

Board of Governors

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

Report by the Director General

1. As foreseen in para. 5 of GOV/2003/82 of 22 December 2003, this report provides further information on recent developments regarding the implementation of the Agreement between the Socialist People's Libyan Arab Jamahiriya (hereinafter referred to as "Libya") and the Agency for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (hereinafter referred to as "the Safeguards Agreement").

A. Background

2. Libya became a party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) on 26 May 1975, and its Safeguards Agreement pursuant to the NPT entered into force on 8 July 1980 (INFCIRC/282).

3. Prior to 20 December 2003, Libya's declared nuclear programme¹ consisted of a 10 MW(th) IRT research reactor in operation since 1980, and a Critical Assembly (100 W), both of which are located at the Tajura Nuclear Research Centre (TNRC). The IRT is a pool-type research reactor using 80% enriched uranium. Prior to December 2003, the total quantity of declared nuclear material under safeguards in Libya amounted to 20 kg of uranium-235 in high enriched uranium fuel and 1000 tonnes of uranium ore concentrate (UOC).

¹ In open source literature in recent years, there were references to the possibility of an undeclared nuclear programme in Libya. The Agency, however, had no actionable information to act on.

B. Chronology since December 2003

4. On 19 December 2003, Libya announced its decision inter alia “to eliminate...materials, equipments and programmes which lead to the production of internationally proscribed weapons.” On the same day, Libya transmitted the text of the Libyan Statement regarding its decision to the Director General.

5. Libya also sent a letter to the President of the United Nations Security Council in which, inter alia, Libya reiterated the content of the above mentioned Statement, reaffirmed that Libya considered itself bound by the NPT and stated that “it accept[ed] any other commitments including the Additional Protocol to the IAEA Safeguards Agreement.” The letter added that Libya was “ready to receive the visits of inspection teams to verify its compliance with those commitments.” On 23 December 2003, the President of the Security Council issued a Press Statement, in which the Security Council members, inter alia, welcomed and encouraged Libya’s cooperation with others, including the United Nations and other relevant international bodies, to ensure the verified elimination of all of Libya’s weapons of mass destruction programmes, and “looked forward to the early implementation of all the commitments made in the [Libyan] announcement including the subjection to urgent international verification.”²

6. On 20 December 2003, the Director General met in Vienna with a Libyan delegation headed by Mr. Matoug M. Matoug, Secretary of the General People’s Committee and Secretary of the National Board of Scientific Research (NBSR). As reported in GOV/2003/82, during the meeting, the Libyan delegation informed the Director General that Libya had been engaged for more than a decade in the development of a uranium enrichment capability. This included importing natural uranium and centrifuge and conversion equipment, and the construction of a now dismantled pilot scale centrifuge facility. Some of these activities should have been, but had not been, reported to the Agency under the Safeguards Agreement. The Director General was informed, however, that Libya’s enrichment programme was at an early stage of development and that no industrial scale facility had been built, nor any enriched uranium produced. The Libyan delegation also informed the Director General that Libya had obtained nuclear weapon design and fabrication documents. The delegation expressed Libya’s commitment to ensuring, through Agency verification, that all of its nuclear activities would henceforth be under safeguards and exclusively for peaceful purposes.

7. From 27 to 29 December 2003, the Director General visited Libya and met senior Libyan officials, including H.E. Colonel Muammar Al-Gaddafi, Leader of the Libyan Revolution; Mr. Shukri Mohammad Ghanem, the General Secretary of the People’s Committee (Prime Minister); and Mr. Abdulrahman Mohamed Shalgam, Secretary of the General People’s Committee for Foreign Affairs and International Co-operation. The Director General was accompanied by a senior Agency team of technical and legal experts, which visited nine locations related to undeclared nuclear activities and initiated a process of verifying the previously undeclared nuclear materials, equipment, facilities and activities. The Libyan authorities confirmed to the Director General Libya’s decision to conclude a Protocol Additional to its Safeguards Agreement and, pending its entry into force, to act as if the Additional Protocol were in force as of 29 December 2003.

8. From 20 through 29 January 2004, another team of Agency inspectors, including nuclear weapon and centrifuge technology experts, visited Libya to continue the verification process. Libyan officials informed the Agency that, pursuant to mutual understandings with the United Kingdom (UK) and the

² United Nations Security Council Press Release, *Press Statement on Libya by Security Council President*, 23 December 2003 (Document: SC/7967).

United States of America (USA), Libya had agreed to transfer to the USA sensitive design information, nuclear weapon related documents, and most of the previously undeclared enrichment equipment, subject to Agency verification requirements and procedures. The Agency made it clear that these items constituted a part of the Agency's evidence and were to remain under Agency seal and legal custody until the Agency has been able to verify the correctness and completeness of Libya's declarations. An Agency inspection team conducted follow-up verification activities in Libya, from 16 through 19 February 2004.

9. On 18 February 2004, the Agency received written confirmation from Libya regarding its decision to conclude an Additional Protocol. In the letter, Libya also confirmed that Libya will act, as of 29 December 2003, as if the Additional Protocol had entered into force.

C. Verification Activities

10. During the Director General's initial visit to Libya, the Agency was informed by Libya that twelve different sites had been involved in its undeclared nuclear programme since the beginning of the 1980s. Annex I contains a list of these 12 sites. The programme was described as including nuclear material and facilities, and uranium conversion and enrichment activities, which it had failed to report to the Agency. Libya also provided information on nuclear cooperation with other countries as well as information on some of the sources of sensitive nuclear technology.

C.1. Imports of Nuclear Material

11. Libya has declared that it had imported a total of 2263 tonnes of UOC between 1978 and 1981. One thousand tonnes of the UOC had been imported in 1981 and reported to the Agency in accordance with Libya's Safeguards Agreement. The remainder has now been declared as having been imported before Libya's Safeguards Agreement came into force in 1980.

12. On 25 January 2004, Agency inspectors visited the UOC storage location at Sabha (Site F). Due to the lack of documentation and of organized storage conditions, it was not possible to complete all the planned verification activities. Inspectors weighed, and took samples of UOC from, a number of accessible drums. The Agency has requested that Libya organize the drums to permit a proper verification of its UOC stocks later this year.

13. In December 2003, Libya provided information about the export in 1985 of some of the UOC for processing into a variety of uranium compounds. Libya did not report the export in 1985 and the current Libyan declaration to the Agency is not clear about the exact amount exported³. This subject will be investigated further. According to the Libyan authorities, the recipient State transferred natural UF₆ (39 kg), UF₄ (5 kg), UO₂ (6 kg) and U₃O₈ (6 kg) back to Libya in 1985. Those imports were subject to reporting under Libya's Safeguards Agreement, but Libya failed to report them to the Agency at that time. The UF₆ and other uranium compounds received in 1985 were verified by the Agency inspectors during their visit in January 2004. The UF₆ was placed under Agency seal and

³ The receiving country was a nuclear-weapon State, hence the export reporting requirement of Article 34(a) of Libya's Safeguards Agreement did not apply.

transferred out of Libya. Libya has undertaken to submit the necessary nuclear material accounting reports with respect to these imports.

14. Libya also stated that it had imported two small cylinders containing UF₆ in September 2000, and one large cylinder containing UF₆ in February 2001, which it had failed to report to the Agency. Libya has not yet confirmed the origin of these UF₆ imports. Using non-destructive assay methods, the Agency has determined that the largest cylinder contains about 1.7 tonnes of low enriched uranium (approximately 1% uranium-235), and that the two other smaller cylinders contain natural and depleted uranium. The contents of all three UF₆ cylinders were verified by Agency inspectors, placed under Agency seal and transferred out of Libya. Libya has undertaken to submit the relevant nuclear material accounting reports with respect to the import of this material.

15. Libya indicated that, in 2002, it had imported some additional uranium compounds from another country, mostly in solution form, for use as standards in chemical laboratories, but had failed to report them to the Agency. Libya has undertaken to submit the relevant nuclear material accounting reports.

C.2. Uranium Conversion Activities

16. The Libyan authorities stated that, during the 1980s, Libya had conducted undeclared laboratory-scale and bench-scale uranium conversion experiments at the TNRC using imported UOC and possibly other imported uranium compounds. Libya failed to report these activities to the Agency as required by the Safeguards Agreement, and failed to provide design information for the facilities where these experiments took place. Approximately 22 kg of natural uranium used in the conversion experiments were verified by the Agency and it will verify the newly declared uranium holdings at Tajura. The Agency will further investigate the details of the conversion experiments. Libya has undertaken to submit design information for the facilities at Tajura where the experiments took place, and to provide records pertaining to the experiments and all relevant nuclear material accounting reports.

17. According to the Libyan authorities, in 1984, Libya ordered from abroad a pilot scale uranium conversion facility, fabricated in portable modules in accordance with specifications provided by Libya. These modules were received in 1986 and stored until 1998 in various locations around Tripoli. In 1998, the modules were moved and partially assembled at Sawani (Site G) and subsequently moved to Al Khalla (Site C), into what would be called the Uranium Conversion Facility (UCF).

18. The first cold testing of the UCF was not conducted until February 2002. For security reasons, Libya decided in April 2002 to move the UCF again. Between March and October 2003, Libya carried out the dismantling, packing and moving of the UCF to Salah Eddin (Site D), where most of the modules currently are located. The milling and waste treatment modules, however, are still at Sawani (Site G). Libya failed to provide the Agency with the relevant design information for the UCF, but has undertaken now to do so.

19. Libya has stated that no uranium has been processed in the UCF. According to the information provided by Libya, the plant has an estimated annual feed capacity of 30 tonnes of uranium and could produce UF₄, UO₂ and uranium metal, but it has no UF₆ production capability. Libya has stated that it had tried, unsuccessfully, to acquire UF₆ production capability. It has also stated that there has been no domestic UF₆ production, even on a laboratory scale.

20. During the December 2003 and January 2004 inspections, the Agency took environmental samples from selected UCF equipment and at buildings where UCF equipment was said to have been located. The results of the analyses are still pending.

C.3. Uranium Enrichment

21. According to the Libyan authorities, in the early 1980s, a foreign expert assisted by Libyan technicians initiated research and development on uranium gas centrifuge enrichment at Tajura, using a centrifuge design that the expert had brought with him. Libya stated that, by the time the expert left (around 1992), Libya had not yet been able to produce an operating centrifuge, and had not conducted any experiments using nuclear material. However, experience had been gained in the design and operation of centrifuge equipment, vacuum technology and mass spectrometry, which proved to be useful in the next phase of the enrichment programme. Libya has provided some drawings and access to equipment for Agency examination. The drawings and equipment, as well as environmental samples taken from the equipment, are currently being assessed.

22. The Libyan authorities stated that, in July 1995, Libya made a strategic decision to reinvigorate its nuclear activities, including gas centrifuge uranium enrichment. According to the Libyan authorities, in 1997, foreign manufacturers provided 20 pre-assembled L-1⁴ centrifuges and components for an additional 200 L-1 centrifuges, including process gas feeding and withdrawal systems, UF₆ cylinders and frequency converters. One of the 20 pre-assembled rotors was used to install a completed single centrifuge at Al Hashan (Site A). A first successful test was completed by October 2000.

23. Libyan authorities informed the Agency that, in late 2000, Libya started to progressively install 9-machine, 19-machine and 64-machine L-1 centrifuge cascades into a larger hall at Al Hashan (Site A). By April 2002, the 9-machine cascade was complete and under vacuum, with all pipes, electrical connections and process equipment installed. The 19-machine cascade was at a similar state of completion, with the first 10 rotors installed but not under vacuum. The 64-machine cascade, together with its process equipment, was only placed in position ready for installation. By then, the mechanical test equipment for the completed single centrifuge had also been moved to the larger hall. Libya stated that, at this time (April 2002), for security reasons the centrifuge equipment associated with the three cascades was dismantled, boxed and moved to Al Fallah (Site B), where it remains in storage, except for the parts transferred out of Libya.

24. Libya has stated that no nuclear material had been used during any tests conducted on the L-1 centrifuges. The Agency is currently reviewing technical reports provided by Libya, and is awaiting the results of environmental samples taken at relevant locations prior to completing a first assessment.

25. Libyan authorities stated that, in September 2000, Libya received two centrifuges of the type called L-2. These are similar to another European design (more advanced than the L-1 type centrifuges), and use maraging steel rotors instead of aluminium rotors. Libya stated that it had placed an initial order for 5000 centrifuges based on this design, and later extended this to 10 000 machines. The components were manufactured in another country and started to arrive in large quantities in December 2002. Out of the 10 000 centrifuges ordered, Libya had received a considerable number of parts, mainly casings, by the time of the Agency inspections in late December 2003. However, according to Libya, no additional rotors were included in the shipments. Libya has also given information to the Agency about the seizure, in early October 2003, of a freight ship at a northern Mediterranean port, carrying centrifuge enrichment related equipment manufactured elsewhere.

26. According to Libyan authorities, all of the centrifuge components found in Libya were manufactured outside Libya, although Libya had imported equipment for a fairly large precision machine shop, now located at Janzour (Site E), to establish a domestic production capability. The

⁴ The L-1 centrifuge design is an old design of European origin, also referred to as G-1, or P-1.

machine shop equipment is still stored in shipping crates. Libya acknowledged that it had also acquired a large stock of maraging steel and high strength aluminium alloy that are essential for the production of centrifuge components. This technology transfer included training of Libyan staff at foreign locations, on at least three occasions.

27. The Agency has examined the centrifuges and the stocks of components and taken environmental samples to verify the Libyan statements. The Agency has been in contact with the governments of countries where the components were said to have been manufactured as part of its effort to verify the information provided by Libya. This process is continuing.

C.4. Irradiation and Reprocessing

28. Libya has stated that it failed to report the fabrication of several dozen small uranium oxide and uranium metal targets, on a gram scale, and their subsequent irradiation in the Tajura Research Reactor between 1984 and 1990, to produce mainly fission product radioisotopes. Thirty-eight of the targets, each containing about one gram of uranium, were dissolved and radioisotopes extracted using ion exchange methods or solvent extraction at the hot cells at the adjacent radiochemical laboratory. Forty-eight additional targets were irradiated but not processed, and are currently stored in one of those hot cells. Libya has indicated that plutonium (in very small quantities) was separated from at least two of the irradiated targets.

29. Libya has agreed to submit revised design information for the Tajura Research Reactor and to include the radiochemical laboratory as part of the facility. Libya has agreed to submit nuclear material accountancy reports to cover fabrication, irradiation and subsequent processing of uranium targets.

C.5. Nuclear Weaponization Issues

30. Libya has acknowledged that it had received documentation related to nuclear weapon design and fabrication from a foreign source. Libya has stated that these documents were the only such documentation existing in Libya. Libyan authorities stated, however, that two copies of these documents were provided to the UK and the USA prior to the Agency's visit in December 2003. The Agency placed the original documents under its seal on 31 December 2003. The documents were reviewed by Agency experts on 20 January 2004, and again placed under Agency seal before being transferred to the USA. The Agency has been assured that these documents will remain accessible to the Agency for further examination, including forensic analysis, until the Agency has been able to verify the correctness and completeness of Libya's declarations.

31. The documents presented by Libya include a series of engineering drawings relating to nuclear weapon components, notes (many of them handwritten) related to the fabrication of weapon components. The notes indicate the involvement of parties other than Libya, which will require follow-up investigation.

32. The Libyan authorities have stated that they had received the documents in late 2001 or early 2002. Libya has stated that it did not take any steps to assess the credibility or explore the practical utility of the information available in the documents. Libya stated that it had had no national personnel competent to evaluate the data and would have asked the supplier for help in the event it had opted to take further steps to develop a nuclear weapon. The Libyan authorities have stated that no other nuclear weapon related information exists in the country.

33. In order to initiate the verification of the Libyan declarations, the Agency requested the Libyan authorities to disclose all capabilities currently existing in Libya that could contribute to weaponization activities. Libya provided the Agency with information on such capabilities and

subsequently allowed the Agency to visit sites deemed relevant by the Agency. The Agency inspected 18 locations identified by Libya that could have, from a technical standpoint, provided support to a nuclear weapon research and development programme. These locations, which are listed in Annex II, included those related to the handling of high explosives, ammunition production, missile propellant fabrication and testing, missile warhead design and manufacturing, metal casting, welding and machining, and chemical and plastic materials research and development and production. While the Agency has identified some infrastructure (such as bermed buildings for the handling of energetic materials) and dual use equipment (for instance machine tools) which could represent capabilities useful for a weapon development programme, initial inspections of these locations did not identify specific facilities currently dedicated to nuclear weapon component manufacturing. Additional analytical and field activities will be necessary before the Agency is able to assess, whether, as declared, Libya had not taken any concrete steps in connection with the information on weapon design and fabrication available to it.

D. Findings, Initial Assessment and Next Steps

34. Starting in the early 1980s and continuing until the end of 2003, Libya imported nuclear material and conducted a wide variety of nuclear activities which it had failed to report to the Agency as required under its Safeguards Agreement. These failures, and the corrective actions to be taken by Libya, can be summarized as follows:

- (a) failure to declare the import of UF₆ in 1985, 2000 and 2001, and its subsequent storage;

Libya has agreed to submit the relevant inventory change reports (ICRs).

- (b) failure to declare the import of other uranium compounds in 1985 and 2002, and their subsequent storage;

Libya has agreed to submit the relevant ICRs.

- (c) failure to declare activities involving the conversion of UOC into uranium oxides, UF₄ and uranium metal, including the production and loss of nuclear material where appropriate, and transfer of wastes resulting therefrom;

Libya has agreed to submit the relevant ICRs.

- (d) failure to declare the fabrication and irradiation of uranium targets, and their subsequent processing, including the separation of a small amount of plutonium, and the storage of wastes resulting therefrom;

Libya has agreed to submit the relevant ICRs.

- (e) failure to provide in a timely manner design information for the pilot centrifuge facility;

Libya has provided some information about the facility, and the sensitive equipment that has been transferred out of Libya.

- (f) failure to provide in a timely manner design information for the UCF and the locations where uranium conversion experiments were carried out and materials stored;

Libya has agreed to provide design information for these facilities.

(g) failure to provide in a timely manner design information for hot cells associated with the research reactor;

Libya has agreed to submit updated design information on the research reactor at Tajura.

35. The above failures show that, over an extended period of time, Libya was in breach of its obligation to comply with the provisions of the Safeguards Agreement. The failure by Libya to report nuclear material, facilities and activities, particularly those related to enrichment, and its acquisition of nuclear weapon design and fabrication documents, are matters of the utmost concern.

36. Following the disclosure of its undeclared nuclear activities, Libya stated that it has adopted a policy of full transparency and has decided to provide the Agency with a full picture of all of its nuclear activities. Since that time, Libya has shown active co-operation and openness. This is evidenced, in particular, by Libya's granting to the Agency unrestricted access to all locations the Agency requested to visit, by its prompt response to Agency requests for information, and by its decision to act as if an Additional Protocol were in force as of 29 December 2003. These are welcome developments.

37. Libya's undeclared nuclear programme involved frequent movements of key equipment and nuclear material, and relied heavily on support from foreign sources. Libya imported nuclear material, sensitive equipment and technology, and documents related to enrichment and the design and fabrication of nuclear weapons. With the cooperation and support of Member States, the Agency is now proceeding with a thorough investigation of all aspects of Libya's undeclared nuclear programme.

38. As part of verifying the correctness and completeness of Libya's declarations, the Agency is also investigating, with the support of Member States, the supply routes and the sources of sensitive nuclear technology and related equipment and nuclear and non-nuclear materials. At this early stage in the Agency's investigation, it is evident already that a network has existed whereby actual technological know-how originates from one source, while the delivery of equipment and some of the materials have taken place through intermediaries, who have played a co-ordinating role, sub-contracting the manufacturing to entities in yet other countries. This supply chain appears to have made use of false end-user certificates whereby, in some cases, the original supplier may not have known the actual end use. However, in other cases the original supplier may have been aware at least of the possibility of misuse, and perhaps even the actual end use since the identity of equipment such as serial numbers had been removed. The Agency's investigation is continuing with a view to ensuring that the sensitive nuclear technologies and equipment found in Libya have not proliferated further. The Agency will also take the necessary steps to ensure that information known to it is brought to the attention of relevant national authorities as appropriate, and that the lessons learned are shared with the international community.

39. The Director General will report to the Board at its June 2004 meeting, or earlier, as appropriate.

Annex I – List of Nuclear Related Locations Declared by Libya⁵

- Site A The original centrifuge R&D location (Al Hashan)
- Site B The new location for centrifuge R&D, also used to store UF6 (Al Fallah)
- Site C The original site for the Uranium Conversion Facility (UCF) (Al Khalla)
- Site D The new site for the UCF (Salah Eddin)
- Site E The machine shop for centrifuge manufacture (Janzour)
- Site F The yellow cake storage facility (Sabha)
- Site G The initial storage for the UCF and storage of centrifuge equipment from the 1980s experiments (Sawani)
- Site H The storage location for construction material (Al Karamia)
- Site I The desalination production plant (Tajura)
- Site J The National Board of Scientific Research (NBSR) headquarters
- Site K The original construction materials storage location (Al Ezeizia)
- Site L Tajura Nuclear Research Centre (TNRC)

⁵ With the exception of Site L, these sites were previously not declared by Libya to the Agency.

Annex II – Sites Inspected in the course of the Assessment of Weapon Development Capabilities

1. Site J NBSR headquarters
2. Site K Al Ezeizia Storage Site
3. Site L Tajura Nuclear Research Centre
4. Al Ezeizia artillery refurbishment site
5. General Company for Engineering Industries (Site 47)
6. Rabta Engineering Industrial Complex
7. Rabta Pharmaceutical Plant
8. Rabta “new service building” (adjacent to the Pharmaceutical plant)
9. Rabta Factory 69 Bomb Filling Plant
10. Tarhuna rocket engine test stand
11. Tarhuna solid propellant pilot plant
12. Central Organization for Electronic Research (COER),
Al Fajer Alga Did (Factory for SCUD Maintenance and Modification)
13. COER, Ber Osta Milad (Tripoli liquid rocket plant)
14. Centre for Remote Sensing and Space Science
15. Advanced Centre of Technology
16. Casting Institute
17. Polymer Institute
18. Welding Institute