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

Report by the Director General

1. On 22 December 2003, the Director General submitted to the Board of Governors a report (GOV/2003/82) on the implementation of the Agreement between the Socialist People's Libyan Arab Jamahiriya (Libya) and the International Atomic Energy Agency (the Agency) for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/282) (the Safeguards Agreement). This was followed by three more reports in 2004, the latest of which, GOV/2004/59, was issued by the Director General on 30 August 2004.[1] Since that date, updates were provided to the Board on progress in the implementation of safeguards in Libya in the annual Safeguards Implementation Reports for 2004, 2005, 2006 and 2007.

2. As foreseen in the Director General's introductory statement at the June 2008 meeting of the Board of Governors, this report summarizes the results of the Agency's verification activities since August 2004 and provides an overview of Libya's past nuclear programme.

A. Background

3. The Director General's reports were prompted by Libya's announcement on 19 December 2003 that it had been engaged in the development of undeclared nuclear capabilities. Libya briefed the Director General on 20 December 2003 on its decision, inter alia, "to eliminate… materials, equipments and programmes which lead to the production of internationally proscribed weapons." In that context, the Director General was informed that Libya had been engaged for more than a decade in the development of a uranium enrichment capability, which had included importing natural uranium and gas ultracentrifuge and conversion equipment, and the construction of pilot scale centrifuge

[1] GOV/2004/12 (20 February 2004); GOV/2004/33 (1 June 2004); GOV/2004/59 (30 August 2004).

facilities. Libya informed the Director General that its uranium enrichment programme was at an early stage of development and no industrial scale facility had been built, and that no enriched uranium had been produced. Libya asked the Agency to confirm, through verification, that all of its nuclear activities would henceforth be under safeguards and used exclusively for peaceful purposes.

4. In the Director General's report of February 2004 (GOV/2004/12), the Board of Governors was informed that Libya had failed to report to the Agency, as required under its Safeguards Agreement, the following:

- The import of UF_6 in 1985, 2000 and 2001, and its subsequent storage;
- The import of other uranium compounds in 1985 and 2002, and their subsequent storage;
- Activities involving the conversion of uranium ore concentrate (UOC) into uranium oxides, UF_4 and uranium metal, and the disposition of the nuclear material and resulting wastes;
- The fabrication and irradiation of uranium targets, and their subsequent processing, including the separation of a small amount of plutonium;
- Timely design information for a pilot centrifuge facility;
- Timely design information for the Uranium Conversion Facility (UCF), and the locations where uranium conversion experiments had been carried out and nuclear material stored; and
- Timely design information for hot cells associated with the IRT research reactor at Tajura.

5. In June 2004 (GOV/2004/33), the Board was informed of the results of the Agency's verification activities as of that date, as well as the corrective measures which had been taken by Libya. A number of issues were indicated as remaining outstanding.

6. In his report of August 2004 (GOV/2004/59), the Director General indicated that there were still some areas related to Libya's acquisition of UF_6, uranium conversion technology and enrichment technology, and the role of the clandestine supply network (hereinafter referred to as "the network") and sources of contamination of some enrichment related equipment, which required further investigation. The issues specifically identified in the Director General's report related to:

- Confirmation of the contents of the drums declared to contain natural UOC (GOV/2004/59, para. 10);
- The origin of the UF_6 received by Libya in 2000 and 2001 (GOV/2004/59, para. 11);
- The origin of the uranium compounds used for laboratory standards received by Libya in 2002 (GOV/2004/59, para. 12);
- Libya's plans for the acquisition of conversion technology to produce UF_6 (GOV/2004/33, para. 11, GOV/2004/59, paras 16–17);
- The scope of Libya's gas centrifuge enrichment activities, including, inter alia, the sources of technology (GOV/2004/59, paras 20–21, 24–27);
- The sources and reasons for low enriched and high enriched uranium particle contamination found on gas centrifuge equipment in Libya (GOV/2004/59, para. 23); and
- The scope and history of Libya's nuclear weapons related activities (GOV/2004/59, paras 32–34).

B. Developments since August 2004

7. Since August 2004, the Agency has continued its efforts to verify the correctness and completeness of Libya's declarations about its nuclear programme, including its past undeclared nuclear activities. The Agency has carried out inspections, complementary access and design information verification in Libya, and held a number of meetings with Libyan authorities. The Agency has also been in contact with other Member States, and had discussions with individuals involved in the network, with a view to confirming Libya's declarations.

8. In September 2004, the Agency completed its review of Libya's initial declarations under the Additional Protocol to its Safeguards Agreement, which Libya had agreed on 29 December 2003 to implement pending its entry into force (GOV/2004/59, para. 29; the Additional Protocol entered into force on 11 August 2006). The Agency has continued to review and assess the periodic updates of the declarations for 2004, 2005, 2006 and 2007. The Agency has requested, and received, further clarification of some aspects of these declarations.[2]

9. Since the last report by the Director General, the Agency has received additional information concerning the chronology and scope of Libya's efforts to acquire technology related to the nuclear fuel cycle, specifically as regards earlier efforts by Libya to acquire centrifuge technology, and Libya's acquisition of documentation on the design of other nuclear fuel cycle facilities. As a consequence of this additional information, Libya has provided updates of the brief time line of its nuclear programme which it had provided to the Agency on 29 December 2003 (GOV/2004/33, para. 13). Below is an overview of the Libyan nuclear programme. Technical details of the Agency's findings are provided in an Annex hereto.

C. Overview of Libya's nuclear programme

10. Libya's nuclear programme originated in 1973, when the Atomic Energy Establishment (AEE) of Libya was set up with a view to building Libya's capabilities and infrastructure in nuclear sciences and technologies. According to Libya, the aim of the programme at that time was to promote the use of peaceful applications of nuclear energy.

11. In January 1981, the Libyan Secretariat of Atomic Energy (SAE) was founded, and the AEE and the Tajura Nuclear Research Centre (TNRC)[3] were brought under its authority. According to information provided by Libya, between 1986 and 2003, multiple changes were made in the governmental entities charged with implementing Libya's nuclear programme. However, the person in charge of the Libyan nuclear programme has remained the same since 1995.

12. In December 2003, Libya announced that it renounced its nuclear weapons programme (GOV/2004/12, para. 5).

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[2] Since December 2003, the Agency has conducted complementary access in Libya on eight occasions. In each instance, Libya has cooperated fully in providing the requested access and in providing detailed information on past and current activities carried out at those locations.

[3] The Tajura Nuclear Research Centre (TNRC) has been renamed as the Renewable Energies and Water Desalination Research Centre (REWDRC).

C.1. Reactor related activities

13. In 1977, an agreement was concluded by Libya with the former Union of Soviet Socialist Republics (USSR) to construct TNRC, including a 10 MW(th) IRT research reactor and associated departments and laboratories. The testing and the initial operation of the laboratories and equipment at TNRC were carried out in 1981, and the reactor was put into operation.

14. At the time of entry into force of its Safeguards Agreement in July 1980, Libya's declared nuclear programme consisted of the IRT research reactor and a 100 W critical assembly, both of which are located at TNRC.

15. Between 1981 and 1983, Libya concluded a number of contracts with the USSR for research, training, operation and maintenance in connection with TNRC. Between 1981 and 1985, Libya also held discussions with the USSR about the acquisition of two VVER-440 nuclear power reactors for electricity generation and water desalination. Preliminary site studies were conducted with respect to the power reactors, but, according to Libya, no final agreement was achieved on the supply of the reactors.

16. Between 1984 and 1990, Libya fabricated several dozen small uranium oxide and uranium metal targets, on a gram scale, and irradiated the targets at the IRT research reactor. Some of the targets were processed in hot cells at the adjacent radiochemical laboratory.

17. In the late 1980s and early 1990s, Libya sought to acquire information related to a heavy water production facility, but its efforts resulted only in Libya's acquisition of documentation containing generic information.

C.2. Nuclear material

18. Between 1978 and 1981, Libya imported a total of 2263 tonnes of UOC from Niger. In the mid-1980s, Libya, with the support of a Brazilian company, also carried out uranium explorations in Libya.

19. In 1985, Libya exported approximately 100 kg of UOC to the USSR and discussed with it the possibility of constructing a uranium conversion facility in Libya. During the same year, the USSR returned to Libya 56 kg of natural uranium in the form of UF_6, UF_4, UO_2 and U_3O_8 (GOV/2004/33, paras 18–19).

20. Libya imported UF_6 in September 2000 (in two small cylinders) and again in February 2001 (in one large cylinder) (GOV/2004/59, para. 11), for a total of approximately 2 tonnes of UF_6.

21. In 2002, Libya obtained uranium compounds through a clandestine source for use as laboratory chemical standards. The labelling of the containers indicated an effort to conceal the fact that the compounds were nuclear material.

C.3. Conversion related activities

22. In 1982, Libya acquired from a Belgian entity a basic design for a uranium ore concentration and conversion facility, which was planned to be located in the Sabha region, but was never built (GOV/2004/59, para. 15).

23. Between 1983 and 1985, Libya actively pursued with a number of countries its efforts to acquire nuclear technology, with the longer term aim of developing its own indigenous capability to produce fissile material. This resulted in the delivery of two boxes of documentation, in the form of microfiches, which contained information related to nuclear fuel cycle facilities.

24. In 1986, Libya acquired from a Japanese company, through an intermediary, a modular mobile Uranium Conversion Facility (UCF) (GOV/2004/59, para. 16). The facility, which was designed to produce UF_4, UO_2 and uranium metal, was partially assembled, but was never operated.

C.4. Enrichment related activities

25. Libyan uranium enrichment activities began in the early 1980s with the help of a foreign expert who assisted Libyan technicians in the development of a uranium gas centrifuge technology (GOV/2004/12, para. 21). Libya has stated that, between the early 1980s and 1992, when the expert left Libya, Libya was not able to produce an operating centrifuge and that it did not use any nuclear material in related experiments or tests (GOV/2004/33, para. 32). Libya has provided only limited documentation related to this phase of its enrichment programme. However, the Agency, based on its examination of documentation available to the Agency and remaining centrifuge parts, environmental sample results and interviews with people involved, has concluded that the Libyan statements with respect to this phase of its past enrichment programme are not inconsistent with the Agency's findings.[4]

26. The second phase of Libya's enrichment programme began in January 1984 when Libyan officials met with Mr. A. Q. Khan. During this meeting, Mr. Khan described to a senior Libyan official the technologies for acquiring nuclear material, and the necessary resources and capabilities, and offered to sell Libya centrifuge enrichment technology. However, according to Libya, the Libyan official felt that the scientific and industrial requirements were too demanding for Libya in terms of resources and technological capabilities at that time, and a decision was made not to pursue the offer.

27. Between 1989 and 1991, further senior level contacts took place with Mr. Khan. These contacts led to a concrete agreement with the network, and the acquisition, according to Libya, of information on L-1 centrifuge technology as developed by Mr. Khan. According to Libya, however, the Libyan authorities felt that the value of the information provided by Mr. Khan was not commensurate with what Libya had paid for it. No complete centrifuges were delivered to Libya as part of this deal.

28. In 1995, Libya re-established its contacts with the network to acquire L-2 centrifuge technology. It initially received 20 pre-assembled L-1 centrifuges and components for an additional 200 L-1 centrifuges in 1997.

29. According to Libya, the first successful test of a single L-1 centrifuge was completed by October 2000. In late 2000, Libya started to progressively install 9-machine, 19-machine and 64-machine L-1 centrifuge cascades. By April 2002, when Libya decided to relocate the equipment for security reasons, the cascades were at different stages of completion, but none were complete. Libya has stated that no nuclear material was used during any of the tests (GOV/2004/12, para. 23).

30. In September 2000, Libya received two L-2 centrifuges. Following this, Libya placed an order for 5000 L-2 machines, which was later increased to 10 000 machines, and all the required supporting equipment, including feed stations, product and tails withdrawal stations, vacuum equipment, cascade piping, drive systems and other miscellaneous equipment (GOV/2004/12, para. 25). The network acted as an intermediary for the manufacturing and shipping of the components and equipment from entities

[4] By "consistent", the Agency means that the information made available to it by the State is internally consistent and consistent with the Agency's findings and all information available to it. The Agency uses the term "not inconsistent" to refer to instances where there is insufficient information available to confirm the information made available by the State (for example, if the events took place many years in the past). The confidence level in the second instance is therefore lower, but the Agency has no credible information contradicting the statements made by the State.

in different countries.[5] In December 2002, the L-2 components started to arrive in Libya in large quantities. The components delivered to Libya did not constitute complete L-2 centrifuges, however, since no rotating parts were received. Libya also acquired a precision machine workshop through the network in late 2001. The workshop was intended to support the gas centrifuge programme. Based on the Agency's examination of equipment, results of environmental sampling, interviews with Libyan scientists and members of the network, and information on payment and shipping documentation, the Agency has concluded that Libya's statements in this regard are consistent with the Agency's findings.

C.5. Other nuclear fuel cycle related activities

31. From the mid-1980s, Libya pursued efforts to acquire fuel fabrication and reprocessing technology through another intermediary who had also provided assistance in connection with Libya's chemical weapons programme. The most advanced negotiations were held in connection with the plan for a pilot reprocessing facility, which proceeded in the late 1980s to the stage of a detailed design. The fuel fabrication laboratory and the reprocessing plant were both based on German origin technology. According to Libya, neither equipment nor a complete set of design drawings had been delivered by the time the projects were stopped at the end of the 1980s. The Agency has concluded that Libya's statements about the design documentation are not inconsistent with the findings of the Agency.

C.6. Weaponization related activities

32. In late 2001 or early 2002, Libya received from the network documentation in relation to nuclear weapon design and manufacturing, but has stated that it had never carried out any work on the study or development of an actual nuclear weapon. Following its evaluation of all information available to it, the Agency concluded that Libya does not have the necessary capabilities to design or manufacture nuclear weapons components. Nor did the Agency find any indications of work related to nuclear weapons development.

D. Assessment

33. Starting in the early 1980s, and continuing until the end of 2003, Libya imported nuclear material and conducted a number of nuclear activities which it failed to report to the Agency as required under its Safeguards Agreement. As corrective measures, Libya has made all declared nuclear material available for Agency verification, submitted relevant inventory change reports (ICRs), and provided relevant design information. The Agency has been able to verify the non-diversion of declared nuclear material in Libya.

34. Following Libya's disclosure in December 2003 of its undeclared nuclear activities, Libya stated that it had adopted a policy of full transparency and that it had decided to provide the Agency with a full picture of all of its nuclear activities. Since December 2003, Libya has been implementing the Additional Protocol to its Safeguards Agreement, which entered into force in August 2006. Since that time, Libya has also provided the Agency unrestricted and prompt access, beyond that required under

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[5] Germany, Italy, Japan, Liechtenstein, Malaysia, Pakistan, Republic of Korea, Singapore, South Africa, Spain, Switzerland, Turkey and the United Arab Emirates.

its Safeguards Agreement and Additional Protocol, to those locations, information and individuals deemed necessary by the Agency to fulfil its verification requirements.

35. The Agency has investigated, with the support of several Member States, the clandestine sources and supply routes of sensitive nuclear technologies and related equipment and nuclear and non-nuclear materials. The Agency has requested from Libya information about the structure and funding of its nuclear programme. In response to that request, Libya has provided detailed information related to its payments to the network. With respect to centrifuge enrichment technology, the know-how originated from one source, while the delivery of equipment and some of the materials was through intermediaries who played a coordinating role, sub-contracting the manufacturing to entities in other countries. Libya's statements regarding the acquisition of centrifuge enrichment technology and equipment are not inconsistent with the Agency's findings.

36. As regards the other parts of the front and back end of the nuclear fuel cycle, with the exception of its acquisition of the modular mobile UCF, Libya obtained technology mainly in the form of documentation. Libya's statements in this regard are not inconsistent with the Agency's findings.

37. As confirmed by Libya, Libya's past nuclear programme, from the mid-1980s until 2003, was aimed at the development of nuclear weapons. However, Libya has stated that it did not proceed with the design of nuclear weapons nor did it have complete fissile material production capabilities. The Agency did not find any indications of actual work related to nuclear weapons development. Given the fact that Libya's programme extended over two decades and was conducted to a great extent clandestinely, and in view of the corresponding lack of supporting documentation, there are some parts of Libya's past programme which the Agency has not been able to reconstruct fully. However, with the cooperation and transparent response shown by Libya, the Agency has been able to conclude that Libya's statements concerning its nuclear programme are not inconsistent with the Agency's findings.

38. In the course of its investigation into Libya's nuclear weapons programme, the Agency was drawn to an observation of a more generalized nature. Much of the sensitive information coming from the network existed in electronic form, enabling easier use and dissemination. This includes information that relates to uranium centrifuge enrichment and, more disturbing, information that relates to nuclear weapon design. Clearly, this is a matter of serious concern to the Agency. The Agency will continue, in cooperation with Member States, to investigate the activities of the network relevant to its mandate.

39. While the Agency is able at this time to continue to provide assurances that no declared nuclear material in Libya has been diverted, and while it considers that the issues that had been reported to the Board of Governors are no longer outstanding at this stage, the Agency, in accordance with its procedures and practices, will continue to implement safeguards in Libya as a routine matter and work to reach a conclusion about the absence of undeclared nuclear material and activities in Libya.

Verification Activities

1. Reactor related activities

1. In the course of discussions with the employee of the intermediary involved in the UCF project (referred to above in para. 24 of the main report), and another former employee of that company, the Agency received information concerning efforts by Libya to procure a feasibility study and preliminary design for a small scale heavy water production facility and designs for small scale front end and back end nuclear fuel cycle facilities. These activities, as described in more detail below, were not included in the time line provided by Libya in December 2003. At the request of the Agency, Libya provided additional information concerning these activities.

2. In response to the Agency's request for further information, Libya acknowledged that it had sought to acquire information related to a heavy water production facility in the late 1980s and early 1990s, but stated that its efforts did not proceed very far and resulted in Libya's acquisition only of documentation containing generic information. Based on a review of the limited documentation available to the Agency, and interviews with the individual employed by the intermediary involved in the acquisition efforts and another non-Libyan scientist who had provided some expert advice in connection with these efforts, the Agency has concluded that Libya's statements are not inconsistent with the Agency's findings.

2. Nuclear material

2.1. Imports of UOC

3. As reflected in the previous report of the Director General, Libya declared that, between 1978 and 1981, it had imported 2263 tonnes of UOC, which is now stored at Sabha (GOV/2004/59, para. 9). In July 2004, the Agency was able to carry out verification activities in connection with the UOC, but the results of the chemical analysis of the UOC were not yet available at the time of the issuance of the Director General's report (GOV/2004/59, para. 10). The Agency has been able, since then, to confirm the contents of the drums as natural uranium in the form of UOC, and the quantity of material contained in the drums, which are consistent with statements made by Libya.

2.2. Imports of other nuclear material

4. As indicated in GOV/2004/33, Annex 1, paras 18–19, the UF_6 received from the USSR in 1985 was transferred out of Libya in 2004; the other uranium compounds remain under Agency seal in Libya. Libya has submitted the necessary nuclear material accounting reports with respect to the import of this material. The composition and quantity of this material have been verified by the Agency.

5. Libya imported UF_6 in September 2000 (in two small cylinders) and again in February 2001 (in one large cylinder) (GOV/2004/59, para. 11), for a total of approximately 2 tonnes of declared UF_6. While the correctness of Libya's declarations concerning the quantity and type of UF_6 in the cylinders

had been verified (GOV/2004/59, para. 11), the Agency was unable to identify the origin of the material prior to the issuance of the Director General's last report to the Board.

6. As part of its effort to establish the origin of the material, the Agency has, since the Director General's last report, conducted an extensive analysis of the impurities in the UF_6 with a view to comparing them with similar materials in historical databases. The results of this comparison have produced no match. However, while the Agency is still not able to confirm the origin of the material, it has been able to establish the route of transport of the UF_6 cylinders. The Agency is continuing to investigate this issue with other States that may have information on the origin of the UF_6.

7. The Agency has also endeavoured to verify that Libya did not import additional UF_6 through the network. To that end, the Agency has interviewed Libyan authorities and individuals involved in the network. The information acquired as a result of these interviews indicates that, while Libya had initially explored with individuals involved in the network the possibility of receiving 20 tonnes of UF_6, only the approximately 2 tonnes referred to above were actually delivered to Libya through the network. The Agency has concluded that Libya's statements are not inconsistent with the Agency's findings.

8. Since the Director General's last report, the Agency has also taken steps to identify the origin of other uranium compounds obtained through a clandestine source by Libya in 2002 for use as laboratory standards (GOV/2004/59, para. 12). In 2005, Libya provided the Agency with the name of the company that had supplied the compounds. Authorities of the State in which the company claimed to be located stated that labels used for uranium compounds were falsified. The Agency continues to investigate the origin of this material.

3. Conversion related activities

9. Since the Director General's last report to the Board, Libya has provided additional clarifications concerning its attempts to acquire uranium conversion technology (GOV/2004/59, paras 13–17; GOV/2004/33, Annex 1, paras 29–31), including more details about the acquisition of the mobile modular UCF in 1986.

10. According to Libya, the UCF project was its only successful effort to acquire conversion capability (GOV/2004/59, para. 16), and Libya never acquired any capability to produce UF_6 at UCF or elsewhere in Libya. Based on the Agency's examination of the equipment received by Libya, information obtained from the manufacturers of the equipment, statements by the then-employee of the intermediary involved in the UCF project and information provided by officials from the State in which the manufacturers were situated, and the fact that there is no other information available pointing to the acquisition of such technologies by Libya through the network, the Agency has concluded that Libya's statements on its efforts to acquire uranium conversion capability are consistent with the Agency's findings.

11. As regards the uranium conversion experiments carried out by Libya on the UCF site in the 1980s (GOV/2004/59, paras 18–19), the Agency had not yet completed its verification of Libya's declarations as of the Director General's last report to the Board in August 2004. While the Agency has since then been able to verify the declared inventories of nuclear material in Libya, it is still not able to reconstruct in detail the history of these experiments. However, the results of environmental sampling and other verification activities undertaken by the Agency have not revealed any inconsistencies with Libya's declarations concerning these experiments.

4. Enrichment related activities

12. In its 2003 time line, Libya indicated that, in July 1995, it had decided to "reinvigorate" the Libyan nuclear activities, and to pursue gas centrifuge enrichment, using the UOC which it already had for conversion into UF_6 at UCF. Libya also indicated in the time line that the delivery of centrifuges had begun in June 1997 (GOV/2004/12, paras 22–27). What was not included in that time line, however, were references to contacts between the network which took place between the early 1980s and the mid-1990s.

13. From information provided to the Agency in early 2007 by individuals involved in the network**,** it became evident that Libya's contacts with the network pre-dated 1995. In response to the Agency's inquiries about these contacts, Libya provided more detailed information in 2007 and 2008 regarding its early contacts with members of the network.

14. According to the additional information provided by Libya, a senior Libyan official met with Mr. Khan in January 1984. During this meeting, Mr. Khan described technologies for acquiring nuclear material, and the necessary resources and associated capabilities, and offered to sell Libya centrifuge enrichment technology. According to the Libyan official, Libya did not have the necessary human resources at that time to establish the programme, and therefore a decision was made not to pursue the offer.

15. Libya's contacts with Mr. Khan were renewed through meetings with another senior Libyan official during the period October/November 1989 and January 1991. During these meetings, actions were initiated for Libya to acquire L-1 centrifuge technology. Libya has stated that, as a result of an agreement concluded during these meetings, some design documentation and components (but no complete L-1 centrifuges) were provided to Libya in January 1991. Libya has stated further that it had set up a scientific committee in February 1991 to evaluate the L-1 drawings and related information and to advise the Minister in charge, but that intervening factors, in particular the embargo imposed by the Security Council in 1992, prevented the implementation of the 1991 agreement. As a consequence, much of the equipment ordered by Libya remained in storage in Dubai.

16. Libya has not been able to provide much documentary support for its description of the activities which took place in the 1980s and the early 1990s, citing multiple organizational changes as having led to a loss of administrative documentation. On the basis of interviews with members of the network, and a review of shipping documentation and manufacturer communications, as well as statements made by Iranian scientists who saw and received some of the equipment which was stored in Dubai (GOV/2007/58, para. 16), the Agency has concluded that the Libyan statements related to the 1991 agreement are not inconsistent with the Agency's findings.

17. As mentioned in the Director General's previous reports, during its investigations, the Agency found low and high enriched uranium particles on certain equipment and locations in Libya, the source of which Libya attributed to foreign equipment (GOV/2004/33, Annex 1, para. 34). On 21 May 2005, the Agency received from Pakistan a number of centrifuge components, which were sampled and analysed by the Agency's Safeguards Analytical Laboratory in Seibersdorf. Based on the analysis of these samples, further information provided by Pakistan, and the results of additional environmental sampling, the Agency has concluded that Libya's assertion that this contamination originated from foreign equipment is consistent with the Agency's findings.

5. Other nuclear fuel cycle related activities

18. Following discussions with the Agency about the information concerning Libya's efforts to acquire designs for other nuclear fuel cycle facilities, Libya provided the Agency in December 2006 with access to the microfiche documents.

19. A detailed analysis of the microfiches indicates that Libya received a substantial amount of design information concerning the following:

- A fuel fabrication laboratory, designed for the conversion of natural and low enriched uranyl nitrate hexahydrate, in small batches, into UO_2 and uranium metal, and the fabrication of fuel rods and fuel assemblies containing uranium metal and UO_2 pellets (referred to as "Project 702");
- A post-irradiation examination facility, designed for the receipt and disassembly of pressurized water reactor (PWR) spent fuel assemblies, the examination of spent fuel and the cutting of spent fuel rods for subsequent reprocessing (referred to as "Project 307");
- A radiochemical separation laboratory, consisting of a pilot scale Purex reprocessing plant designed for processing approximately 1100 kg of uranium per year of PWR spent fuel and recovering approximately 10 kg of plutonium per year (referred to as "Project 701"); and
- A high level liquid waste vitrification plant, designed for solidifying high level waste from the reprocessing plant into borosilicate glass (referred to as Project 303").

20. Libya has stated that the material was received in the mid- to late-1980s through the same intermediary which had arranged for the procurement of equipment for the UCF project (see para. 10 of this Annex), but has not been able to explain in detail how the documentation was acquired from the intermediary or provide information on the origin of the microfiches. Although the source of the technology reflected in the microfiches is unclear from the documentation, it appears to be different from the source of the equipment acquired for the UCF project.

21. Though the documentation does not identify the individuals responsible for drawing the designs contained in the microfiches, the Agency was able to identify some of the engineering companies which had been involved in this effort. From this information, the Agency was then able to identify and interview some of the engineers who worked for one of these companies. The engineers indicated that detailed design work was carried out for these four projects in 1986. At the time they were employed to carry out the projects, the engineers were made aware that the work was secret, and that the facilities were to be designed for a hot and dry climate, but they did not know who the client was. This is in line with information obtained from a Member State indicating that no licence had been issued for the export of such technology to Libya.

22. Although the documentation contained in the microfiches is very detailed, it appears not to be complete, since it does not contain information related to core and sensitive parts of the projects. It also seemed, from the non-sequential numbering of the two storage boxes, that a number of boxes could be missing. Libya has stated that the documentation shown to the Agency is the only documentation that it had received, and that it had received no equipment in connection with the projects. Libya also stated that these projects had not progressed as far as identifying locations in Libya for such facilities.

23. The Agency has not found in Libya any equipment or facilities, or indications thereof, relevant to the four projects. Based on the Agency's verification activities to date, the Agency has concluded that Libya's statements about the design documentation are not inconsistent with the findings of the

Agency. However, since some sensitive information still appears to be missing, the Agency will continue to explore the matter further in Libya and elsewhere as a routine matter.

6. Weaponization related activities

24. As of the Director General's last report to the Board, the scope and history of Libya's nuclear weapons related activities, including any nuclear weapons related capabilities, whether concrete actions had been taken by Libya in connection with information on weapon design and fabrication, and the source of the nuclear weapons related documentation, required further investigation.

25. As indicated in previous reports, in December 2003, Libya provided the Agency with documents related to the design and fabrication of a nuclear explosive device which it said had been provided to it by a foreign source (GOV/2004/12, para. 30). These documents are currently stored outside Libya under Agency seal. Examination of the documents, and interviews of Libyan officials and some members of the network, as well as information received from Pakistani authorities, revealed the likely origin and transfer route of most of the sensitive information contained in the documents.

26. However, information derived from interviews with individuals involved in the network (including computerized and other information in their possession), and information provided by some Member States, indicate that a substantial amount of sensitive information related to the fabrication of a nuclear weapon was available to members of the network. In addition, documentation related to high enriched uranium re-conversion, casting and machining, and the testing of nuclear weapons components, was found in the possession of some individuals of the network. This documentation was more up-to-date than, for example, a related document found in Iran (GOV/2008/4, para. 19).

27. Libya has stated that it took no concrete steps in connection with the information made available to it on weapon design and fabrication. With a view to verifying that information, Agency inspectors visited, and interviewed, staff of a number of relevant military related R&D institutes and workshops in Libya, including those related to Libya's ballistic missile programme. Based on the results of an assessment of Libya's industrial capabilities, and on all other information available to the Agency, the Agency has concluded that Libya's statement in this regard is not inconsistent with the Agency's findings.

28. Since September 2004, the Agency has continued to assess the capabilities available in Libya that could be used for nuclear weapons related activities, in particular through visits, inter alia, to a number of research and military institutes and universities. The Agency has concluded that Libya's current capabilities are not suited for the design or manufacturing of nuclear weapon components. Nor has the Agency found any indications of work related to nuclear weapons development.