1981 from two producers (see GOV/2004/33, Annex 1, paragraphs 15 and 16). The total amount of uranium contained in the yellowcake imported by Libya was 1587 tonnes contained in 6367 drums. As reported in GOV/2004/33, that total has been confirmed by documents provided by the producers, and Libya has stated that no uranium ore concentrate was imported from other suppliers, nor produced domestically.

10. In July 2004, the Agency carried out a verification of Libya’s yellowcake inventory. Libya had to rearrange the drums containing the yellowcake so that they could be accurately counted and randomly sampled. The reorganization took several months due to the large number of drums, the difficult working conditions in the storage location and the unavailability of necessary equipment. The Agency has been able to confirm that the declared number of drums (6367) was correct. In addition, 160 drums were randomly selected for non-destructive assay of natural uranium. Twenty-three additional drums were randomly selected for weighing and sampling for laboratory analysis. All the drum weights agreed with Libya’s declarations. The samples are being analysed to confirm that the drum contents are natural uranium ore concentrate. Sample analysis is still pending and the results are expected by September.

## **C.2. Imports of Other Nuclear Material**

11. It was reported in GOV/2004/33 (Annex 1, paragraph 20) that Libya received UF<sub>6</sub> from a foreign source in September 2000 (two small cylinders) and again in February 2001 (one large cylinder). It was also reported that the Agency had completed sampling and analysis of the two small cylinders, which were found to contain natural uranium in one case and depleted uranium (0.3 percent U-235) in the other. In June 2004, the Agency completed its sampling and analysis of the large cylinder, which was found to contain natural uranium. The Agency has continued to discuss this issue with the States that may have information on the origin of the UF<sub>6</sub>. The Agency has urged Libya to further investigate whether any documentation related to the acquisition or procurement of the UF<sub>6</sub> can still be located.

12. Sample results have been obtained for the uranium compounds imported by Libya in 2002 for use as laboratory standards (see GOV/2004/33, paragraph 22). Some of the labels on the standards indicated that they contained non-nuclear material, but sample analysis has shown that the standards contain depleted uranium (0.4 percent U-235). The origin of these compounds remains to be confirmed.

## **C.3. Uranium Conversion**

13. As reported in (GOV/2004/33, Annex 1, paragraphs 23–25), Libya conducted a series of uranium conversion experiments in an undeclared facility at the REWDC, mainly during the 1980s. However, Libya has stated that these experiments did not include any production or use of UF<sub>6</sub>. The Agency has explored this statement with Libya, since gas centrifuge enrichment is only possible with uranium in the form of UF<sub>6</sub>. The Agency has had several discussions with Libyan authorities in an attempt to clarify Libya's former plans in this respect.

14. It was also reported in GOV/2004/33 (Annex 1, paragraph 25) that a group of Libyan scientists studied fluorine chemistry in the mid-1980s in a foreign country. This matter was further discussed with Libyan authorities in July 2004, and Libya has provided the Agency with information on the training agreement, stating that four students attended three months of a training programme that was originally planned to last one year. A company from the country concerned participated in the construction of the building at REWDC where the undeclared uranium conversion experiments took place. Libya has stated that no uranium conversion or fuel fabrication equipment was received from the foreign country in question, and that no fuel fabrication equipment was ever received from any other sources.

15. It was reported in GOV/2004/33 (Annex 1, paragraph 27) that, beginning in 1981, a foreign company conducted negotiations with Libya concerning the construction of a series of uranium conversion laboratories and facilities. In July 2004 Libya provided documents relevant to those negotiations for Agency review. According to Libyan authorities, three projects were envisioned in the proposals from the company. The first was a chemical, mineralogical and ore-processing laboratory, consisting of three buildings to be located in Sabha (where the yellowcake is currently stored). One building would have been for administration, one for chemical analysis, mineralogy and process testing, and one for ore crushing, sampling and auxiliary services. None of those buildings was designed to process large quantities of uranium. The second project was for laboratories for the conversion of yellowcake into UO<sub>3</sub> (uranium trioxide) and conversion of UO<sub>3</sub> to UF<sub>4</sub> (uranium tetrafluoride). The second project also included the option of a uranium metal laboratory, and provided detailed specifications for large scale production of natural uranium metal. At certain stages of the negotiation it was envisioned that process buildings (but not necessarily process equipment) would be provided to support UF<sub>6</sub> production from UF<sub>4</sub>. The third project was for uranium conversion

laboratories to be located on a site adjacent to REWDC. The company has confirmed that these projects were not implemented.

16. In 1984, Libya ordered a modular uranium conversion facility (called the UCF) from a foreign company. The history of the UCF was described in GOV/2004/33 (Annex 1, paragraphs 29–31). Most of the equipment was delivered in 1994, but Libyan authorities have stated that one module of the UCF, related to the production of UF<sub>4</sub>, was never received by Libya. At the Agency's request, Libya has provided some additional documentation on the procurement of the UCF, and the Agency is continuing to discuss this matter with officials of the country where the supplier was located.

17. The Agency has no additional information about the request of Libyan scientists to acquire fluorination equipment to produce 15–30 tonnes of UF<sub>6</sub> annually (see GOV/2004/33, Annex 1 paragraph 30). The Libyan authorities have stated that they did not proceed with the request.

18. On 22 July 2004, the Agency conducted a complementary access at the REWDC. Two radiochemical laboratories involved in early uranium conversion work were examined and environmental samples were taken. The results of the sample analyses are pending. At this point, many environmental samples have been taken in parts of the REWDC used for uranium conversion work. All samples analysed to date have shown only natural uranium, in line with Libya's declarations.

19. On 16 August 2004, the Agency received revised accounting reports for the uranium conversion research and development facility at REWDC. Since this facility was not declared to the Agency when uranium conversion experiments were conducted there in the 1980s, the Agency has asked Libya to provide design information and relevant accounting reports (including retrospective reports of all inventory changes). Libya has now provided drafts of all the necessary design information and accounting reports and these are under review.

#### **C.4. Uranium Enrichment**

20. As reported in GOV/2004/33, all L-1 and L-2 centrifuge parts and enrichment process equipment were removed from Libya to the United States of America (USA) in January 2004, in accordance with an agreement between the two countries. The Agency is undertaking a full analysis of the inventory of equipment in the USA to refine the assessment of the completeness of Libya's declarations and to support the Agency's investigations of the clandestine procurement network.

21. It was also reported in GOV/2004/33 (Annex 1, paragraph 35) that Libya declared that two L-2 centrifuges, together with the two small UF<sub>6</sub> cylinders mentioned above, were imported in September 2000 from a foreign supplier. Agency discussions with officials from the State where the supplier was located have confirmed this information. These imports were arranged through a clandestine procurement network. Ongoing investigations, in cooperation with several Member States, have also confirmed that the network acted as an intermediary for the production, shipment and delivery to Libya of the parts required for the assembly of 10 000 L-2 centrifuges. In June 2004, it was found that L-1 cylinders (used in centrifuge rotors) were also contained in certain shipments from a supplier in a foreign country. It has been determined by the Agency that L-2 centrifuges, bases, drive motors, drive converters and magnets were clandestinely obtained by the network through foreign suppliers. The Agency's investigations are continuing.

22. The Agency's centrifuge experts have analysed several versions of the L-1 and L-2 centrifuge drawings provided by Libya on electronic media, to determine the chronology and source of the documents. It is now clear to the Agency that the L-1 and L-2 centrifuge drawings are similar to early European-origin centrifuge designs and have a number of common features with P-1 and P-2

centrifuge designs as well as P-1 centrifuge components seen by Agency inspectors in the Islamic Republic of Iran.

23. The Agency has continued to work with the State where most of the L-1 centrifuge components (including rotors) are believed to have originated. Some of those components show contamination with low and high enriched uranium particles (see GOV/2004/33, Annex 1, paragraph 34). Authorities from that State have taken some samples from the suspected supplier of the components and have shared the sample data with the Agency. The Agency will continue to pursue a more definitive understanding of the sources and reasons for the contamination. This investigation is continuing, but can only be completed if the Agency is permitted to take independent swipe samples at locations where the enriched uranium contamination may have originated. In connection with this work, information from intermediaries and/or the companies and workshops involved in the production and storage of centrifuge components is indispensable.

24. The Agency has also received support from a State where rotor drives and some types of magnets were procured by the network. Investigations are also continuing into a consignment of UF<sub>6</sub> process equipment that was part of the L-2 centrifuge programme and destined for Libya, but never arrived. Libya along with other States and individuals are assisting in these efforts.

25. It was reported in GOV/2004/33 (Annex 1, paragraph 32) that a small number of unfinished maraging steel tubes of the same diameter as those used in L-2 centrifuges were found in Libya. Libya has stated that the tubes were supplied in the early 1980s and that there is no information on their origin. Careful examination of these tubes and other centrifuge components is currently being undertaken in an attempt to determine the original source.

26. The Agency has continued to investigate centrifuge related training (see GOV/2004/33, Annex 1, paragraphs 39–40) that took place in various locations. The findings so far have been consistent with the statements of the Libyan authorities, but the investigation is continuing.

27. On 21 July 2004, the Agency visited the Welding Institute near Tripoli to take environmental samples and to meet with personnel from the Institute. The Welding Institute was one of the locations visited in January 2004 by the Agency in connection with nuclear weaponization issues (see GOV/2004/12, 20 February 2004). In light of the specialized equipment at the Welding Institute, the Agency sought to confirm that no work related to gas centrifuge development had been conducted there. Libya stated that no work had been performed at the Welding Institute in connection with Libya's enrichment programme and that none of the special fabrication materials associated with gas centrifuges were or had been in the Institute's possession. Results of environmental samples are pending.

## **C.5. Irradiation of Uranium Targets**

28. In June 2004, sample analysis results were received for the hot cells at REWDC where small uranium targets had been irradiated in the Tajura Research Reactor (see GOV/2004/33, Annex 1, paragraph 43). The results show mainly natural uranium, with traces of depleted uranium and plutonium. These results are consistent with Libyan statements concerning the use of the hot cells.

## **C.6. Additional Protocol Implementation**

29. On 26 May 2004, as reported in GOV/2004/33, Libya submitted the initial declarations required under its Additional Protocol. On 30 June 2004, the Agency provided the Libyan authorities with written comments on the declarations.

30. From 19 to 22 July 2004, the Agency met with Libyan representatives concerning the initial Additional Protocol declarations. Agreement was reached on revisions to the declarations in response to the Agency's comments and Libya has submitted the revised initial declarations, as well as the first annual update of the declarations. The Agency received these in August and they are being reviewed.

31. Altogether, the Agency has conducted three complementary accesses in Libya under the terms of its Additional Protocol. In all cases, Libya has cooperated fully in providing the requested access and in providing detailed information on past and current activities carried out at those locations.

## **C.7. Nuclear Weaponization Issues**

32. As reported in GOV/2004/33, Annex I, paragraphs 44–45, Libya provided the Agency documents related to the design and fabrication of a nuclear explosive device that were provided by a foreign source. Those documents are presently undergoing forensic analysis to establish inter alia the dates of the printing and the source of the paper, as well as other characteristics.

33. The Agency continues to review the capabilities available at locations that could be used for nuclear weapon related activities.

34. As already highlighted in GOV/2004/33, the ability of the Agency to derive a credible assessment on whether, as declared, Libya had not taken any concrete steps in connection with the information on weapon design and fabrication available to it, would benefit greatly from the provision of additional information, including from the provider of the weapon design and fabrication information and from those contractors which helped Libya develop some of its dual use infrastructure.

## **D. Assessment and Next Steps**

35. Libya has shown good cooperation with the Agency since the beginning of the verification activities in Libya that followed Libya's declaration in December 2003. This has enabled the Agency to build an understanding of Libya's previously undeclared nuclear programme. Libya has provided prompt access to locations requested by the Agency, has made senior personnel available and has taken corrective actions to come into compliance with its Safeguards Agreement.

36. The Agency's assessment to date is that Libya's declarations on its uranium conversion programme, enrichment programme and other past nuclear related activities appear to be consistent with the information available to and verified by the Agency. As indicated above, there are still some areas related to the acquisition of UF<sub>6</sub>, uranium conversion technology and enrichment technology that need further investigation in order to fully verify the completeness and correctness of Libya's declarations. These investigations are ongoing.

37. The cooperation of Libya and other Member States remains essential for the successful completion of the Agency's verification work relevant to Libya's past undeclared nuclear programme, particularly in clarifying the role of the clandestine supply network in supporting this programme, and in confirming the sources of contamination of some enrichment related equipment by low and high enriched uranium particles.

38. The Director General will continue to report developments as part of the periodic reporting of the Agency's verification activities unless circumstances warrant otherwise.