Board of Governors

For official use only

GOV/2020/9
Date: 29 April 2020

Restricted Distribution
Original: English

The Safeguards Implementation Report for 2019

Report by the Director General

IAEA
International Atomic Energy Agency
Atoms for Peace and Development

IAEA
Atoms for Peace and Development

GOV/2020/9

Report by the Director General on Safeguards Implementation for 2019

Summary for 2019

- One comprehensive safeguards agreement and two additional protocols entered into force. Four operational small quantities protocols were amended.
- For one State for which the Secretariat had previously drawn the broader conclusion that all nuclear material in the State remained in peaceful activities, the Secretariat was unable to draw that conclusion for that State for 2019. LIBYA
- The Agency continued to verify and monitor the nuclear-related commitments of the Islamic Republic of Iran under the Joint Comprehensive Plan of Action.
- The Agency continued to monitor developments in the DPRK's nuclear programme, evaluate all safeguards relevant information available to it, and enhance the Agency's readiness to play its essential role in verifying the DPRK's nuclear programme.
- The Agency developed a State-level safeguards approach for one State and started the implementation of integrated safeguards in that State. This brings the total number of States with comprehensive safeguards agreement for which State-level safeguards approaches have been developed to 131. These 131 States hold 97% of all nuclear material (by significant quantity) under Agency safeguards in States with a comprehensive safeguards agreement.
- Internal evaluation of the effectiveness of safeguards implementation was enhanced through expanded peer reviews of annual implementation plans and State evaluation reports.
- The Agency started to develop a new initiative to assist States to strengthen and sustain the effectiveness of State and regional authorities responsible for safeguards implementation and of their respective systems of accounting for and control of nuclear material.
- The Agency started to develop a comprehensive integrated lifecycle management system for the responsible and sustainable management of assets in the Department of Safeguards.
- The Agency enhanced its business continuity and disaster recovery processes to ensure the continuation of critical business and the availability of information during a disruptive event.
- The Agency began a project aimed at the procurement, commissioning and calibration of a new Large Geometry Secondary Ion Mass Spectrometer to sustain analysis capabilities in the area of particle analysis for uranium isotopes.

Recommended Action

The Board is invited to take note of the Agency's *Safeguards Implementation Report for 2019* attached hereto.

The Board is invited to authorize the release of the *Safeguards Statement* and the Background to the *Safeguards Statement* and Summary.

The Safeguards Implementation Report for 2019

Report by the Director General

A. Safeguards Statement for 2019[1, 2]

In 2019, safeguards were applied for 183 States[3, 4] with safeguards agreements in force with the Agency. The Secretariat's findings and conclusions for 2019 are reported below with regard to each type of safeguards agreement. These findings and conclusions are based upon an evaluation of all safeguards relevant information available to the Agency in exercising its rights and fulfilling its safeguards obligations for that year.

1. One hundred and thirty-one States had both comprehensive safeguards agreements and additional protocols in force[5]:

(a) For 69 of these States[4], the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities. On this basis, the Secretariat concluded that, for these States, all nuclear material remained in peaceful activities.

(b) For 62 of these States, the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities. Evaluations regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.

2. Safeguards activities were implemented for 44 States with comprehensive safeguards agreements in force, but without additional protocols in force. For these States, the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.

3. As of the end of 2019, 10 States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) had yet to bring into force comprehensive safeguards agreements with the Agency as required by Article III of that Treaty. For these States Parties, the Secretariat could not draw any safeguards conclusions.

4. Three States had safeguards agreements based on INFCIRC/66/Rev.2 in force, requiring the application of safeguards to nuclear material, facilities and other items specified in the relevant safeguards agreement. One of these States, India, had an additional protocol in force. For these States, the Secretariat found no indication of the diversion of nuclear material or of the misuse of the facilities or other items to which safeguards had been applied. On this basis, the Secretariat concluded that, for these States, nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities.

---

[1] The designations employed and the presentation of material in this report, including the numbers cited, do not imply the expression of any opinion whatsoever on the part of the Agency or its Member States concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.

[2] The referenced number of States Parties to the NPT is based on the number of instruments of ratification, accession or succession that have been deposited.

[3] These States do not include the Democratic People's Republic of Korea (DPRK), where the Agency did not implement safeguards and, therefore, could not draw any conclusion.

[4] And Taiwan, China.

[5] Or an additional protocol being provisionally applied, pending its entry into force.

5. Five nuclear-weapon States had voluntary offer agreements and additional protocols in force. Safeguards were implemented with regard to declared nuclear material in selected facilities in all five States. For these States, the Secretariat found no indication of the diversion of nuclear material to which safeguards had been applied. On this basis, the Secretariat concluded that, for these States, nuclear material in selected facilities to which safeguards had been applied remained in peaceful activities or had been withdrawn from safeguards as provided for in the agreements.

B. Background to the Safeguards Statement and Summary

B.1. Safeguards conclusions

1. The *Safeguards Statement* reflects the Secretariat's findings and conclusions resulting from the Agency's activities under the safeguards agreements in force. The Secretariat derives these conclusions on the basis of an evaluation of the results of its safeguards activities and of all other safeguards relevant information available to it. The Secretariat follows uniform internal processes and defined procedures to draw independent and objective safeguards conclusions based on its own verification activities and findings. This section provides background to the *Safeguards Statement.*

Fact box 1. Safeguards activities overview

2. A summary of the status of safeguards agreements and other information presented below is given in Tables 1 to 5 in Section B.7.

B.1.1. States with comprehensive safeguards agreements in force

3. Under a comprehensive safeguards agreement, the Agency has the "right and obligation to ensure that safeguards will be applied, in accordance with the terms of the agreement, on all source or special fissionable material in all peaceful nuclear activities within the territory of the State, under its jurisdiction or carried out under its control anywhere, for the exclusive purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices".[9]

4. Comprehensive safeguards agreements consist of Part I, Part II, and Definitions. Part I consists of general provisions and Part II describes the procedures for implementing those provisions. These procedures include the record keeping and reporting obligations of the State with regard to nuclear

---

[6] Significant quantity — the approximate amount of nuclear material for which the possibility of manufacturing a nuclear explosive device cannot be excluded.

[7] Material balance areas (MBAs) containing locations outside facilities where nuclear material is customarily used (LOFs).

[8] Calendar-days in the field for verification comprise calendar-days spent on performing inspections, complementary accesses, design information verifications at facilities and information verifications at LOFs and on the associated travel and rest periods.

[9] Paragraph 2 of INFCIRC/153 (Corrected).

material, nuclear facilities and LOFs. They also include procedures related to Agency access to nuclear material, nuclear facilities and LOFs.

5. The procedures set out in Part II of a comprehensive safeguards agreement include certain reporting requirements related to the export and import of material containing uranium or thorium which has not yet reached the stage of processing where its composition and purity make it suitable for fuel fabrication or for isotopic enrichment. Nuclear material which has reached that stage of processing, and any nuclear material produced at a later stage, is subject to all the other safeguards procedures specified in the agreement. An inventory of such nuclear material is established on the basis of an initial report by a State, which is then verified by the Agency and maintained on the basis of subsequent reports by the State and by Agency verification. The Agency performs its verification and evaluation activities in order to confirm that these declarations by the State are correct and complete — i.e. to confirm that all nuclear material in the State remains in peaceful activities.

Small quantities protocols

6. Many States with minimal or no nuclear activities have concluded a small quantities protocol (SQP) to their comprehensive safeguards agreement. Under an SQP based on the original standard text[10] submitted to the Board of Governors in 1974, the implementation of most of the safeguards procedures in Part II of a comprehensive safeguards agreement are held in abeyance as long as certain criteria are met. In 2005, the Board of Governors approved the revision[11] of the standard text of the SQP. This revision changed the eligibility criteria for an SQP, making it unavailable to a State with an existing or planned facility, and reduced the number of measures held in abeyance. Of particular importance is the fact that, under the revised standard text of the SQP, the requirement that the State provide the Agency with an initial inventory report and the Agency's right to carry out ad hoc and special inspections are no longer held in abeyance.

Additional protocols

7. Although the Agency has the authority under a comprehensive safeguards agreement to verify the peaceful use of all nuclear material in a State (i.e. the correctness and completeness of the State's declarations), the tools available to the Agency under such an agreement are limited. The *Model Additional Protocol*[12], approved by the Board of Governors in 1997, equips the Agency with important additional tools that provide broader access to information and locations. The measures provided for under an additional protocol thus significantly increase the Agency's ability to verify the peaceful use of all nuclear material in a State with a comprehensive safeguards agreement.

B.1.1.1. States with both comprehensive safeguards agreements and additional protocols in force[5]

Status of implementation

8. As of 31 December 2019, 131 (129)[13] States had both comprehensive safeguards agreements and additional protocols in force[5].

9. Safeguards implementation involved, as appropriate, activities carried out in the field, at regional offices and at Agency Headquarters in Vienna. The activities at Headquarters included the evaluation of States' accounting reports and other information required under comprehensive safeguards

---

[10] GOV/INF/276/Annex B.

[11] GOV/INF/276/Mod.1 and Corr.1.

[12] INFCIRC/540 (Corrected), *Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards*.

[13] The numbers in parentheses provide the respective data for 2018.

agreements and additional protocols and the evaluation of safeguards relevant information from other sources.

Deriving conclusions

10. A safeguards conclusion that all nuclear material has remained in peaceful activities in a State is based on the Agency's finding that there are no indications of diversion of declared nuclear material from peaceful nuclear activities and no indications of undeclared nuclear material or activities in the State as a whole. The Agency draws such a conclusion only where a State has both a comprehensive safeguards agreement and an additional protocol in force and the evaluations described below have been completed.

11. To ascertain that there are no indications of diversion of declared nuclear material from peaceful nuclear activities in a State, the Agency needs to carry out a comprehensive evaluation of all safeguards relevant information available to it, which includes information provided by the State with regard to the design and operation of nuclear facilities and LOFs, the State's nuclear material accounting reports, the State's declarations submitted under the additional protocol and the results of the Agency's in-field activities carried out to verify the State's declarations.

12. To ascertain that there are no indications of undeclared nuclear material or activities in a State, the Agency needs to carry out an evaluation of the consistency of the State's declared nuclear programme with the results of the Agency's verification activities under the relevant safeguards agreements and additional protocols and with all other safeguards relevant information available to the Agency. In particular, the Agency needs to have:

- Conducted a comprehensive State evaluation based on all safeguards relevant information available to the Agency about the State's nuclear and nuclear-related activities (including design information on facilities and information on LOFs, declarations submitted under additional protocols, and information collected by the Agency through its verification activities and from other sources);
- Performed complementary access, as necessary, in accordance with the State's additional protocol;
- Addressed all anomalies, discrepancies and inconsistencies identified in the course of its evaluation and verification activities.

13. When the evaluations described in paragraphs 11 and 12 above have been completed and no indication has been found by the Agency that, in its judgement, would give rise to a proliferation concern, the Secretariat can draw the broader conclusion that all nuclear material in a State remained in peaceful activities. Subsequently, the Agency implements integrated safeguards — an optimized combination of safeguards measures available under comprehensive safeguards agreements and additional protocols — for that State. Due to increased assurance of the absence of undeclared nuclear material and activities for the State as a whole, the intensity of inspection activities at declared facilities and LOFs can be reduced. Integrated safeguards were implemented for the whole 2019 or part thereof for 67 (67) States.[4, 14]

---

[14] Albania, Andorra, Armenia, Australia, Austria, Bangladesh, Belgium, Botswana, Bulgaria, Burkina Faso, Canada, Chile, Croatia, Cuba, Czech Republic, Denmark, Ecuador, Estonia, Finland, Germany, Ghana, Greece, Holy See, Hungary, Iceland, Indonesia, Ireland, Italy, Jamaica, Japan, Kazakhstan, the Republic of Korea, Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Malta, Mauritius, Monaco, Montenegro, Netherlands, New Zealand, North Macedonia, Norway, Palau, Peru, Philippines, Poland, Portugal, Romania, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Tajikistan, Ukraine, United Republic of Tanzania, Uruguay, Uzbekistan and Viet Nam.

Overall conclusions for 2019

14. On the basis of the evaluations described in paragraphs 11 and 12, the Secretariat drew the conclusions referred to in paragraph 1(a) of the *Safeguards Statement* for 69 (70) States[4] — Albania, Andorra, Armenia, Australia, Austria, Bangladesh, Belgium, Botswana, Bulgaria, Burkina Faso, Canada, Chile, Croatia, Cuba, Czech Republic, Denmark[15], Ecuador, Estonia, Finland, Germany, Ghana, Greece, Holy See, Hungary, Iceland, Indonesia, Ireland, Italy, Jamaica, Japan, Jordan, Kazakhstan, the Republic of Korea, Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Madagascar, Mali, Malta, Mauritius, Monaco, Montenegro, Netherlands[16], New Zealand[17], North Macedonia, Norway, Palau, Peru, Philippines, Poland, Portugal, Romania, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Tajikistan, Turkey, Ukraine, United Republic of Tanzania, Uruguay, Uzbekistan and Viet Nam. Libya did not qualify in 2019

15. Because the evaluation process described in paragraph 12 had not yet been completed for 62 (59) States, the conclusion drawn for these States relates only to declared nuclear material in peaceful activities. The conclusion in paragraph 1(b) of the *Safeguards Statement* was drawn for Afghanistan, Angola, Antigua and Barbuda, Azerbaijan, Bahrain, Benin, Bosnia and Herzegovina, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Democratic Republic of the Congo, Djibouti, Dominican Republic, El Salvador, Eswatini, Ethiopia, Fiji, Gabon, Gambia, Georgia, Guatemala, Haiti, Honduras, the Islamic Republic of Iran, Iraq, Kenya, Kyrgyzstan, Lesotho, Liberia, Libya[41], Malawi, Marshall Islands, Mauritania, Mexico, Mongolia, Morocco, Mozambique, Namibia, Nicaragua, Niger, Nigeria, Panama, Paraguay, Republic of Moldova, Rwanda, Saint Kitts and Nevis, Senegal, Serbia, Thailand, Togo, Turkmenistan, Uganda, United Arab Emirates and Vanuatu.

B.1.1.2. States with comprehensive safeguards agreements in force but no additional protocols in force

Status of implementation

16. As of 31 December 2019, safeguards were implemented for 44 (45) States in this category. Safeguards implementation involved activities in the field and at Headquarters, including the evaluation of States' accounting reports and other information required under comprehensive safeguards agreements and the evaluation of safeguards relevant information from other sources.

Deriving conclusions

17. For a State with a comprehensive safeguards agreement, the Agency's right and obligation are as described in paragraph 3 above. Although the implementation of safeguards strengthening measures[18] under such an agreement have increased the Agency's ability to detect undeclared nuclear material and activities, the activities that the Agency may conduct in this regard are limited for a State without an additional protocol. Thus, the conclusion in the *Safeguards Statement* for a State with a comprehensive

---

[15] This conclusion is drawn with regard to that part of Denmark which is covered by INFCIRC/193 and INFCIRC/193/Add.8, i.e. Denmark and the Faroe Islands, and to Greenland for which Denmark has concluded a separate comprehensive safeguards agreement and an additional protocol thereto (INFCIRC/176 and INFCIRC/176/Add.1, respectively).

[16] This conclusion is drawn with regard only to that part of the Netherlands which is covered by INFCIRC/193 and INFCIRC/193/Add.8, i.e. the Netherlands in Europe, which excludes the Caribbean part of the Netherlands (the islands of Bonaire, Sint Eustatius and Saba), Aruba, Curaçao and Sint Maarten. The Netherlands has concluded a separate comprehensive safeguards agreement that applies to its constituent parts mentioned above (INFCIRC/229), but has not yet concluded an additional protocol thereto.

[17] This conclusion is drawn with regard only to New Zealand which is covered by INFCIRC/185 and INFCIRC/185/Add.1; it is not drawn for the Cook Islands and Niue, which are also covered by INFCIRC/185, but not by INFCIRC/185/Add.1.

[18] Such measures include the early provision of design information, environmental sampling and the use of satellite imagery.

safeguards agreement alone relates only to the non-diversion of declared nuclear material from peaceful activities.

18. In the course of its evaluation, the Agency also seeks to determine whether there is any indication of undeclared nuclear material or activities in the State which would need to be reflected in the *Safeguards Statement*. However, without the measures provided for in the *Model Additional Protocol* being implemented, the Agency is not able to provide credible assurance of the absence of undeclared nuclear material and activities for the State as a whole.

Syrian Arab Republic

19. In August 2019, the Acting Director General submitted a report to the Board of Governors entitled *Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic* (GOV/2019/34) covering relevant developments since the previous report in August 2018 (GOV/2018/35). The Acting Director General informed the Board of Governors that no new information had come to the knowledge of the Agency that would have an impact on the Agency's assessment that it was very likely that a building destroyed at the Dair Alzour site was a nuclear reactor that should have been declared to the Agency by Syria.[19] In 2019, the Director General and Acting Director General renewed calls on Syria to cooperate fully with the Agency in connection with unresolved issues related to the Dair Alzour site and other locations. Syria has yet to respond to these calls.

20. In 2019, inspections were carried out at the Miniature Neutron Source Reactor facility near Damascus and a LOF in Damascus.

21. On the basis of the evaluation of information provided by Syria, and all other safeguards relevant information available to it, the Agency found no indication of diversion of declared nuclear material from peaceful activities. For 2019, the Agency concluded for Syria that declared nuclear material remained in peaceful activities.

Overall conclusions for 2019

22. On the basis of the evaluation performed and as reflected in paragraph 2 of the *Safeguards Statement*, the Secretariat concluded that for the 44 (45) States[20], declared nuclear material remained in peaceful activities. This conclusion was drawn for Algeria, Argentina, Bahamas, Barbados, Belarus, Belize, Bhutan, the Plurinational State of Bolivia, Brazil, Brunei Darussalam, Dominica, Egypt, Grenada, Guyana, Kiribati, Lao People's Democratic Republic, Lebanon, Malaysia, Maldives, Myanmar, Nauru, Nepal, Oman, Papua New Guinea, Qatar, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Saudi Arabia, Sierra Leone, Solomon Islands, Sri Lanka, Sudan, Suriname, Syrian Arab Republic, Tonga, Trinidad and Tobago, Tunisia, Tuvalu, the Bolivarian Republic of Venezuela, Yemen, Zambia and Zimbabwe.

---

[19] The Board of Governors, in its resolution GOV/2011/41 of June 2011 (adopted by a vote), had, inter alia, called on Syria to urgently remedy its non-compliance with its NPT Safeguards Agreement and, in particular, to provide the Agency with updated reporting under its Safeguards Agreement and access to all information, sites, material and persons necessary for the Agency to verify such reporting and resolve all outstanding questions so that the Agency could provide the necessary assurance as to the exclusively peaceful nature of Syria's nuclear programme.

[20] In addition, this conclusion is drawn for those territories of the Netherlands referred to in footnote 16 for which the broader conclusion is not drawn – i.e. the Caribbean part of the Netherlands (the islands of Bonaire, Sint Eustatius and Saba), Aruba, Curaçao and Sint Maarten; and the Cook Islands and Niue, which are covered by New Zealand's comprehensive safeguards agreement but not by its additional protocol – see footnote 17. It is also drawn for France's territories covered by the safeguards agreement reproduced in INFCIRC/718 between France, EURATOM and the Agency pursuant to Additional Protocol I to the Treaty of Tlatelolco; and for the United States of America's territories covered by the safeguards agreement reproduced in INFCIRC/366 between the United States of America and the Agency pursuant to Additional Protocol I to the Treaty of Tlatelolco.

B.1.2. States Parties to the NPT without comprehensive safeguards agreements in force

23. As of 31 December 2019, 10 (11) States Parties to the NPT had yet to bring comprehensive safeguards agreements into force pursuant to Article III of the Treaty.

Overall conclusions for 2019

24. As indicated in paragraph 3 of the *Safeguards Statement*, the Secretariat could not draw any safeguards conclusions for Cabo Verde, Equatorial Guinea, Eritrea, Guinea, Guinea-Bissau, Federated States of Micronesia, Sao Tome and Principe, Somalia, State of Palestine[21] and Timor-Leste.

B.1.3. States with safeguards agreements based on INFCIRC/66/Rev.2 in force

25. Under safeguards agreements based on INFCIRC/66/Rev.2, the Agency applies safeguards in order to ensure that nuclear material, facilities and other items specified under the safeguards agreement are not used for the manufacture of any nuclear weapon or to further any military purpose, and that such items are used exclusively for peaceful purposes and are not used for the manufacture of any nuclear explosive device.

Status of implementation

26. As of 31 December 2019, safeguards were implemented at facilities in India, Israel and Pakistan pursuant to safeguards agreements based on INFCIRC/66/Rev.2. India has an additional protocol to its INFCIRC/754 safeguards agreement in force.

Deriving conclusions

27. The conclusion described in paragraph 4 of the *Safeguards Statement* is reported for these three States, and relates to the nuclear material, facilities and other items to which safeguards were applied. To draw such a conclusion in respect of these States, the Agency evaluates all safeguards relevant information available to it, including verification results and information about facility design features and operations.

Overall conclusions for 2019

28. On the basis of the results of its verification and evaluation activities, the Secretariat concluded that the nuclear material, facilities or other items to which safeguards were applied in India, Israel and Pakistan remained in peaceful activities.

B.1.4. States with both voluntary offer agreements and additional protocols in force

29. Under a voluntary offer agreement, the Agency applies safeguards to nuclear material in those facilities that have been selected by the Agency from the State's list of eligible facilities in order to verify that the material is not withdrawn from peaceful activities except as provided for in the agreement. In selecting facilities under voluntary offer agreements for the application of safeguards, the Agency takes such factors into consideration as: (i) whether the selection of a facility would satisfy legal obligations arising from other agreements concluded by the State; (ii) whether useful experience may be gained in implementing new safeguards approaches or in using advanced equipment and technology; and (iii) whether the cost efficiency of Agency safeguards may be enhanced by applying safeguards, in the exporting State, to nuclear material being shipped to States with comprehensive safeguards agreements in force. By implementing measures under the additional protocol in these five States with

---

[21] The designation employed does not imply the expression of any opinion whatsoever concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.

voluntary offer agreements, the Agency also seeks to obtain and verify information that could enhance the safeguards conclusions for States with comprehensive safeguards agreements in force.

Status of implementation

30. During 2019, safeguards were implemented at facilities selected by the Agency in the five States with voluntary offer agreements in force: China, France, the Russian Federation, the United Kingdom of Great Britain and Northern Ireland (United Kingdom) and the United States of America.

Deriving conclusions

31. The conclusion contained in paragraph 5 of the *Safeguards Statement* is reported for the five States with voluntary offer agreements in force in which safeguards were applied to nuclear material in selected facilities. To draw the safeguards conclusion, the Agency evaluates all safeguards relevant information available to it, including verification results and information about facility design features and operations.

Overall conclusions for 2019

32. On the basis of the results of its verification and evaluation activities, the Secretariat concluded for China, France, the Russian Federation, the United Kingdom and the United States of America that nuclear material to which safeguards had been applied in selected facilities remained in peaceful activities or had been withdrawn as provided for in the agreements. There were no such withdrawals from the selected facilities in France, the Russian Federation, the United Kingdom and the United States of America.

B.2. Verification and Monitoring in the Islamic Republic of Iran in light of United Nations Security Council Resolution 2231 (2015)

33. The Agency continued to verify and monitor the nuclear-related commitments of the Islamic Republic of Iran (Iran) under the Joint Comprehensive Plan of Action (JCPOA). Iran continued to provisionally apply the additional protocol to its safeguards agreement in accordance with Article 17(b) of the Additional Protocol, pending its entry into force. During the year, four quarterly reports and six reports providing updates on developments in between the issuance of quarterly reports were submitted to the Board of Governors and in parallel to the United Nations Security Council entitled *Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)* (GOV/2019/10, GOV/2019/21, GOV/2019/32 and GOV/2019/55; and GOV/INF/2019/8, GOV/INF/2019/9, GOV/INF/2019/10, GOV/INF/2019/12, GOV/INF/2019/16 and GOV/INF/2019/17).

B.3. Democratic People's Republic of Korea

34. In August 2019, the Acting Director General submitted a report to the Board of Governors and General Conference entitled *Application of Safeguards in the Democratic People's Republic of Korea* (GOV/2019/33–GC(63)/20), which provided an update of developments since the Director General's report of August 2018 (GOV/2018/34-GC(62)/12).

35. Since 1994, the Agency has not been able to conduct all necessary safeguards activities provided for in the DPRK's NPT Safeguards Agreement. From the end of 2002 until July 2007, the Agency was not able — and, since April 2009, has not been able — to implement any verification measures in the DPRK, and, therefore, the Agency could not draw any safeguards conclusion regarding the DPRK.

36. In 2019, no verification activities were implemented in the field but the Agency continued to monitor developments in the DPRK's nuclear programme and to evaluate all safeguards relevant information available to it, including open source information and satellite imagery.

37. In 2019, the Secretariat intensified efforts to enhance the Agency's readiness to play its essential role in verifying the DPRK's nuclear programme. The Secretariat has further increased the frequency of collection of satellite imagery, procured equipment and supplies, updated verification approaches and procedures, conducted specialized training, commenced new knowledge management activities, and ensured the availability of appropriate verification technologies and equipment. Once a political agreement has been reached among the countries concerned, the Agency is ready to return to the DPRK in a timely manner, if requested to do so by the DPRK and subject to approval by the Board of Governors.

38. In 2019, the Agency continued to monitor the Yongbyon site. During 2019, there were no indications of the operation of the Yongbyon Experimental Nuclear Power Plant (5MW(e)) reactor, nor any indications of reprocessing activities at the Radiochemical Laboratory. At the Yongbyon Nuclear Fuel Rod Fabrication Plant, there were indications consistent with the use of the reported centrifuge enrichment facility located within the plant. The Agency did not observe any further activities consistent with the fabrication of major reactor components in the light water reactor (LWR) construction yard. Movements of construction vehicles near the reactor containment building, turbine hall and electrical switchyard continued to be observed. The Agency has not observed any indications of operation of the reactor, although there was an indication of a test of parts of the cooling infrastructure in March 2019.

39. At the group of buildings within a security perimeter in the vicinity of Pyongyang,[22] there were indications of ongoing activities.

40. The Agency has not had access to the Yongbyon site or to other locations in the DPRK. Without such access, the Agency cannot confirm either the operational status or configuration/design features of the facilities or locations, or the nature and purpose of the activities conducted therein.

41. In 2019, some of the DPRK's nuclear facilities appeared not to be operating, while activities at some other facilities continued or developed further. The DPRK's nuclear activities remain a cause for serious concern. The continuation of the DPRK's nuclear programme is a clear violation of relevant United Nations Security Council resolutions and is deeply regrettable.

B.4. Areas of difficulty in safeguards implementation

42. The performance and the effectiveness of State and regional authorities responsible for safeguards implementation (SRA) and of their respective systems of accounting for and control of nuclear material (SSACs/RSACs) have a significant impact upon the effectiveness and efficiency of Agency safeguards implementation.

43. The effectiveness of some SRAs is affected by issues identified by the Agency in one or more of the following areas: provision of safeguards information to the Agency; provision of access to the Agency to conduct in-field verification activities; technical effectiveness of SSACs; and States' cooperation and logistical support related to the Agency's verification activities in the field or at Headquarters. Addressing these issues lead to additional costs, effort and resources for the Agency and, in many cases, also for the SRAs and nuclear facility operators.

44. In 2019, despite the above-mentioned issues, the Agency — based on the evaluation of all safeguards relevant information available to it — did not find any indication that, in its judgement, gave rise to proliferation concern.

45. The Agency continues to address these issues to resolve them through cooperation and engagement with the States concerned. There are different causes of these issues. Some States have still not established SSACs, which are required under comprehensive safeguards agreements. Moreover, not all

---

[22] GOV/2019/33-GC(63)/20, para. 18.

SRAs have the necessary legal authority, independence from nuclear facility or LOF operators, resources or technical capabilities to implement the requirements of safeguards agreements and additional protocols.

46. In 2019, the Agency developed a new initiative to assist States to strengthen the effectiveness of SSAC/SRAs. The initiative focussed on 19 States that were yet to provide their initial inventory report on nuclear material or their initial additional protocol declarations. For these States, the Agency identified the main causes of their reporting issues and developed a plan to assist the respective SRAs based on their specific needs and to monitor progress.

47. In accordance with the decision of the Board of Governors in September 2005, States which have not amended or rescinded their SQPs should do so as soon as possible. At the end of 2019, 32 (35) States[23] had operative SQPs that had yet to be amended.

B.5. Strengthening the effectiveness and improving the efficiency of safeguards

48. The Agency has continued to improve the efficiency of safeguards implementation while maintaining or strengthening its effectiveness. This improvement has been essential since the number of safeguards agreements and additional protocols in force[5], the quantities of nuclear material and other items under safeguards and the number of facilities under safeguards have all increased in recent years. In contrast, the Agency's financial resources have not risen commensurately. It should be noted that while a number of facilities are being retired from service, this will not immediately reduce verification effort as safeguards continue to be applied to those facilities until their status is confirmed by the Agency as decommissioned for safeguards purposes.

49. Some of the factors contributing to strengthening the effectiveness and improving the efficiency of safeguards are shown in Fact box 2.

50. As a result of these improvements, safeguards have been implemented more effectively in the field and have been complemented by enhanced and improved activities at Headquarters.

51. During 2019, the Agency developed a State-level safeguards approach (SLA) for one State with a comprehensive safeguards agreement. This brings the total number of States with a comprehensive safeguards agreement for which an SLA has been developed to 131. These 131 States hold 97% of all nuclear material (by significant quantity) under Agency safeguards in States with a comprehensive safeguards agreement. These 131 States comprise 67 States[14] with a comprehensive safeguards agreement and an additional protocol in force for which the broader conclusion has been drawn (of which 17 are States with an SQP); 37 States[24] with a comprehensive safeguards agreement and an additional protocol in force for which the broader conclusion was not drawn for 2019 (of which 25 are

---

[23] The States with SQPs based on the original standard text are: Barbados, Belize, Bhutan, the Plurinational State of Bolivia, Brunei Darussalam, Dominica, Fiji, Grenada, Guyana, Haiti, Kiribati, Kyrgyzstan, Lao People's Democratic Republic, Maldives, Mongolia, Myanmar, Namibia, Nauru, Nepal, Oman, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Saudi Arabia, Sierra Leone, Solomon Islands, Sudan, Suriname, Trinidad and Tobago, Tuvalu, Yemen and Zambia. In addition, there is an SQP based on the original standard text to the safeguards agreement reproduced in INFCIRC/229 between the Netherlands and the Agency pursuant to the NPT and Additional Protocol I to the Treaty of Tlatelolco.

[24] Afghanistan, Antigua and Barbuda, Azerbaijan, Bosnia and Herzegovina, Burundi, Cambodia, Central African Republic, Chad, Congo, Côte d'Ivoire, Cyprus, Democratic Republic of the Congo, Eswatini, Ethiopia, Fiji, Gabon, Gambia, Georgia, Guatemala, Kyrgyzstan, Libya, Malawi, Marshall Islands, Mongolia, Mozambique, Namibia, Niger, Nigeria, Republic of Moldova, Rwanda, Saint Kitts and Nevis, Senegal, Thailand, Togo, Turkmenistan, Uganda and Vanuatu.

States with an SQP); and 27 States[25] with a comprehensive safeguards agreement with an SQP in force but no additional protocol in force. Previously, an SLA was developed for one State[26] with a voluntary offer agreement and an additional protocol in force.

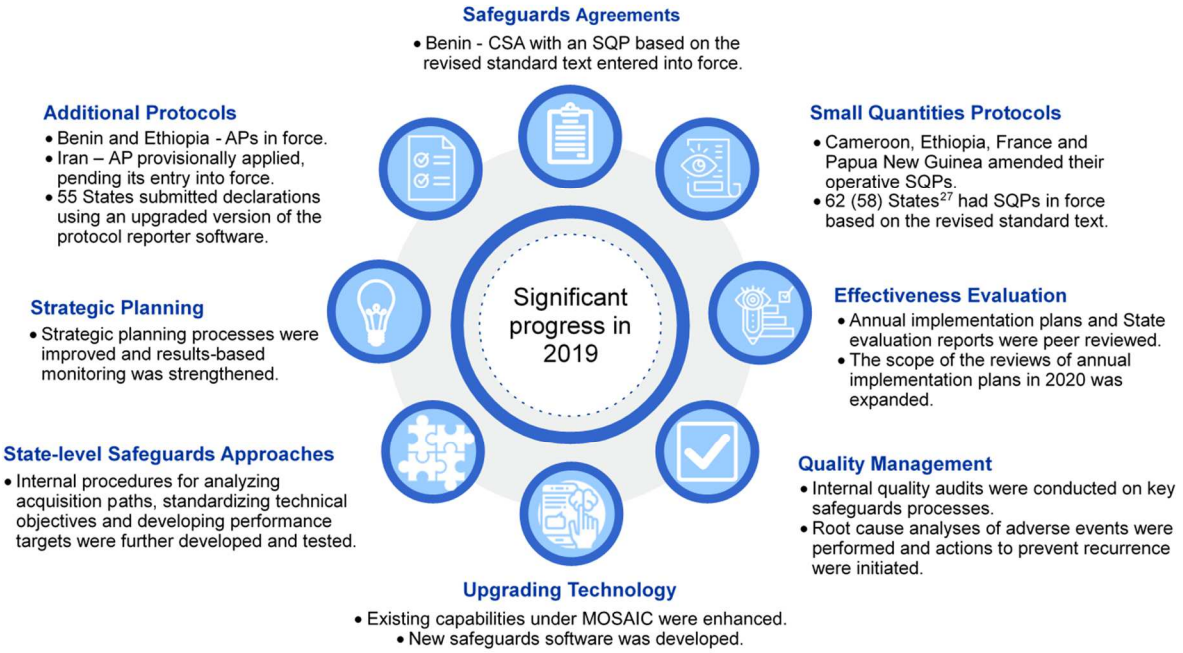
52. After completing the modernization of safeguards information technology under the MOSAIC project in 2018, the Agency focused on enhancing existing and developing new safeguards software capabilities in line with the departmental strategic priorities.

53. Under the departmental quality management system (QMS), regular oversight of the key safeguards processes and their results is provided through different activities, including internal audits, process analysis and improvement activities, to ensure impartiality, effectiveness and efficiency of safeguards implementation.

54. Internal evaluation of the effectiveness of safeguards implementation was performed through peer reviews of annual implementation plans and State evaluation reports. In 2019, 21 annual implementation plans were reviewed. In addition, the State evaluation of five States was peer reviewed by ad-hoc departmental teams. In the second part of the year, preparatory work commenced on expanding the scope of the reviews of annual implementation plans in 2020.

55. Member State Support Programmes (MSSPs) and the Standing Advisory Group on Safeguards Implementation (SAGSI) continued to make substantial contributions to Agency safeguards through the provision of assistance and advice, respectively.

Fact box 2. Strengthening the effectiveness and improving the efficiency of safeguards



[25] Barbados, Belize, Bhutan, the Plurinational State of Bolivia, Brunei Darussalam, Dominica, Grenada, Guyana, Kiribati, Lao People's Democratic Republic, Maldives, Myanmar, Nauru, Nepal, Papua New Guinea, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sierra Leone, Solomon Islands, Suriname, Tonga, Trinidad and Tobago, Tuvalu, Zambia and Zimbabwe.

[26] United Kingdom.

B.6. Safeguards expenditures and resources

56. During 2019, the activities of Major Programme 4 — Nuclear Verification — were funded from various sources — primarily through the Regular Budget and extrabudgetary contributions. The Regular Budget appropriation of €145.3 (€142.0) million[28] for 2019 was adjusted to €142.9 (€138.7) million at the United Nations operational average rate of exchange for the year. Figure 1 presents the nominal budget growth[29] for the period 2015–2019 by comparing the growth of the final budget[30] to the growth of the approved budget[31].

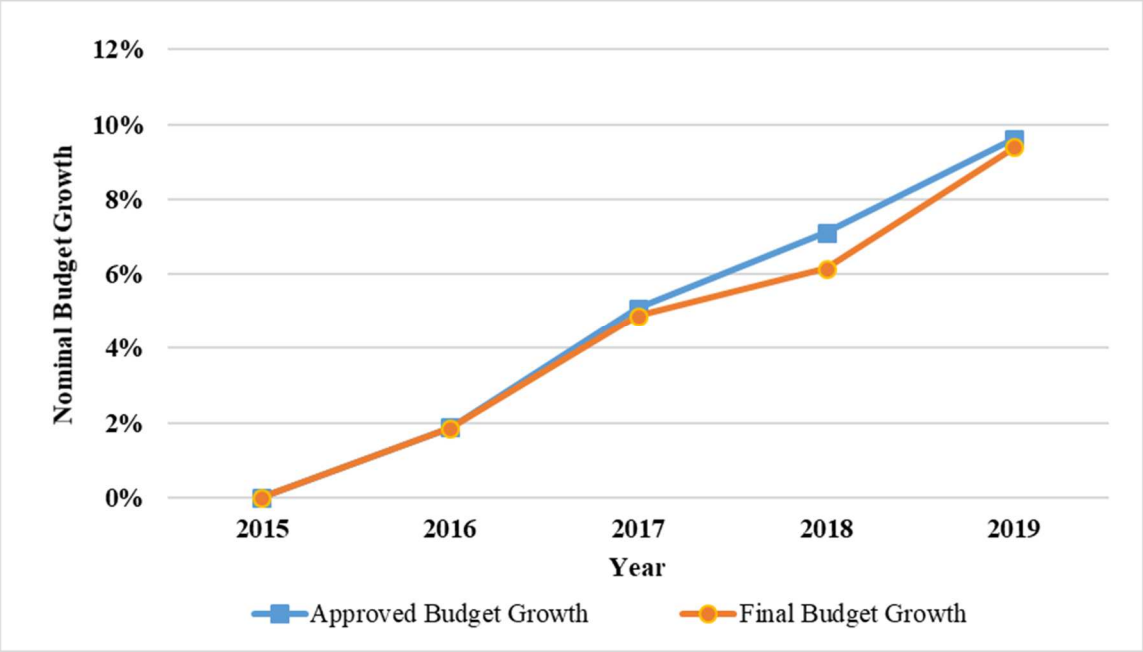


Figure 1. Nominal budget growth of the Regular Budget, 2015–2019 (base 2015=0%)

57. The expenditures for Major Programme 4 were €142.9 (€138.6) million from the Regular Budget, an increase of 3.1%, compared with 2018. The Regular Budget utilization rate for 2019

---

[27] The States with SQPs in force based on the revised standard text are: Afghanistan, Andorra, Angola, Antigua and Barbuda, Bahamas, Bahrain, Benin, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Comoros, Congo, Costa Rica, Djibouti, Dominican Republic, Ecuador, El Salvador, Eswatini, Ethiopia, Gabon, Gambia, Guatemala, Holy See, Honduras, Iceland, Kenya, Kuwait, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Monaco, Montenegro, Mozambique, New Zealand, Nicaragua, North Macedonia, Palau, Panama, Papua New Guinea, Paraguay, Qatar, Republic of Moldova, Rwanda, Saint Kitts and Nevis, San Marino, Senegal, Seychelles, Singapore, Togo, Tonga, Uganda, United Republic of Tanzania, Vanuatu and Zimbabwe. In addition, the SQP to the safeguards agreement reproduced in INFCIRC/366 between the United States of America and the Agency pursuant to Additional Protocol I to the Treaty of Tlatelolco and the SQP to the safeguards agreement reproduced in INFCIRC/718 between France, EURATOM and the Agency pursuant to Additional Protocol I to the Treaty of Tlatelolco were amended.

[28] At an exchange rate €1=$1, excluding Major Capital Investment Fund.

[29] As per GC(60)/2, it includes the gradual integration in the Regular Budget of €5.2 million allocated during the period 2017–2019 for the Agency's verification and monitoring of Iran's nuclear-related commitments under the JCPOA, in light of the United Nations Security Council resolution 2231 (2015).

[30] Represents the operational portion of the Regular Budget appropriation as represented in the annual Agency's Financial Statements, including the effects of the price adjustment and the recalculation of the Regular Budget portion of US dollars at the United Nations operational average rate of exchange for the year.

[31] Represents the Regular Budget approved by the Agency's policy-making organs excluding the effects of price adjustment and currency revaluation.

was 100% (100%) with an unspent balance of €20 thousand at the end of the year. Figure 2 shows the utilization trend of Major Programme 4 for the period 2015–2019.

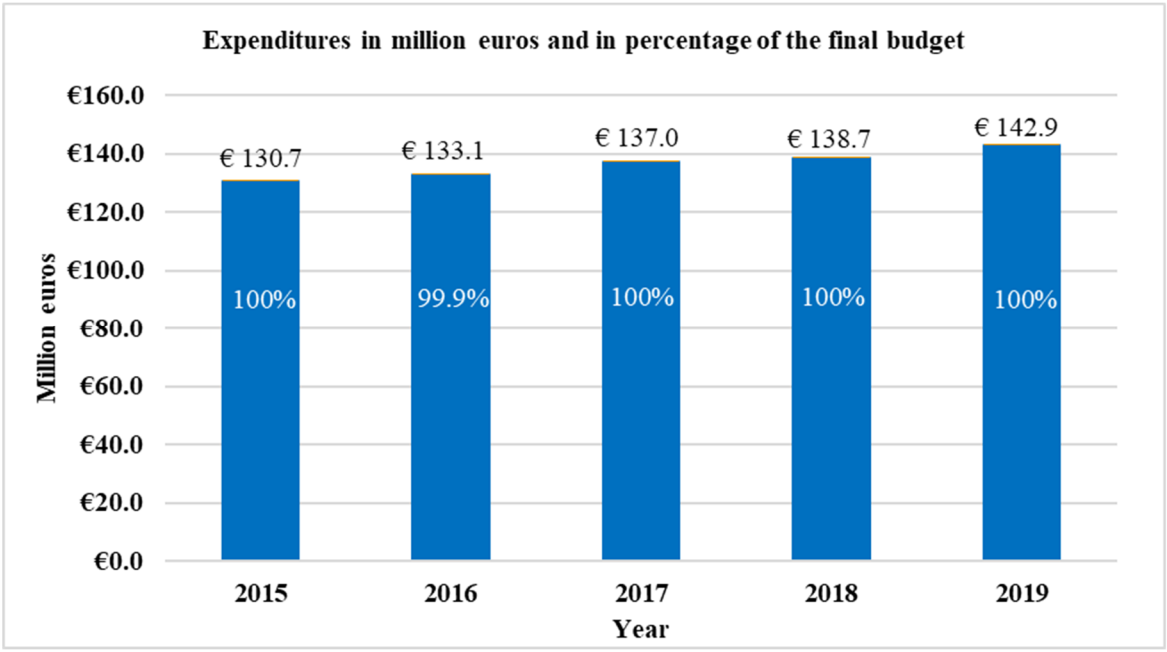


Figure 2. Major Programme 4 — Nuclear Verification — budget and expenditures, 2015–2019

58. The expenditures[32] from the extrabudgetary contributions were €20.2 (€18.9) million, an increase of 7% compared with 2018. This increase resulted mainly from the upgrade and maintenance activities of the safeguards information technology system.

B.7. Status of safeguards agreements (as of 31 December 2019)

59. This section contains information — presented in the five tables below — on safeguards agreements that provide the basis for the Agency's implementation of safeguards in 2019. It does not include agreements under which the application of safeguards has been suspended in the light of implementation of safeguards pursuant to another agreement. For full details, see the Agency's website: http://www.iaea.org.

[32] Including Programme Support Costs.

Table 1 – States with comprehensive safeguards agreements and additional protocols in force

State	SQP	INFCIRC	Additional protocol (date of entry into force)
Afghanistan	X(A)	257	19 July 2005
Albania		359	03 November 2010
Andorra	X(A)	808	19 December 2011
Angola	X(A)	800	28 April 2010
Antigua and Barbuda	X(A)	528	15 November 2013
Armenia		455	28 June 2004
Australia		217	12 December 1997
Austria		193	30 April 2004
Azerbaijan		580	29 November 2000
Bahrain	X(A)	767	20 July 2011
Bangladesh		301	30 March 2001
Belgium		193	30 April 2004
Benin	X(A)	930	17 September 2019
Bosnia and Herzegovina		851	03 July 2013
Botswana		694	24 August 2006
Bulgaria[(1)]		193	01 May 2009
Burkina Faso	X(A)	618	17 April 2003
Burundi	X(A)	719	27 September 2007
Cambodia	X(A)	586	24 April 2015
Cameroon	X(A)	641	29 September 2016
Canada		164	08 September 2000
Central African Republic	X(A)	777	07 September 2009
Chad	X(A)	802	13 May 2010
Chile		476	03 November 2003
Colombia		306	05 March 2009
Comoros	X(A)	752	20 January 2009
Congo	X(A)	831	28 October 2011
Costa Rica	X(A)	278	17 June 2011
Côte d'Ivoire		309	05 May 2016
Croatia[(1)]		193	01 April 2017
Cuba		633	03 June 2004
Cyprus[(1)]		193	01 May 2008
Czech Republic[(1)]		193	01 October 2009
Democratic Republic of the Congo		183	09 April 2003
Denmark[(2)]		193 176	30 April 2004 22 March 2013
Djibouti	X(A)	884	26 May 2015
Dominican Republic	X(A)	201	05 May 2010
Ecuador	X(A)	231	24 October 2001
El Salvador	X(A)	232	24 May 2004
Estonia[(1)]		193	01 December 2005
Eswatini	X(A)	227	08 September 2010
Ethiopia	X(A)	261	18 September 2019

State	SQP	INFCIRC	Additional protocol (date of entry into force)
Fiji	X	192	14 July 2006
Finland		193	30 April 2004
Gabon	X(A)	792	25 March 2010
Gambia	X(A)	277	18 October 2011
Georgia		617	03 June 2003
Germany		193	30 April 2004
Ghana		226	11 June 2004
Greece		193	30 April 2004
Guatemala	X(A)	299	28 May 2008
Haiti	X	681	09 March 2006
Holy See	X(A)	187	24 September 1998
Honduras	X(A)	235	17 November 2017
Hungary[(1)]		193	01 July 2007
Iceland	X(A)	215	12 September 2003
Indonesia		283	29 September 1999
Iraq		172	10 October 2012
Ireland		193	30 April 2004
Italy		193	30 April 2004
Jamaica		265	19 March 2003
Japan		255	16 December 1999
Jordan		258	28 July 1998
Kazakhstan		504	09 May 2007
Kenya	X(A)	778	18 September 2009
Korea, Republic of		236	19 February 2004
Kuwait	X(A)	607	02 June 2003
Kyrgyzstan	X	629	10 November 2011
Latvia[(1)]		193	01 October 2008
Lesotho	X(A)	199	26 April 2010
Liberia	X(A)	927	10 December 2018
Libya		282	11 August 2006
Liechtenstein		275	25 November 2015
Lithuania[(1)]		193	01 January 2008
Luxembourg		193	30 April 2004
Madagascar	X(A)	200	18 September 2003
Malawi	X(A)	409	26 July 2007
Mali	X(A)	615	12 September 2002
Malta[(1)]		193	01 July 2007
Marshall Islands		653	03 May 2005
Mauritania	X(A)	788	10 December 2009
Mauritius	X(A)	190	17 December 2007
Mexico		197	04 March 2011
Monaco	X(A)	524	30 September 1999
Mongolia	X	188	12 May 2003
Montenegro	X(A)	814	04 March 2011

State	SQP	INFCIRC	Additional protocol (date of entry into force)
Morocco		228	21 April 2011
Mozambique	X(A)	813	01 March 2011
Namibia	X	551	20 February 2012
Netherlands[3]		193	30 April 2004
New Zealand[4]	X(A)	185	24 September 1998
Nicaragua	X(A)	246	18 February 2005
Niger		664	02 May 2007
Nigeria		358	04 April 2007
North Macedonia	X(A)	610	11 May 2007
Norway		177	16 May 2000
Palau	X(A)	650	13 May 2005
Panama	X(A)	316	11 December 2001
Paraguay	X(A)	279	15 September 2004
Peru		273	23 July 2001
Philippines		216	26 February 2010
Poland[1]		193	01 March 2007
Portugal		193	30 April 2004
Republic of Moldova	X(A)	690	01 June 2012
Romania[1]		193	01 May 2010
Rwanda	X(A)	801	17 May 2010
Saint Kitts and Nevis	X(A)	514	19 May 2014
Senegal	X(A)	276	24 July 2017
Serbia		204	17 September 2018
Seychelles	X(A)	635	13 October 2004
Singapore	X(A)	259	31 March 2008
Slovakia[1]		193	01 December 2005
Slovenia[1]		193	01 September 2006
South Africa		394	13 September 2002
Spain		193	30 April 2004
Sweden		193	30 April 2004
Switzerland		264	01 February 2005
Tajikistan		639	14 December 2004
Thailand		241	17 November 2017
Togo	X(A)	840	18 July 2012
Turkey		295	17 July 2001
Turkmenistan		673	03 January 2006
Uganda	X(A)	674	14 February 2006
Ukraine		550	24 January 2006
United Arab Emirates		622	20 December 2010
United Republic of Tanzania	X(A)	643	07 February 2005
Uruguay		157	30 April 2004
Uzbekistan		508	21 December 1998
Vanuatu	X(A)	852	21 May 2013
Viet Nam		376	17 September 2012

State	SQP	INFCIRC	Additional protocol (date of entry into force)

General Notes:

- In addition, safeguards, including the measures of the Model Additional Protocol, were applied for Taiwan, China.
- The safeguards agreement reproduced in INFCIRC/193 is that concluded between the non-nuclear-weapon States of the European Atomic Energy Community (EURATOM), EURATOM and the Agency.
- 'X' in the 'SQP' column indicates that the State has an operative SQP. 'X(A)' indicates that the SQP in force is based on the revised SQP standard text (see Section B, paragraph 6).

Table Notes:

(1) The date refers to accession to INFCIRC/193 and INFCIRC/193/Add.8.

(2) The application of safeguards in Denmark under the bilateral NPT safeguards agreement (INFCIRC/176), in force since 1 March 1972, was suspended on 21 February 1977, on which date the safeguards agreement between the non-nuclear-weapon States of EURATOM, EURATOM and the Agency (INFCIRC/193) entered into force for Denmark. Since 21 February 1977, INFCIRC/193 also applies to the Faroe Islands. Upon Greenland's secession from EURATOM as of 31 January 1985, the agreement between the Agency and Denmark (INFCIRC/176) re-entered into force for Greenland. The additional protocol to this agreement entered into force on 22 March 2013 (INFCIRC/176/Add.1).

(3) The safeguards agreement reproduced in INFCIRC/229 with regard to the Caribbean part of the Netherlands (the islands of Bonaire, Sint Eustatius, and Saba), Aruba, Curaçao and Sint Maarten is pursuant to the NPT and Additional Protocol I to the Treaty of Tlatelolco. There is an SQP to this agreement. No additional protocol is in force for that agreement.

(4) The safeguards agreement reproduced in INFCIRC/185 is also applicable to the Cook Islands and Niue. The amended SQP reproduced in INFCIRC/185/Mod.1 and the additional protocol reproduced in INFCIRC/185/Add.1, however, are not applicable to the Cook Islands and Niue.

Table 2 – States with comprehensive safeguards agreements but no additional protocols in force

State	SQP	INFCIRC	Additional protocol
Algeria		531	Signed: 16 February 2018
Argentina		435	
Bahamas	X(A)	544	
Barbados	X	527	
Belarus		495	Signed: 15 November 2005
Belize	X	532	
Bhutan	X	371	
Bolivia, Plurinational State of	X	465	Signed: 18 September 2019
Brazil		435	
Brunei Darussalam	X	365	
Democratic People's Republic of Korea(1)		403	
Dominica	X	513	
Egypt		302	
Grenada	X	525	
Guyana	X	543	
Iran, Islamic Republic of(2)		214	Signed: 18 December 2003
Kiribati	X	390	Signed: 09 November 2004
Lao People's Democratic Republic	X	599	Signed: 05 November 2014
Lebanon	X(A)	191	
Malaysia		182	Signed: 22 November 2005
Maldives	X	253	

State	SQP	INFCIRC	Additional protocol
Myanmar	X	477	Signed: 17 September 2013
Nauru	X	317	
Nepal	X	186	
Oman	X	691	
Papua New Guinea	X(A)	312	
Qatar	X(A)	747	
Saint Lucia	X	379	
Saint Vincent and the Grenadines	X	400	
Samoa	X	268	
San Marino	X(A)	575	
Saudi Arabia	X	746	
Sierra Leone	X	787	
Solomon Islands	X	420	
Sri Lanka		320	Approved: 12 September 2018
Sudan	X	245	
Suriname	X	269	
Syrian Arab Republic		407	
Tonga	X(A)	426	
Trinidad and Tobago	X	414	
Tunisia		381	Signed: 24 May 2005
Tuvalu	X	391	
Venezuela, Bolivarian Republic of		300	
Yemen	X	614	
Zambia	X	456	Signed: 13 May 2009
Zimbabwe	X(A)	483	

General Notes:

- The safeguards agreement reproduced in INFCIRC/435 is that concluded between Argentina, Brazil, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Material (ABACC) and the Agency.
- 'X' in the 'SQP' column indicates that the State has an operative SQP. 'X(A)' indicates that the SQP in force is based on the revised SQP standard text (see Section B, paragraph 6).

Table Notes:

(1) In a letter to the Director General dated 10 January 2003, the DPRK stated that the Government had "decided to lift the moratorium on the effectiveness of its withdrawal from the Treaty on the Non-Proliferation of Nuclear Weapons" and that "its decision to withdraw from the Treaty will come into effect from 11 January 2003 onwards."

(2) On 16 January 2016, as notified in its letter to the Director General of 7 January 2016, Iran began to provisionally apply its additional protocol in accordance with Article 17(b) of the Additional Protocol, pending its entry into force.

Table 3 – States Parties to the NPT without comprehensive safeguards agreements in force

States Parties to the NPT	SQP	Safeguards agreement	Additional protocol
Cabo Verde	X(A)	Signed: 28 June 2005	Signed: 28 June 2005
Equatorial Guinea	X	Approved: 13 June 1986	
Eritrea			
Guinea	X(A)	Signed: 13 December 2011	Signed: 13 December 2011
Guinea-Bissau	X(A)	Signed: 21 June 2013	Signed: 21 June 2013
Micronesia, Federated States of	X(A)	Signed: 01 June 2015	
Sao Tome and Principe	X(A)	Approved: 21 November 2019	Approved: 21 November 2019
Somalia			
State of Palestine(1)	X(A)	Signed: 14 June 2019	
Timor-Leste	X(A)	Signed: 06 October 2009	Signed: 06 October 2009

General Note:
- 'X' in the 'SQP' column indicates that the State has an SQP. 'X(A)' indicates that the SQP is based on the revised SQP standard text (see Section B, paragraph 6). In both cases, the SQP will come into force at the same time as the safeguards agreement.

Table Note:
(1) The designation employed does not imply the expression of any opinion whatsoever concerning the legal status of any country or territory or of its authorities, or concerning the delimitation of its frontiers.

Table 4 – States with safeguards agreements based on INFCIRC/66/Rev.2 in force

State	INFCIRC	Additional protocol
India	754	In force: 25 July 2014
Israel	249/Add.1	
Pakistan	34 116 135 239 248 393 418 705 816 920	

Table 5 – States with voluntary offer agreements and additional protocols in force

State	INFCIRC	Additional protocol
China	369	In force: 28 March 2002
France[(1)]	290	In force: 30 April 2004
Russian Federation	327	In force: 16 October 2007
United Kingdom of Great Britain and Northern Ireland[(2), (3), (4)]	263	In force: 30 April 2004
United States of America[(5)]	288	In force: 06 January 2009

Table Notes:

(1) The safeguards agreement reproduced in INFCIRC/718 between France, EURATOM and the Agency is pursuant to Additional Protocol I to the Treaty of Tlatelolco. There is an SQP to this agreement. The SQP was amended. No additional protocol to that agreement has been concluded.

(2) The safeguards agreement reproduced in INFCIRC/175, which remains in force, is an INFCIRC/66/Rev.2-type safeguards agreement, concluded between the United Kingdom and the Agency.

(3) The safeguards agreement between the United Kingdom, EURATOM and the Agency pursuant to Additional Protocol I to the Treaty of Tlatelolco was signed but has not entered into force. There is an SQP to this agreement. No additional protocol to that agreement has been concluded.

(4) The safeguards agreement between the United Kingdom and the Agency for the applications of safeguards in the United Kingdom in connection with the NPT and the additional protocol thereto were signed but have not entered into force.

(5) The safeguards agreement reproduced in INFCIRC/366 between the United States of America and the Agency is pursuant to Additional Protocol I to the Treaty of Tlatelolco. There is an SQP to this agreement. The SQP was amended. No additional protocol to that agreement has been concluded.

C. Safeguards Implementation

60. This section presents the results[33] of safeguards implementation for 2019 for States[4] with safeguards agreements in force. The results are summarized for each group of States described in the *Safeguards Statement*. Further data regarding verification activities and results are presented in Appendices I and II.

61. An evaluation of the implementation of safeguards was performed for each State with a safeguards agreement in force, namely:

- States with both comprehensive safeguards agreements and additional protocols in force[5]:
  - States with the broader conclusion in which integrated safeguards were implemented for the whole year or part thereof;
  - States with the broader conclusion in which integrated safeguards were not implemented during the year;
  - States with the broader conclusion not drawn.
- States with comprehensive safeguards agreements in force but without additional protocols in force;
- States with safeguards agreements based on INFCIRC/66/Rev.2 in force, including one State with an additional protocol in force;
- States with both voluntary offer agreements and additional protocols in force.

62. Analysis of these results leads to the identification of any implementation problems for individual States and the formulation of action plans to resolve them. Generic issues are addressed in Section D.

63. Key to the process by which safeguards conclusions are drawn is the State evaluation process. The Secretariat follows uniform internal processes and defined procedures to draw independent and objective safeguards conclusions based on its own verification activities and findings. During the year, State evaluations for 183 (182) States[4] were completed and reviewed.[34]

C.1. States with both comprehensive safeguards agreements and additional protocols in force[5]

64. Only for a State with both a comprehensive safeguards agreement and an additional protocol in force, when all the necessary evaluations have been completed, does the Agency draw the broader conclusion that all nuclear material in the State has remained in peaceful activities. After drawing the broader conclusion for a State, and when the necessary arrangements have been completed, the Agency implements integrated safeguards under which — due to increased assurance of the absence of undeclared nuclear material and activities for the State as a whole — the intensity of inspection activities at declared facilities and LOFs can be reduced.

65. Where integrated safeguards are implemented, the Agency establishes technical objectives for specific locations, or groups of locations, according to the nuclear material or activity involved. The technical objectives form the basis of the State-level safeguards approach (SLA). The verification

---

[33] Results for the DPRK are not included as the Agency did not implement safeguards in the DPRK.

[34] Completion of the process of reviewing the State evaluation reports extends into the first three months of the following year. The number of States shows, therefore, the total for the twelve-month period running from April 2019 to March 2020.

measures and activities necessary to meet these objectives are also defined in the SLA and annual implementation plans. Where integrated safeguards are not implemented, the safeguards activities to be performed in the field are based either on an SLA developed for the State or on the Agency's Safeguards Criteria, and new techniques and technologies are implemented, as applicable, to strengthen effectiveness and improve efficiency.

66. As reported in paragraph 1 of the *Safeguards Statement*, 131 States had both comprehensive safeguards agreements and additional protocols in force[5]. As reported in paragraph 1(a) of the *Safeguards Statement*, the Secretariat was able to draw the broader conclusion for 69[35] of the 131 States[4] that all nuclear material remained in peaceful activities. The results of safeguards implementation for these 69 States[4] are subdivided below into two categories: 67 States[4, 36], where integrated safeguards were implemented for the whole year or part thereof; and two States[37] where integrated safeguards were not implemented in 2019. In addition, for one State[38] integrated safeguards were partially implemented in 2019.

C.1.1. States with the broader conclusion in which integrated safeguards were implemented during 2019

67. Integrated safeguards were implemented for the whole of 2019 in 66 (67) States[4] with the broader conclusion and the implementation of integrated safeguards commenced in Liechtenstein during 2019 (see Appendix II, Group 1). Safeguards implementation activities were carried out for those States in accordance with the SLA and annual implementation plan for each individual State.

68. The amounts of nuclear material under safeguards, the number of facilities and MBAs containing LOFs under safeguards, the safeguards activities undertaken during the year, the verification effort and data on the submission of accounting reports and additional protocol declarations are presented for each State in Appendix II, Tables II.1–3.

69. Having evaluated the results of safeguards activities and all other available safeguards relevant information for each of these States, the Secretariat found that there was no indication of diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material and activities in these States[4]. On this basis, the Secretariat concluded that, for these States[4], all nuclear material remained in peaceful activities.

---

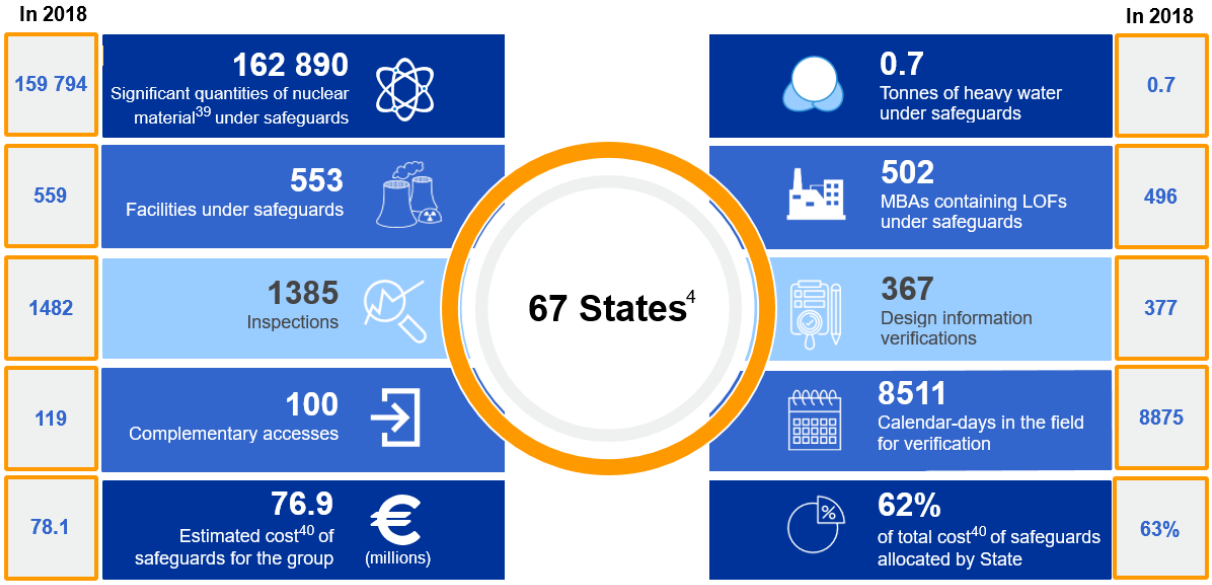
[35] In 2019, one planned in-field verification activity was not conducted at the IR-100 research reactor and subcritical uranium-water assembly located at the Sevastopol National University of Nuclear Energy and Industry of Ukraine, where declared nuclear material was located. Nevertheless, on the basis of the evaluation of all safeguards relevant information for Ukraine in 2019, the Agency did not find any indication that, in its judgment, gave rise to a proliferation concern. Consequently, the Secretariat was able to draw the broader conclusion for Ukraine that all nuclear material remained in peaceful activities.

[36] Integrated safeguards were implemented only in that part of Denmark which is covered by INFCIRC/193 and INFCIRC/193/Add.8, i.e. Denmark and the Faroe Islands, which excludes Greenland. Integrated safeguards were implemented only in that part of the Netherlands covered by INFCIRC/193 and INFCIRC/193/Add.8, i.e. the Netherlands in Europe, which excludes the Caribbean part of the Netherlands (the islands of Bonaire, Sint Eustatius and Saba), Aruba, Curaçao and Sint Maarten. Integrated safeguards were implemented only in that part of New Zealand which is covered by INFCIRC/185 and INFCIRC/185/Add.1, which excludes the Cook Islands and Niue.

[37] Jordan and Turkey.

[38] Libya.

Fact box 3. States[4] in which integrated safeguards were implemented during 2019



Japan

70. The proportion of nuclear material on the Fukushima Daiichi site at the time of the accident which has been successfully re-verified has reached approximately 83% at the end of 2019. Nuclear material inaccessible for verification continues to remain at only the three damaged reactors (Units 1-3). In 2019, a portion of fresh fuel was removed from the spent fuel pond of Unit 3 and re-verified. Removal and verification of the remaining fresh fuel and spent fuel in the spent fuel pond is planned in 2020. Removal of assemblies from the spent fuel ponds of Units 1 and 2 is not expected before 2022, due to the on-going cleaning activities on the operating floors. As clean-up and decommissioning activities on the site progress, safeguards measures continue to be applied to ensure that nuclear material cannot be removed from the reactors without the Agency's knowledge. The damaged units and the site have been monitored using remote surveillance and unattended radiation detection systems along with frequent short-notice inspections and complementary access. Safeguards measures remained in place throughout 2019 for the reactor Units 5 and 6, and the Common Spent Fuel Storage Facility (CSFS). Further improvements of safeguards measures for the damaged reactors are being considered, in light of the development of access technologies and enhancement of the site infrastructure.

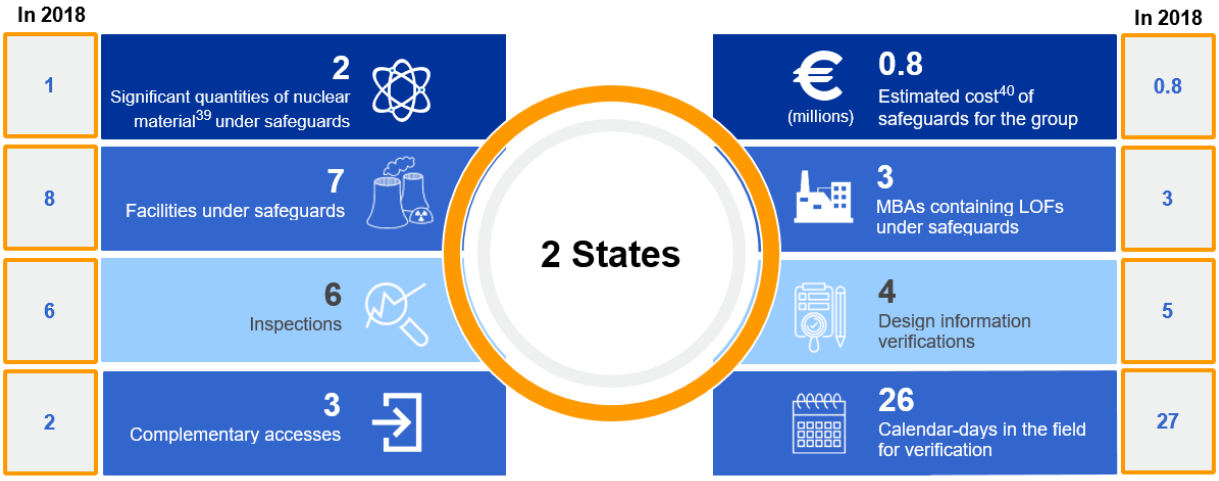
C.1.2. States with the broader conclusion in which integrated safeguards were not implemented during 2019

71. There are two (three) States in this group. The amounts of nuclear material under safeguards, the number of facilities and MBAs containing LOFs under safeguards, the safeguards activities undertaken during the year, the verification effort and data on the submission of accounting reports and additional protocol declarations are presented for each State in Appendix II, Tables II.4–6.

[39] This figure excludes the Agency's estimate of the plutonium in reactors which, under agreed reporting procedures, has not yet been reported to the Agency.

[40] See Section F.1.3.

Fact box 4. States in which integrated safeguards were not implemented during 2019



72. Having evaluated the results of safeguards activities and all other available safeguards relevant information for each of these States, the Secretariat found that there was no indication of diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material and activities in these States. On this basis, the Secretariat concluded that, for these States, all nuclear material remained in peaceful activities.

C.1.3. States without the broader conclusion

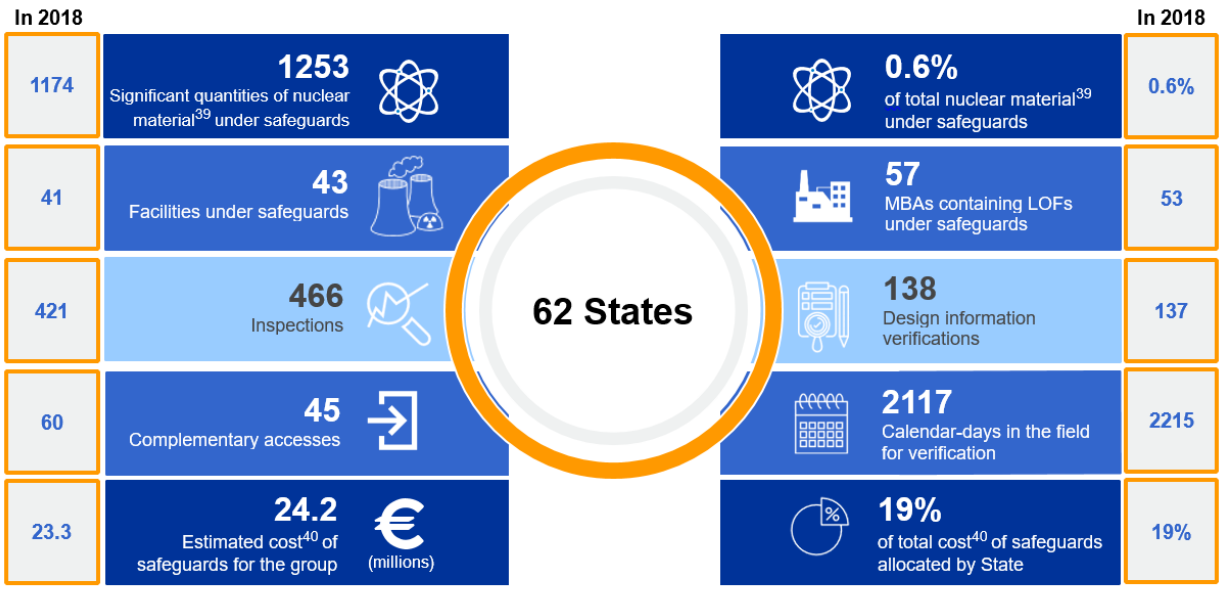
73. For 2019, the Secretariat concluded that, for Libya, declared nuclear material remained in peaceful activities.[41, 42]

74. There were 62 (59) States with both comprehensive safeguards agreements and additional protocols in force[5] for which the Secretariat had not drawn a broader conclusion for 2019. The amounts of nuclear material under safeguards, the number of facilities and MBAs containing LOFs under safeguards, the safeguards activities undertaken during the year, the verification effort and data on the submission of accounting reports and additional protocol declarations are presented for each State in Appendix II, Tables II.7–9.

[41] The continued inability of the Agency to verify the information provided by Libya on the actual status of nuclear material previously declared by Libya under the additional protocol at a location in Libya has eroded the Agency's ability to implement safeguards effectively with respect to the above-mentioned nuclear material and, therefore, affected its ability to draw the broader conclusion for Libya for 2019. The Agency continues to work with Libya in order to resolve this issue so that a safeguards conclusion that all nuclear material remained in peaceful activities could be drawn for Libya.

[42] Integrated safeguards were partially implemented for Libya in 2019.

Fact box 5. States with both comprehensive safeguards agreements and additional protocols in force[5], without the broader conclusion



75. Attaining a broader conclusion involves activities by both the State and the Agency that may include legal and administrative aspects. The States should provide all the required nuclear material accounting and additional protocol information and respond to Agency requests seeking to resolve questions or inconsistencies. The Agency continues to work with these States to obtain the necessary information, to resolve inconsistencies in the information, to resolve safeguards relevant questions regarding their nuclear activities and to complete the evaluations for each of the States.

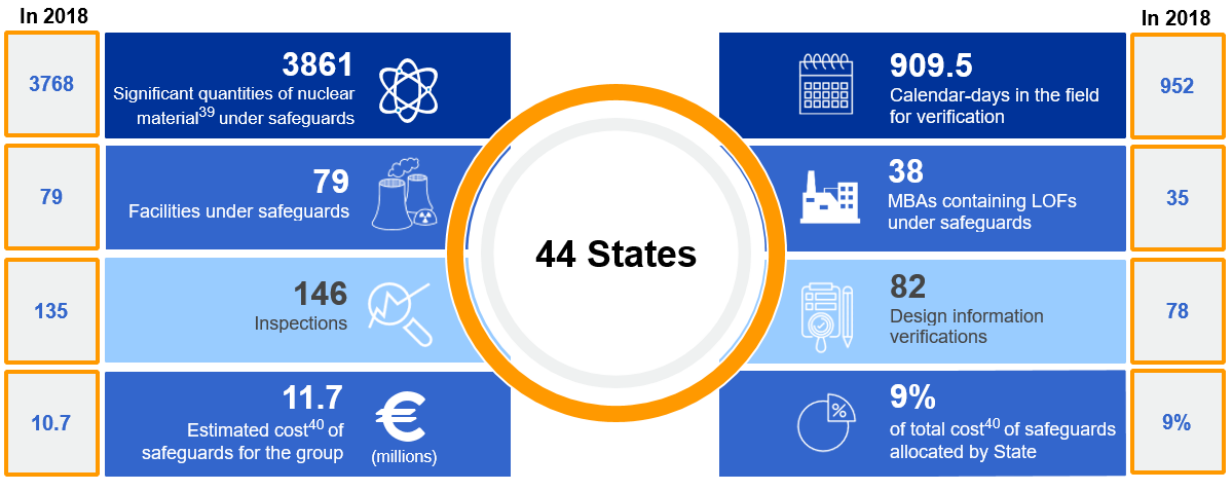
76. Having evaluated the results of safeguards activities and all other available safeguards relevant information for each of these States, the Secretariat found that there was no indication of diversion of declared nuclear material from peaceful nuclear activities in these States. Evaluations regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.

C.2. States with comprehensive safeguards agreements in force but without additional protocols in force

77. As reported in paragraph 2 of the *Safeguards Statement*, safeguards were applied[3] for 44 (45) States with comprehensive safeguards agreements but without additional protocols in force. The amounts of nuclear material under safeguards, the number of facilities and MBAs containing LOFs under safeguards, the safeguards activities undertaken during the year and the verification effort and data on the submission of accounting reports are presented for each State in Appendix II, Tables II.10–12.

78. Having evaluated the results of safeguards activities and all other available safeguards relevant information for each of these States, the Secretariat found that there was no indication of the diversion of declared nuclear material from peaceful nuclear activities in these States. On this basis, the Secretariat concluded that, for these States, declared nuclear material remained in peaceful activities.

Fact box 6. States with comprehensive safeguards agreements in force but without additional protocols in force

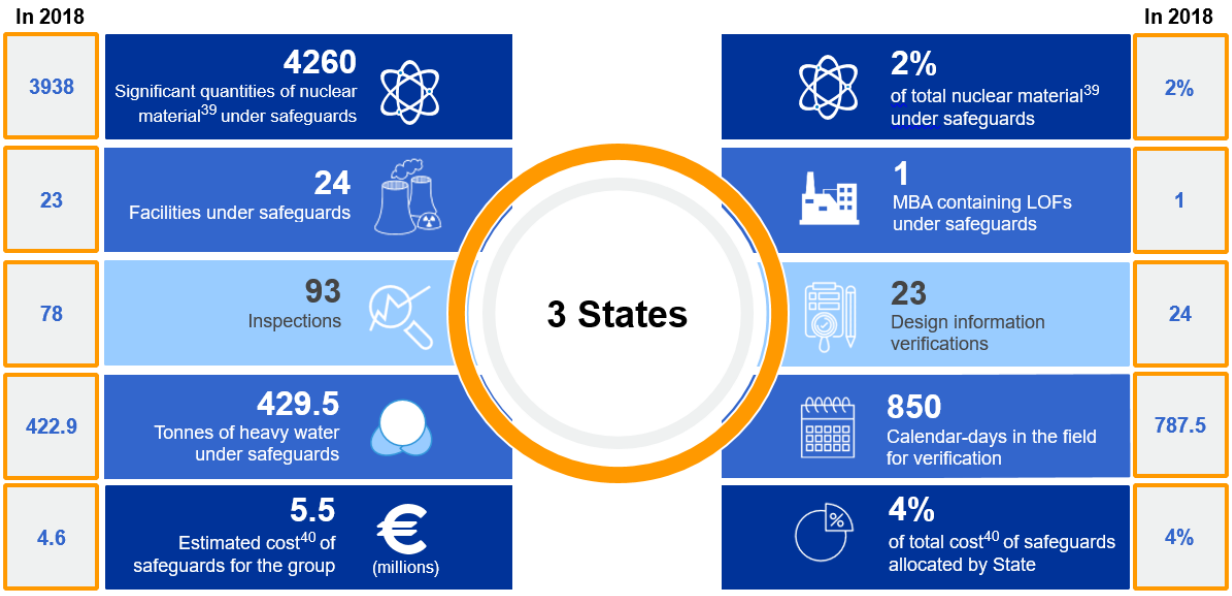


C.3. States with safeguards agreements based on INFCIRC/66/Rev.2 in force

79. As reported in paragraph 4 of the *Safeguards Statement*, India, Israel and Pakistan have safeguards agreements based on INFCIRC/66/Rev.2. India has an additional protocol to its safeguards agreement (INFCIRC/754/Add.6).

80. The amounts of nuclear material and heavy water under safeguards, the number of facilities and MBAs containing LOFs under safeguards, the safeguards activities undertaken during the year, the verification effort and data on the submission of accounting reports are presented for each State in Appendix II, Tables II.13–15.

Fact box 7. States with safeguards agreements based on INFCIRC/66/Rev.2 in force



81. Having evaluated the results of safeguards activities and all other safeguards relevant information available to it for each of these States, the Secretariat found that there was no indication of diversion of nuclear material or of the misuse of the facilities or other items to which safeguards had been applied in

these States. On this basis, the Secretariat concluded that, for these States, nuclear material, nuclear facilities or other items to which safeguards had been applied remained in peaceful activities.

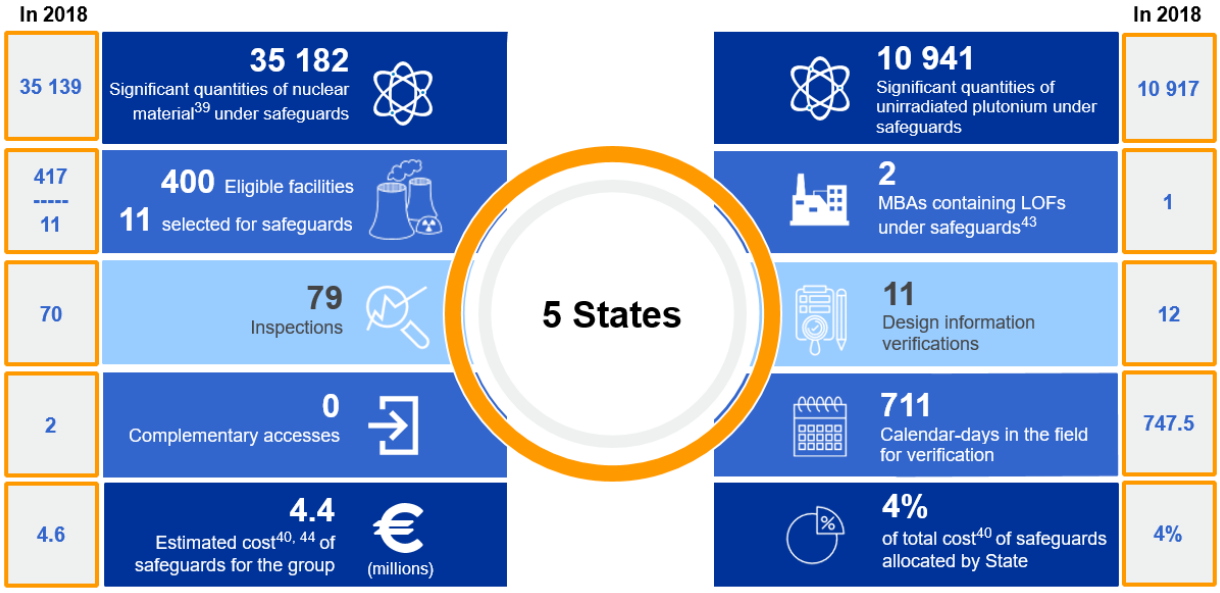
C.4. States with both voluntary offer agreements and additional protocols in force

82. As reported in paragraph 5 of the *Safeguards Statement*, there were five nuclear-weapon States with voluntary offer agreements and additional protocols in force.

83. The amounts of nuclear material under safeguards, the number of facilities under safeguards, the safeguards activities undertaken during the year, the verification effort and data on the submission of accounting reports and additional protocol declarations are presented for each State in Appendix II, Tables II.16–18.

84. Having evaluated the results of safeguards activities and all other safeguards relevant information available to it for each of these States, the Secretariat found that there was no indication of the diversion of nuclear material to which safeguards had been applied. On this basis, the Secretariat concluded that, for the five States, nuclear material to which safeguards had been applied in selected facilities, or parts thereof, remained in peaceful activities or was withdrawn from safeguards as provided for in the agreements. There were no such withdrawals from the selected facilities in France, the Russian Federation, the United Kingdom and the United States of America.

Fact box 8. States with both voluntary offer agreements and additional protocols in force



[43] One MBA containing LOFs in the United States of America's territories covered by the safeguards agreement pursuant to Additional Protocol I to the Treaty of Tlatelolco reproduced in INFCIRC/366, and one MBA containing LOFs in the French Protocol I territories covered by the safeguards agreement pursuant to Additional Protocol I to the Treaty of Tlatelolco reproduced in INFCIRC/718.

[44] This figure does not include safeguards implementation costs covered by extrabudgetary contributions.

C.5. States Parties to the NPT without comprehensive safeguards agreements in force

85. As reported in paragraph 3 of the *Safeguards Statement*, the Secretariat could not draw any safeguards conclusions for the ten States Parties to the NPT which, at the end of 2019, had yet to bring comprehensive safeguards agreements into force pursuant to Article III of the Treaty. Six (six) of these States Parties have signed comprehensive safeguards agreements and four of the six have also signed additional protocols.

D. Areas of Difficulty in Safeguards Implementation

86. This section describes progress in addressing the problems in the implementation of safeguards during 2019.

D.1. Safeguards implementation in States with small quantities protocols

87. As called on by the Board of Governors in September 2005, States which have not amended or rescinded their SQPs should respond to the Agency's proposal and either amend or rescind, as appropriate, their SQPs as soon as possible. At the end of 2019, 32 (35) States had operative SQPs that had yet to be amended.

88. The actions undertaken by the Agency under the *Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols*, are provided in Section E.1.

D.2. Effectiveness of systems of accounting for and control of nuclear material

89. The performance of State and regional authorities responsible for safeguards implementation (SRA) and the effectiveness of their respective systems of accounting for and control of nuclear material (SSAC) have a significant impact upon the effectiveness and efficiency of safeguards implementation.

90. The effectiveness of some SRAs is affected by issues identified by the Agency in one or more of the following areas: provision of safeguards information to the Agency; provision of access to the Agency to conduct in-field verification activities; technical effectiveness of SSACs; and States' cooperation and logistical support related to the Agency's verification activities in the field or at Headquarters. Addressing these issues lead to additional costs, effort and resources for the Agency and, in many cases, also for the SRAs and nuclear facility operators.

D.2.1. Provision of safeguards information

91. Complete, accurate and timely provision by States of safeguards-related reports, declarations and other information is important for effective and efficient safeguards implementation. A summary of the issues related to the timely provision of nuclear material reports and additional protocol declarations due with regard to 2019 for States with safeguards agreements in force is shown in Fact box 9.

Fact box 9. Timeliness of reports and declarations which were due with regard to 2019 for States with safeguards agreements in force

92. Issues related to the reporting of nuclear material continued for several States. Figure 3A shows the number of States for which the provision of nuclear material accountancy reports to the Agency for the period 2013–2019 was either delayed or remained outstanding. Over the last seven years, modest progress has been observed on the provision of initial inventory reports on nuclear material by States with an SQP based on the revised standard text. In 2019, the Agency received four of the five initial inventory reports on nuclear material that were due during the year. In addition, two States with an SQP based on the revised standard text provided their initial inventory report that was due before 2019. Concerning States with CSAs without an operative SQP, a reduction in the number of States that did not provide all required nuclear material accountancy reports has now been observed for three consecutive years. Moreover, the number of States which provided nuclear material accountancy reports with significant delays slightly decreased in 2019.

93. Figure 3B shows the number of States for which the provision of additional protocol declarations to the Agency for the period 2013–2019 was either delayed or remained outstanding. During 2019, declarations were received from 113 States[4], about 80% of the States with an additional protocol in force[5]. Four of these States provided their initial declarations in 2019, while three other States provided updated annual declarations more than two years after the previous submission. Overall, 23 States (21 of them with an operative SQP) did not submit any additional protocol declarations in 2019. Of those, seven States had provided declarations in previous years (three of them in 2018); for the remaining 16 States the initial declarations are still outstanding. Significant delays in the submission of additional protocol declarations were observed for 18 States in 2019, including five States with at least one facility under Agency safeguards. For ten of these 18 States the significant delay recorded in 2019 is a recurring event. In each of the last seven years, issues related to the submission of declarations pursuant to additional protocols have been found in over 30% of States with additional protocols in force, with the problem persisting for more than half of them.

[45] One quarter of the outstanding PILs and MBRs were for MBAs containing LOFs.

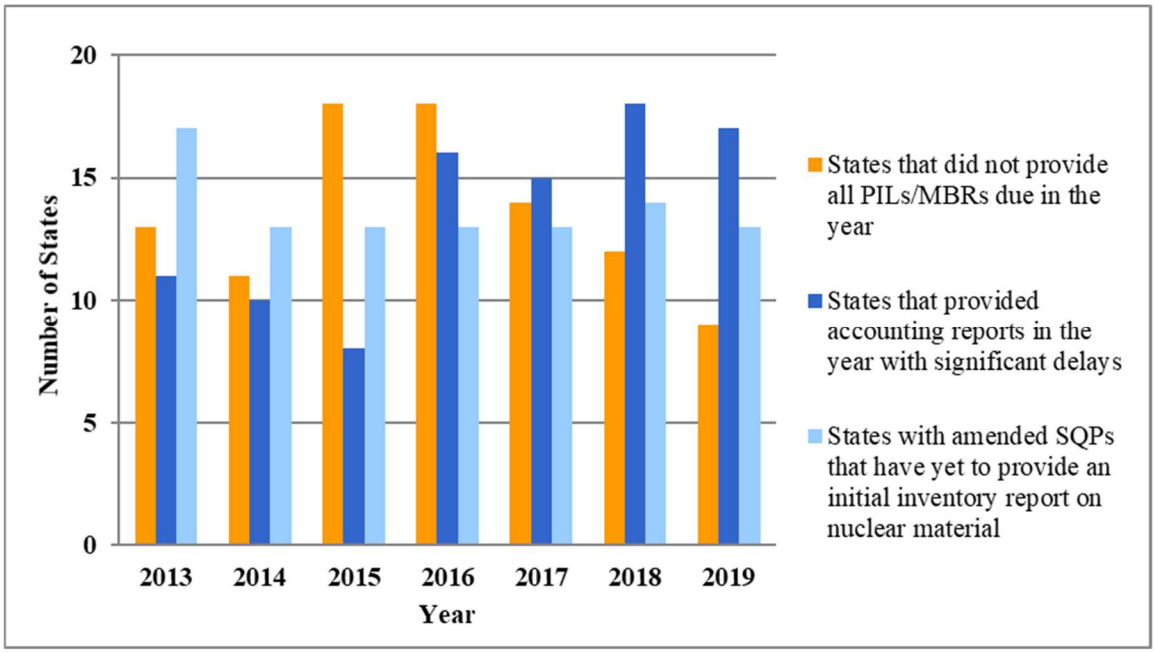


Figure 3A. States for which the provision of nuclear material accountancy reports to the Agency was delayed or remained outstanding

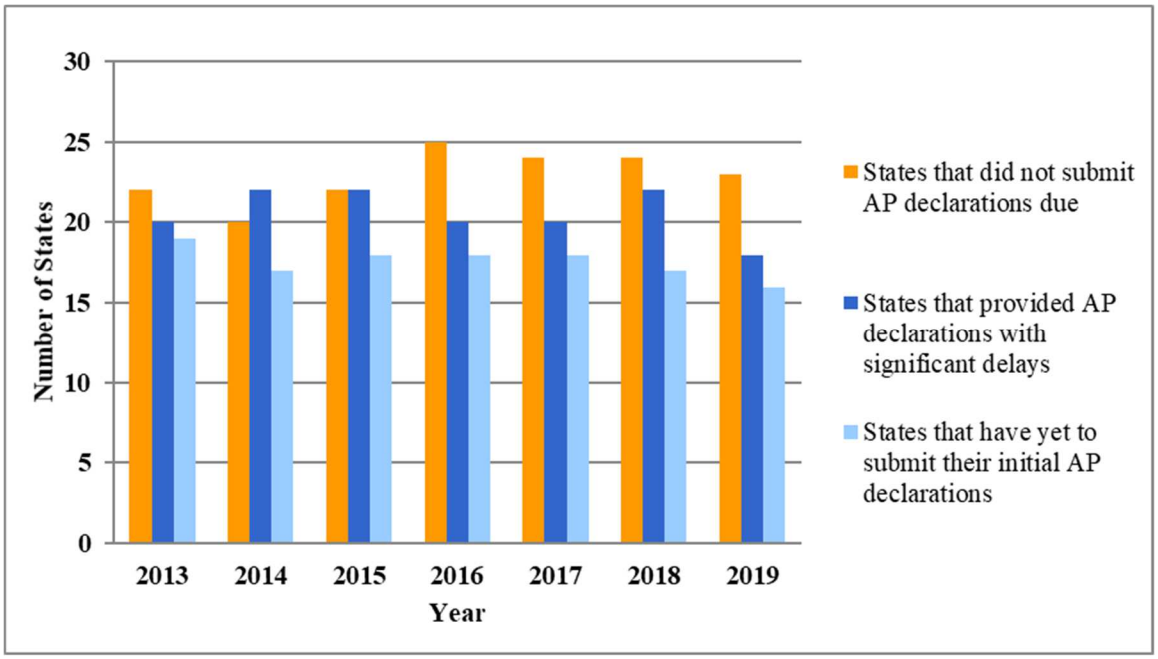


Figure 3B. States for which the provision of additional protocol declarations to the Agency was delayed or remained outstanding

D.2.2. Provision of access to conduct in-field activities

94. Granting timely and unrestricted access to Agency inspectors to facilities, LOFs, sites or other locations, and to safeguards data is an essential component of the effectiveness of the Agency's verification activities in the field.

95. Three States restricted inspectors' access to certain areas considered by the Agency of safeguards relevance which are within the layout of declared facilities. These restrictions of access precluded the Agency from verifying that there was no undeclared nuclear material at these facilities which was required to be safeguarded. While such restrictions of access were to areas where SRAs had indicated nuclear material was not present, such access was requested by the Agency to assure the absence of undeclared nuclear material at all areas of the facilities. In 2019, the issue was resolved in one of these instances, and significant progress was achieved towards the resolution of the other issues. The Agency continues to engage with the States concerned to obtain the necessary access. Five other States did not facilitate the conduct of planned safeguards activities through provision of timely access for Agency inspectors or the equipment or services necessary for such activities. In these States, additional effort was required to attain the safeguards technical objectives.

96. Issues related to the provision of required visas for designated inspectors continued during 2019 in around one tenth of States, including five States with CSAs without an operative SQP. Restrictions on, or significant delays in, accepting the designation of inspectors, including instances where States accepted the designation of a limited number of inspectors, were experienced in approximately one fifth of States. The restrictions on designation of inspectors and issues related to the provision of required visas complicated travel and inspection planning and in some cases limited the Agency's ability to respond to changing inspection needs.

D.2.3. Technical effectiveness of SSACs

97. Some SRAs do not exercise sufficient oversight of nuclear material accounting and control systems at nuclear facilities and LOFs to ensure the required accuracy of safeguards information transmitted to the Agency.

98. In 20 States with at least one facility under Agency safeguards, the SRA had limited capabilities to independently validate safeguards information received from operators and assure the quality of operators' records, reports and declarations prior to their submission by the SRA to the Agency.

99. The quality of the operator's measurement and accountancy systems at facilities with nuclear material in bulk form is an important factor for the evaluation of the material balance. Measurements of nuclear material in bulk form by facility operators generally met international measurement and accountancy standards. However, the measurements of nuclear material at 21 facility MBAs showed evidence of bias, poor measurement quality and/or accountancy practices. As a consequence, while the Agency found no indications of the diversion of declared nuclear material, the material balance evaluations at these MBAs showed statistically significant values for material unaccounted for, the difference statistic and shipper-receiver differences or bias in the trends for these material balance statistics.

D.2.4. States' cooperation and logistical support

100. The Agency's ability to resolve questions, inconsistencies, discrepancies or anomalies depends on States' cooperation in responding to Agency requests for additional information or for access to resolve such issues. Delays in resolving issues can result in the Agency being unable to attain the safeguards technical objectives in a timely manner. The effort to resolve questions, inconsistencies, discrepancies or anomalies results in greater use of Agency and State resources. For 21 States, additional effort was required by the Agency to obtain the necessary clarification or support for the resolution of Agency questions, including in relation to verifying the correctness and completeness of States' declarations.

101. Some verification activities in the field strongly depend on the facility operational programme which is communicated by the State through authenticated mailbox systems or other established channels which are agreed between the State and the Agency. In 2019, late submission to the Agency of changes to facility operational programmes lead to more effort in carrying out planned safeguards

activities at some facilities in five States. Moreover, some States did not accept arrangements with the Agency to allow the transfer of safeguards data to Agency Headquarters.

102. During 2019, difficulties in customs clearance of Agency safeguards equipment were experienced in 14% of all shipments to destinations outside the European Union. These difficulties, particularly occurring in five States, affected the timely availability of safeguards equipment supporting verification activities in the field. Finally, issues related to delays in the shipment times for destructive analysis samples, which prevent the timely analysis of relevant samples, were overcome in 2019.

103. Despite the above-mentioned issues identified in the sub-sections D.2.1-D.2.4, the Agency — based on the evaluation of all safeguards relevant information available to it — did not find any indication that, in its judgement, gave rise to a proliferation concern. The Agency continues to address these issues to resolve them through cooperation and engagement with the States concerned.

D.2.5. Strengthening the effectiveness of SSAC/SRAs

104. There have been only modest improvements in resolving SRA effectiveness issues over the last years. There are different causes of these issues. In some cases, States do not have an established SRA. Moreover, one quarter of the States with an operative SQP do not have a responsive point of contact for safeguards matters. While established, some SRAs lack the necessary authority, independence from operators, resources or technical capabilities to implement the requirements of safeguards agreements and/or additional protocols. In approximately one quarter of States, including ten States with at least one facility under Agency safeguards, the scope of nuclear laws and regulations does not sufficiently cover all safeguards matters at national level.

105. During the year, the Agency continued to address the above-mentioned issues with the respective SRAs as appropriate, and to provide assistance to the SRAs as discussed in Section E.5. In addition, in 2019 the Agency developed a new initiative to assist States to strengthen the effectiveness of SSAC/SRAs. The initiative focussed on the 19 States that were yet to provide their initial inventory report on nuclear material or their initial additional protocol declarations. For these States, the Agency identified the main causes of their reporting issues and developed a plan to assist the respective SRAs based on their specific needs and to monitor the progress. Since the start of the initiative, one of these States provided its initial additional protocol declarations, and another one provided its initial inventory report on nuclear material. Based on the experience gained in 2019, in 2020, the Agency will continue with its initiative that aims at strengthening and sustaining the effectiveness of SSAC/SRAs in States with at least one facility under Agency safeguards and that express an interest in participating. This will include the development of a comprehensive plan to address States' needs to strengthen and sustain the effectiveness of their SSAC/SRAs, and monitor progress in close cooperation with each State involved. Costs associated with the implementation of this initiative will be secured mainly from extrabudgetary resources.

D.3. Security concerns

106. In certain States, the overall security situation continues to be a concern to the Agency because of the potential impact on the Agency's ability to perform planned in-field verification activities. The Agency worked very closely with the United Nations Department of Safety and Security (UNDSS) to assess the prevailing security conditions in all States and assign the appropriate security levels for staff travelling to those areas. Based on recent developments and experience, an updated in-field security training is required to be completed by all staff who travel. Additionally, tailored security briefings have been made available. Security clearance by UNDSS is required for all staff on official travel.

E. Strengthening the Effectiveness and Improving the Efficiency of Safeguards

E.1. Conclusion of safeguards agreements and additional protocols

107. The Agency continued to implement the *Plan of Action to Promote the Conclusion of Safeguards Agreements and Additional Protocols*, which was last updated in September 2019. The Agency organized an outreach workshop for diplomats from Permanent Missions and Embassies located in Berlin, Brussels and Geneva (Vienna, Austria, 9–10 April 2019), a national workshop for Oman (Muscat, Oman, 17–18 June 2019) and a country visit to Eritrea (14-16 January 2019). During these outreach activities, the Agency encouraged States to conclude comprehensive safeguards agreements and additional protocols, and to amend their SQPs. In addition, the Agency held consultations with representatives from a number of Member and non-Member States in Addis Ababa, Bangkok, Geneva, New York and Vienna at various times throughout the year. During the year, a comprehensive safeguards agreement with an SQP based on the revised standard text and an additional protocol entered into force for Benin. In addition, the State of Palestine[21] signed a comprehensive safeguards agreement with an SQP based on the standard revised text. An additional protocol entered into force for Ethiopia. An additional protocol was signed for the Plurinational State of Bolivia. The Board of Governors approved a comprehensive safeguards agreement with an SQP based on the revised standard text and an additional protocol for Sao Tome and Principe.

108. The Agency also continued to communicate with States in order to implement the Board's 2005 decisions regarding SQPs, with a view to amending or rescinding such protocols. In 2019, the SQPs were amended for Cameroon, Ethiopia, France[46] and Papua New Guinea. At the end of 2019, 62 (58) States[27] had operative SQPs in force based on the revised standard text. Figure 4A shows the number of States with operative SQPs from 2009 to 2019. The number of States that have an operative SQP based on the original standard text has decreased by approximately 40% in the last decade. Since 2013, the average rate at which operative SQPs based on the original standard text have been amended, rescinded or have become non-operational is approximately two per year.

109. Figure 4B shows the status of additional protocols from 2009 to 2019 for States with safeguards agreements in force. The number of States that have brought an additional protocol into force has increased by approximately 45% in the last decade. Since 2013, the average rate at which new additional protocols were brought into force is approximately two per year. At the end of 2019, there were 47 States with safeguards agreements in force but without an additional protocol in force. Of these, 34 have a comprehensive safeguards agreement with an operative SQP and 11 have a comprehensive safeguards agreement without an operative SQP. Since 2010, the average rate at which new additional protocols were brought into force for States with comprehensive safeguards agreement without an operative SQP is approximately one per year. Figure 4B also shows the number of States Parties to the NPT that had yet to bring comprehensive safeguards agreements into force pursuant to Article III of the Treaty. This number has decreased by approximately 45% from 2009 to 2013; since then, only three States Parties to the NPT, Benin, Djibouti and Liberia, have brought a comprehensive safeguards agreement into force.

110. The status of safeguards agreements, SQPs, and additional protocols as of 31 December 2019 is shown in the tables in Section B.7.

---

[46] The SQP to the safeguards agreement reproduced in INFCIRC/718 between France, EURATOM and the Agency pursuant to Additional Protocol I of the Treaty of Tlatelolco, covering the French Protocol I territories, was amended.

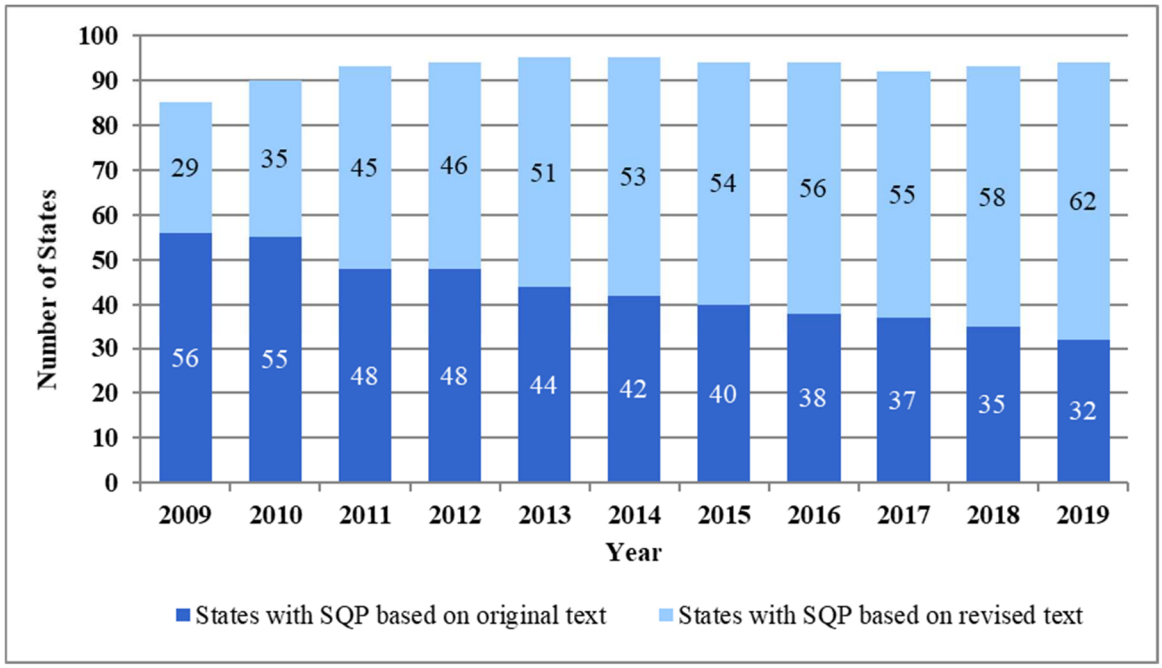


Figure 4A. Status of operative small quantities protocols for States with comprehensive safeguards agreement in force, 2009–2019

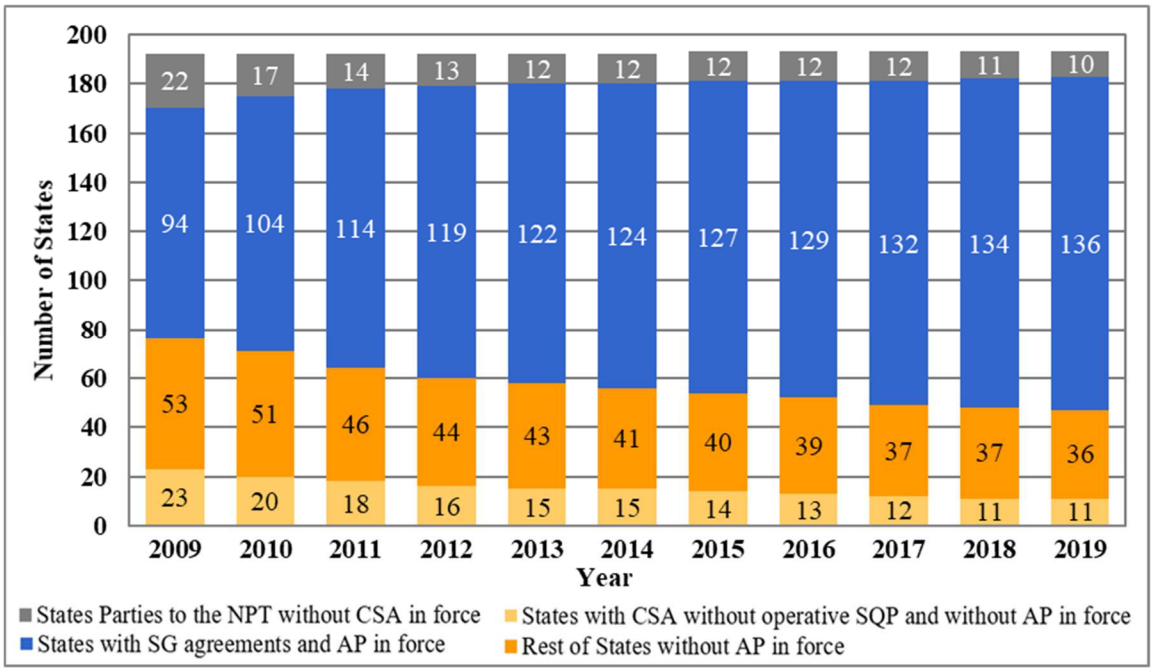


Figure 4B. Status of additional protocols for States[3, 4] with safeguards agreements in force, 2009–2019

E.2. Strategic planning

111. The Department of Safeguards conducts internal strategic planning to help ensure that safeguards continue to be implemented both effectively and efficiently into the future. Strategic planning contributes towards: addressing the increasing workload and static resources; anticipating and responding to new demands; keeping up with technology and innovation; sustaining the safeguards workforce and institutional knowledge; and enhancing organizational performance.

112. In 2019, the Department implemented a number of priority initiatives, including those related to implementation of State-level safeguards and strengthening the State evaluation process, and continued to develop its strategic planning processes, with an emphasis on effective implementation and monitoring of results. An associated software application was also completed.

113. During 2019, the Agency continued to rely on MSSPs to address research and development (R&D) needs related to the implementation of verification activities. In 2019, the Agency published the *Development and Implementation Support Programme for Nuclear Verification, 2020–2021* (STR-393). The document, along with the updated Research and Development Plan (STR-385) published in 2018 supports strategic planning by identifying R&D areas relevant to safeguards, and by communicating priority R&D needs and the types of external support necessary to meet these needs.

114. In July 2019, the Agency issued the report *Symposium on International Safeguards: Building Future Safeguards Capabilities*[47] capturing the key takeaways of the Symposium, held in November 2018. The report offered a set of ideas for potential action, for the safeguards community at large, around innovation, partnering and improving communication and collaboration among States, industry, academia, non-governmental organizations and the Secretariat.

E.3. The development and implementation of State-level safeguards approaches

115. The Agency has progressively developed and implemented SLAs as set out in the Supplementary Document (GOV/2014/41 and Corr.1). The development and implementation of an SLA for a State enables the Agency to better focus the Agency's verification efforts on the relevant safeguards objectives for that State. During 2019, the Agency developed an SLA for one State with a comprehensive safeguards agreement. This brings the total number of States with a comprehensive safeguards agreement for which an SLA has been developed to 131. These 131 States hold 97% of all nuclear material (by significant quantity) under Agency safeguards in States with a comprehensive safeguards agreement. These 131 States are comprised of 67 States[14] with a comprehensive safeguards agreement and an additional protocol in force for which the broader conclusion has been drawn (of which 17 are States with an SQP); 37 States[24] with a comprehensive safeguards agreement and an additional protocol in force for which the broader conclusion was not drawn for 2019 (of which 25 are States with an SQP); and 27 States[25] with a comprehensive safeguards agreement with an SQP in force but no additional protocol in force. Previously, an SLA was developed for one State[26] with a voluntary offer agreement and an additional protocol in force. As described in the Supplementary Document, in developing and implementing an SLA, consultations were held with the relevant State and/or regional authority, particularly on the implementation of in-field safeguards measures.

116. To further ensure consistency and non-discrimination in the implementation of SLAs, the Agency has continued to improve internal work practices taking into account experience gained and lessons learned in the development and implementation of SLAs for States under integrated safeguards. In 2019, the Agency started a two-year project aimed at improving the development of SLAs using a structured approach which includes: further developing and testing internal procedures for analysing acquisition paths; standardizing the formulation and prioritization of technical objectives; and developing and testing performance targets. To support the Agency's efforts to strengthen internal procedures for analysing acquisition paths, the Agency — with the support of MSSPs[48] — developed and refined departmental standard assessments of the time required to develop undeclared nuclear fuel cycle facilities. The Agency also standardized the formulation and prioritization of technical objectives. The

---

[47] Available on the IAEA website: https://www.iaea.org/sites/default/files/19/07/cn-267-symposium-report.pdf

[48] Experts from the Support Programmes of Australia, Brazil, Canada, China, Finland, France, Germany, Japan, the Republic of Korea, the Russian Federation, the United Kingdom, the United States of America and the European Commission were involved in this effort.

Agency is developing performance targets to be used in the development and implementation of SLAs and in the evaluation of the effectiveness of safeguards implementation at the State-level. In 2019, these developments were tested internally for seven States. The Agency was still analysing the results at the end of 2019.

E.4. Development of verification measures and technologies

E.4.1. Safeguards approaches

117. Site or facility specific safeguards approaches/procedures were developed or improved in 2019 for:

- The application of a dual containment and surveillance system at an interim spent fuel dry storage in Pakistan;
- The application of dual containment and surveillance systems at waste management facilities, associated with CANDU reactors, in Canada;
- The verification of nuclear material at the depleted, natural and low enriched uranium conversion and fuel fabrication plants in Japan.

118. In 2019, the Agency continued to prepare, with Member States support, for the future application of safeguards to new types of facilities (e.g. geological repositories, spent fuel encapsulation plants, pyroprocessing facilities, small modular reactors and pebble bed modular reactors). These preparations included safeguards by design: evaluating safeguards concepts, investigating prospective safeguards technologies and equipment, and identifying safeguards measures and potential efficiencies through design modification early in the design stages of a facility. During the year, the interdepartmental working group on safeguards by design continued to foster knowledge sharing and enhanced cooperation within the Agency on this subject. In addition, early interaction with small modular reactor designers commenced in 2019, as part of MSSPs tasks on safeguards by design.

119. In December 2019, the Agency published two further volumes in its series of Member State guidance documents entitled: *International Safeguards in the Design of Reprocessing Plants* (NF-T-3.2) and *International Safeguards in the Design of Enrichment Plants* (NF-T-4.10). During the year, MSSPs continued to support the Agency's efforts to update its guidance for safeguards implementation. In 2019, the Agency held three more expert meetings on the updating of the Physical Model (characterizing all elements of the nuclear fuel cycle), covering fuel fabrication, enrichment and reprocessing. Expert meetings were also held on the Agency's guidance for acquisition path steps related to undeclared enrichment and reprocessing facilities, and on the Agency's guidance for implementing safeguards at post-operational facilities.

120. During 2019, the Department of Safeguards continued its contribution to assessments of the proliferation resistance of nuclear facilities through participating in the Agency's International Project on Innovative Reactors and Fuel Cycle and the Generation IV International Forum. In addition, the Agency participated in the Safeguards and Security Working Group under the Republic of Korea and the United States Joint Fuel Cycle Study.

E.4.2. Major safeguards projects

E.4.2.1 Chornobyl

121. In 2019, the Agency continued development of the safeguards approach for the transfer of spent fuel from wet storage to interim dry storage after conditioning. Installed safeguards equipment at the conditioning facility and interim dry storage facility were running in cold test mode during 2019 and are ready for hot testing in 2020. Furthermore, the Agency continues to develop an effective and efficient

approach, including hardware, to safeguard the nuclear material contained in the new safe confinement of the Chornobyl nuclear power plant, installed over the damaged reactor Unit 4.

E.4.2.2 Encapsulation Plant and Geological Repository

122. Finland and Sweden each have plans to construct an encapsulation plant and a geological repository (EPGR) in which to dispose of spent fuel. The Agency's EPGR project coordinates the development of specific safeguards approaches for EPGRs, assesses verification methods, and identifies the needs for new safeguards equipment and techniques necessary for safeguarding these facilities to optimize safeguards measures at the time these facilities become operational. In Finland, ground breaking for the encapsulation plant commenced in spring 2016, and construction works for the facility started in 2017. In 2019, the Agency continued to verify the status of the EPGR through design information verification activities. In Sweden, the licensing process for the construction and the operation of the EPGR is ongoing. Construction is expected to commence in 2022. The Agency, in cooperation with the European Commission, has finalized a plan regarding equipment infrastructure requirements and specifications for the installation of safeguards equipment at the encapsulation plant in Finland. The Agency also continues working on the equipment infrastructure requirement for the associated geological repository. A safeguards approach for the EPGR in Finland is also under development, and the installation of safeguards equipment is expected to start in 2020.

E.4.2.3. Japan Mixed-Oxide Fuel Fabrication Plant

123. Due to continuing construction delays at the Japan Mixed-Oxide Fuel Fabrication Plant, development and implementation activities under this project continued to be limited in 2019. Plant construction and commissioning are not expected to be complete before 2022.

E.4.3. Information management and analysis

E.4.3.1. Safeguards information system

124. After completing the modernization of safeguards information technology (IT) under the MOSAIC project in 2018, the Agency focused on enhancing existing and developing new safeguards software capabilities in line with the departmental strategic priorities. In 2019, the Agency reorganized the management of the safeguards IT products according to the core business processes — verification, analysis, cooperation with States, and services. This new alignment of resources allows the Agency to better respond to the evolving needs of users and technology. The review and prioritization of activities related to enhancing and developing safeguards software capabilities was coordinated at the departmental level.

125. In 2019, new software capabilities were developed to address the management of incidents and problems related to safeguards equipment, including the establishment of a knowledge base for problem resolution; the correlated analysis and evaluation of safeguards verification data using an integrated system; the workflow of documents across the Department through a new document management system; and the review of Agency's technical assistance activities.

E.4.3.2. Information analysis

126. The analysis of safeguards relevant information is an essential part of evaluating a State's nuclear activities and drawing safeguards conclusions. In drawing its safeguards conclusions, the Agency analyses the consistency of State declarations and compares them with the results of Agency verification activities and other safeguards relevant information available to it. In support of this process, the Agency draws on an increasing amount of information from verification activities performed at Headquarters and in the field, including the results from non-destructive assay (NDA), destructive analysis (DA), environmental sample analyses and remotely monitored equipment. The Agency also draws on a diverse

range of other safeguards relevant information sources, including commercial satellite imagery and other open sources, and trade information. Throughout 2019, the Agency continued to identify new safeguards-relevant open sources of information, improve processes and enhance methodologies and tools.

127. To continuously improve the quality of the information on which it relies, the Agency monitored the performance of laboratories and measurement systems and organized international technical meetings, training and workshops for various States on nuclear material accounting, including measurement data analysis, statistical methodologies and material balance evaluation concepts. The results of this monitoring were included in yearly departmental assessments of measurement quality.

128. Material balance evaluation reports are prepared routinely by the Agency for all nuclear material bulk handling facilities with an inventory or throughput of more than one significant quantity of nuclear material and, upon request, for other cases. In 2019, a total of 210 (202) reports evaluating the balances of all nuclear material types were prepared for 85 (83) MBAs in 53 (52) facilities. Material balance evaluations include, inter alia, the processing, reconciliation and statistical analysis of NDA and DA measurements, and their comparison with State declarations.

129. In 2019, the Agency collected, analysed and evaluated DA samples to verify State accountancy reports, DA samples for material characterization, and environmental samples for qualitative analysis. Table 6 shows the number of samples collected, analysed and evaluated in 2018 and 2019.

130. During 2019, the Agency produced 183 (149) destructive analysis evaluation reports, covering the evaluation of 443 (637) uranium samples, 50 (33) plutonium samples and 18 (12) heavy water samples. In addition, 85 (81) verification measurement performance evaluations assessing operator and Agency DA and NDA measurement uncertainties were performed. The Agency maintains key performance indicators to ensure timeliness of evaluation reports. During the year, legacy statistical evaluation software and databases related to verification measurement data have continued to be re-engineered and prepared for consolidation and integration into the secure IT environment.

Table 6 – Summary of safeguards samples collected, analysed, and evaluated in 2018 and 2019.

Year	Destructive Analysis (DA) samples for nuclear material accounting purposes											
	DA samples collected				DA samples analysed				DA samples evaluated			
	Uranium	Plutonium	Heavy Water	Total	Uranium	Plutonium	Heavy Water	Total	Uranium	Plutonium	Heavy Water	Total
2018	453	34	2	489	512	55	5	572	637	33	12	682
2019	442	40	10	492	450	55	18	523	443	50	18	511

Year	Destructive Analysis (DA) samples for material characterization purposes		
	DA samples collected	DA samples analysed	DA samples evaluated
2018	61	92	82
2019	116	138	80

Year	Environmental swipe samples (ES)		
	ES collected	Subsamples analysed	ES evaluated
2018	420	928	407
2019	405	918	445

131. The effectiveness and efficiency of the environmental sampling evaluation process continued to increase during the year due to the implementation of new evaluation tools, updates to modelling

software, and modifications to the environmental sampling database. The Agency maintains key performance indicators to ensure timeliness of sample evaluation. In 2019, Agency evaluators prepared 64 (37) environmental sampling inputs for the evaluation of States and 369 (282) environmental sampling evaluation reports covering 445 (407) environmental swipe samples and 80 (82) DA samples for material characterization purpose from 60 (51) States[4]. These reports integrate and evaluate the analysis results received from the Network of Analytical Laboratories (NWAL) and compare them against States' declarations to provide assurance regarding the absence of undeclared nuclear material or activities.

132. Taking advantage of the technical advancements in the area of commercial satellite imagery, in 2019 the Agency was able to acquire from online catalogues of satellite imagery providers more extensive and timely relevant present and historical images. These images are fully customized in size and resolution to the Agency's needs, thus improving the efficiency and effectiveness of satellite imagery analysis. During the year, the Agency acquired 1951 (936) commercial satellite images in support of safeguards verification activities. The imagery was acquired with regard to 47 (48) States[49] from 18 (22) different Earth observation satellites. Of these images, 518 (367) were new acquisitions, and the remaining 1433 (569) were purchased or received from the public archives of the Agency's commercial satellite imagery providers. In 2019, the Agency produced 187 (146) imagery analysis products, including reports, imagery-derived information and geographical information system products, to support verification activities in the field and at Headquarters.

133. In 2019, the Agency continued to develop tools, including the Collaborative Analysis Platform (CAP), to help increase the number of open source information items collected automatically. In 2019, 674 (673) analytical products were prepared to support the State evaluation process.

134. Data on nuclear-relevant trade from public and internal sources was used to assess the consistency of nuclear activities declared by States to the Agency. From this and other data, 147 (114) trade analysis reports were produced for State evaluation purposes in 2019. Member States provided the Agency with information concerning 160 (130) unfulfilled procurement enquiries for nuclear-related products.

E.4.4. Sample processing and analysis

135. Environmental and nuclear material samples collected by safeguards inspectors are analysed by the Agency's Safeguards Analytical Laboratories (SAL) in Seibersdorf, Austria – consisting of the Nuclear Material Laboratory (NML) and the Environmental Sample Laboratory (ESL) – and other members of the Network of Analytical Laboratories (NWAL). The NWAL includes 23 qualified laboratories located in Australia, Brazil, China, France, Hungary, Japan, the Republic of Korea, the Russian Federation, the United Kingdom, the United States of America and the European Commission. In addition, the Agency operates the On-Site Laboratory (OSL) in Rokkasho, Japan, for analysis of nuclear material samples collected at this site.

136. The Agency also provides logistical support for the sampling, transport and analysis of nuclear material and environmental samples. Key performance indicators are used to monitor all stages of the sample collection, transport and analysis process in order to identify potential problems and make improvements in timeliness. Moreover, the Agency administers a rigorous quality control programme, which includes regular inter-laboratory comparison exercises covering the major safeguards analytical techniques, to confirm the quality of analytical results across the NWAL.

137. In 2019, MSSPs provided reference materials and support to the advancement of analytical techniques. In particular the Agency began to use analytical data on uranium particle age determination,

[49] Including the DPRK.

currently provided by one NWAL member, in safeguards evaluations. MSSPs also contributed to cooperation projects in support of the Agency's quality control effort.

E.4.4.1. Nuclear material and heavy water sample analysis

138. In 2019, the Agency collected 442 (453) uranium samples, 40 (34) plutonium-bearing samples, and ten (two) heavy water samples, as shown in Table 6 above. All accountancy samples were analysed by the Agency's NML, while the heavy water analysis was performed by the Hungarian Academy of Sciences. In addition, 97 (87) samples were analysed by the Agency at the OSL. In 2019 the NML made improvements to its data handling and reporting systems through the implementation of new laboratory information management system applications. In addition, a full digitization of archived analytical reports in NML was realized through a cooperative project with the Department of Management; the movement of these paper reports into the NML database improves access to historical analytical results.

139. Among the 442 uranium samples collected by Agency inspectors for accountancy purposes, there were 93 (58) samples collected for analysis using the Combined Procedure for Uranium Concentration and Enrichment Assay (COMPUCEA). This is a transportable analytical measurement system, which combines L-edge densitometry and gamma ray spectrometry to enable high-accuracy uranium content and enrichment measurements to be made in the field. In 2019, time efficiency gains resulted from measuring a total of 59 (45) of those COMPUCEA samples in the field, with the remaining 34 (13) shipped to the Agency's NML for confirmatory analysis. COMPUCEA was applied in one State for the first time in 2019, bringing to five the total number of States in which this method has been applied.

140. The Agency analysed 450 (512) uranium samples for pair comparison purposes in 2019. The median time from the collection of a uranium sample to the final evaluation report to the Division of Operations was 113 (118) days in 2019, consistent with historical levels. Figure 5 displays the number of uranium sample analysis reports completed during the last eight years.

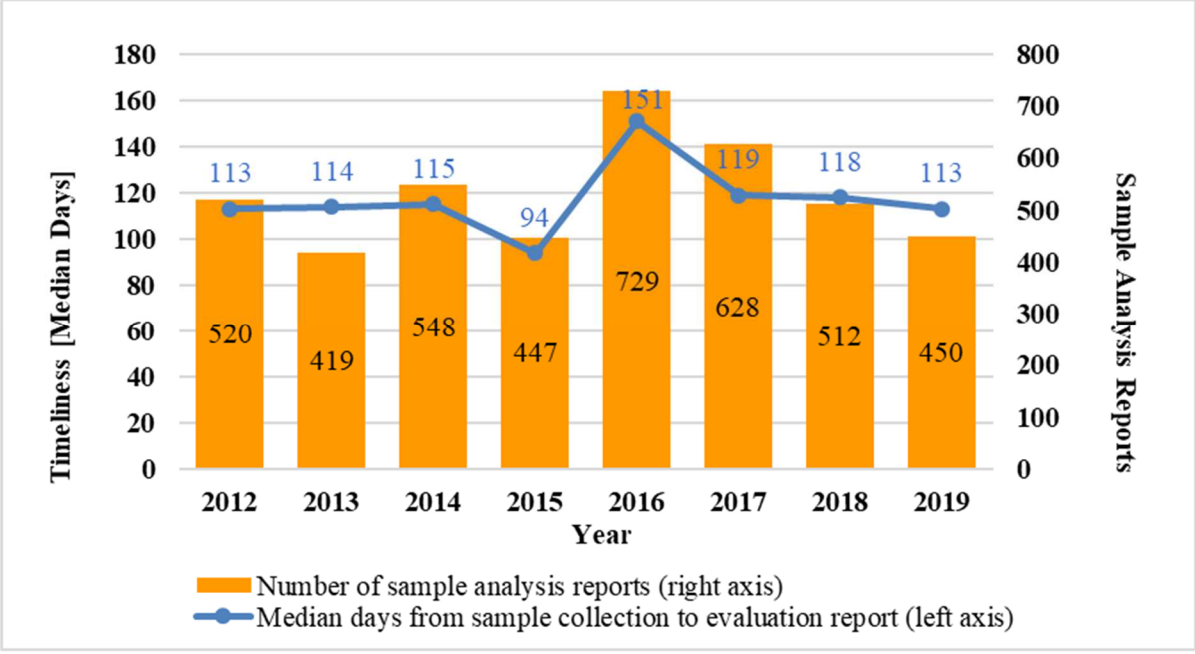


Figure 5. Number of sample analysis reports and median overall timeliness for uranium samples collected for material balance evaluation (excluding samples analysed by OSL)

E.4.4.2. Environmental and other sample analysis

141. In 2019, the Agency collected 405 (420) environmental samples, while 918 (928) subsamples underwent bulk and particle analysis, as shown in Table 6 above. Of these subsamples, the Agency's ESL analysed 104 (123) with the rest analysed by partner laboratories of the NWAL. The median overall time from sample collection to issuance of the evaluation report continued to improve in 2019 and amounted to 139 (143) days. Figure 6 illustrates the improvements in the efficiency of the environmental sampling process over the last eight years, during which period the overall processing time was reduced by 40% despite an increase of nearly 20% in the number of analysis reports completed. The main contributors to this improved efficiency were more timely screening and distribution of samples to the NWAL and improved analysis times by the laboratories.

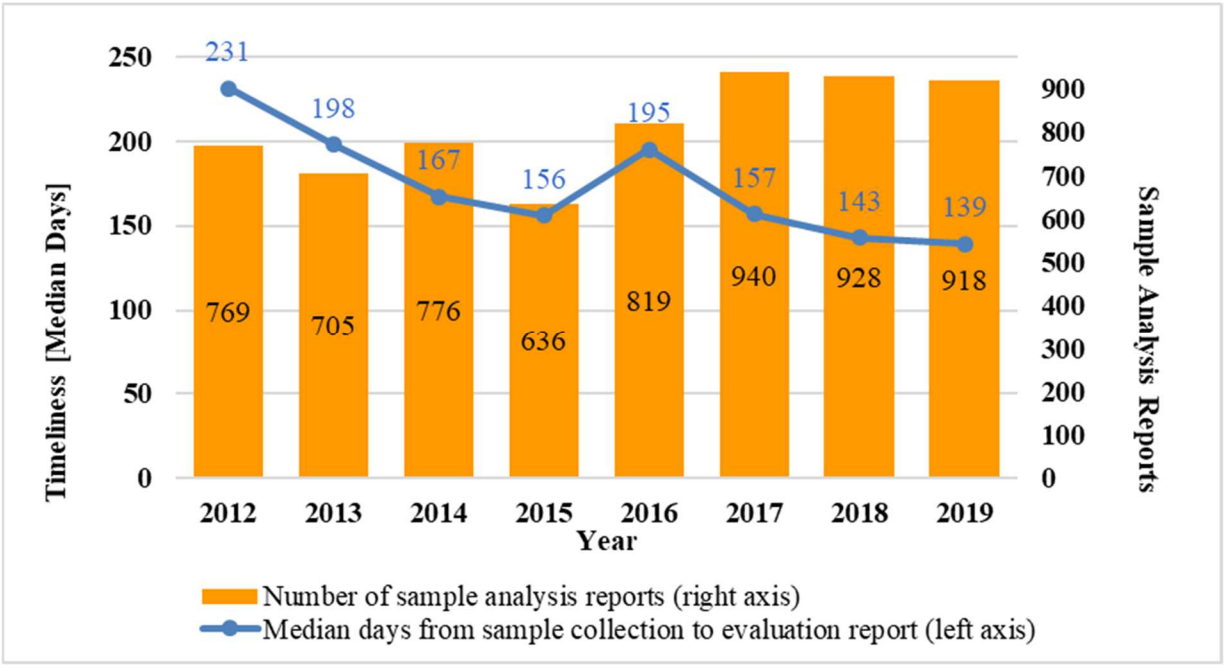


Figure 6. Number of sample analysis reports and median overall timeliness for environmental samples

142. The Agency also collected 116 (61) other samples of nuclear material in 2019 for material characterization, i.e. to determine whether such material produced at the front-end of the nuclear fuel cycle was of a composition and purity suitable for fuel fabrication or for being isotopically enriched, and therefore subject to nuclear material accountancy and other safeguards procedures specified in the relevant safeguards agreements. In 2019, the NWAL analysed a total of 138 (92) samples of this type, including 109 (69) by the Agency's NML.

E.4.4.3. Enhancing the capability of the Safeguards Analytical Services

143. Efforts to expand the use of the NWAL continued. In 2019, one laboratory in the United Kingdom officially qualified for nuclear material characterization. Laboratories in five Member States are in various stages of the qualification process.

144. In 2019, laboratories in Belgium, Canada and the Netherlands were undergoing qualification for nuclear material analysis. In addition, a laboratory in Argentina was undergoing qualification for heavy water analysis and a laboratory in Germany was undergoing qualification for the provision of reference materials.

E.4.5. Safeguards equipment development and implementation

145. Throughout 2019, the Agency provided equipment and technical support for verification activities in the field, ensuring that instrumentation necessary for the implementation of effective safeguards worldwide continued to function as required. One-hundred and seventy-one (121) coordination tasks supporting safeguards equipment were completed in 2019. In addition, approximately 7000 (6500) pieces of equipment were dispatched to support verification activities in the field. Of those, about 2900 (2000) items were shipped by cargo and about 4100 (4500) were hand-carried by Agency inspectors and technical teams. During 2019, the effort spent to install, maintain and support the use of equipment in the field required 1133 (1003.5) days of in-field work, plus the associated travel and rest days.

146. Significant financial and human resources were dedicated to performance monitoring to ensure the reliability of the Agency's equipment. At present, the reliability of digital surveillance systems, NDA systems, unattended monitoring systems and electronic seals has exceeded the target goal of 99% availability[50]. This high level of infrastructure availability is achieved through robust design of the system architecture - implying redundancy and modularity - and implementation of preventive maintenance policies.

147. In 2019, activities related to integration of Agency safeguards equipment supported ten major projects in five States. In addition, the Agency continued to develop systems that meet specific requirements for installation of safeguards equipment in nuclear facilities.

148. Several contractual frameworks were established to facilitate the sourcing of standardized instrumentation and related services at competitive prices. In the area of safeguards instrumentation, 17 purchase agreements were established to streamline procurement activities for equipment and associated services.

149. In 2019, cooperative efforts continued with the regional or State authorities for the procurement, acceptance testing, training, installation and maintenance of safeguards equipment designated for joint use.

150. In 2019, the Austrian Certifying Body (Akkreditierung Austria) issued the ISO 17025:2017 accreditation for the Equipment Radiation Monitoring Laboratory (ERML) for the direct and indirect measurement of surface contamination by alpha, beta and gamma emitters and leak testing of sealed radioactive sources.

151. During 2019, the Equipment Radiation Monitoring Laboratory (ERML) monitored for radioactive contamination over 29 000 (22 000) items, including metal seals and environmental samples. The Agency also distributed approximately 15 000 (14 000) personal protective equipment for activities in the field.

[50] Defined as (1 - system failures/total number of system uses).

E.4.5.1. Non-destructive assay systems

152. In 2019, the Agency prepared, tested and calibrated 2088 (2112) separate pieces of NDA equipment which were assembled into 1064 (1097) NDA systems to be used during verification activities in the field.

153. NDA system capabilities were expanded by the following:

- The Passive Gamma Emission Tomography (PGET) system successfully verified spent fuel pins in closed containers stored inside spent fuel ponds of nuclear installations;
- The Fast Neutron Coincidence Collar (FNCL), designed for the verification of fresh fuel assemblies containing burnable poison rods, was authorized for inspection use. The FNCL is more accurate and four times faster than systems based on thermal neutron detection (Figure 7);
- Suppliers with expertise and cutting edge production capabilities in readily transportable neutron generators and unprecedentedly large volume Cadmium Zinc Telluride (CZT) detector crystals were identified and selected after a competitive bidding process. Enhancements in these technologies can directly translate to improvement of measurement performance;
- The replacement of the kit comprising of the equipment used by safeguards inspectors for performing complementary accesses was completed. The new kit offers additional measurement techniques, including chemical identification, gamma imaging, and indoor positioning; hands-free operation in the field; continuous data collection capability with metadata; and integration with software for data analysis. The upgrade is estimated to have led to an 80% reduction of in-field measurement time for a typical calendar-day in the field for verification and a 75% reduction in the pre-analysis processing time of data collected.

Figure 7. Fast Neutron Coincidence Collar (FNCL)

E.4.5.2. Surveillance systems

154. By the end of 2019, the Agency had 1425[51] (1563) cameras operating or ready to use at 261 (277) facilities in 37 (37) States[4]. The Agency also supports and jointly uses 195 cameras which are owned by State or regional authorities. For these cameras, the Agency applies cryptographic keying, in the same manner as to its own equipment, to ensure authenticity, security and independence of the data.

155. The Agency is completing the transition to the next generation surveillance system (NGSS) by replacing the camera systems that are reaching their end of life cycle (Figure 8). By the end of 2019, 1031 (881) NGSS cameras had been installed in 33 States[4].

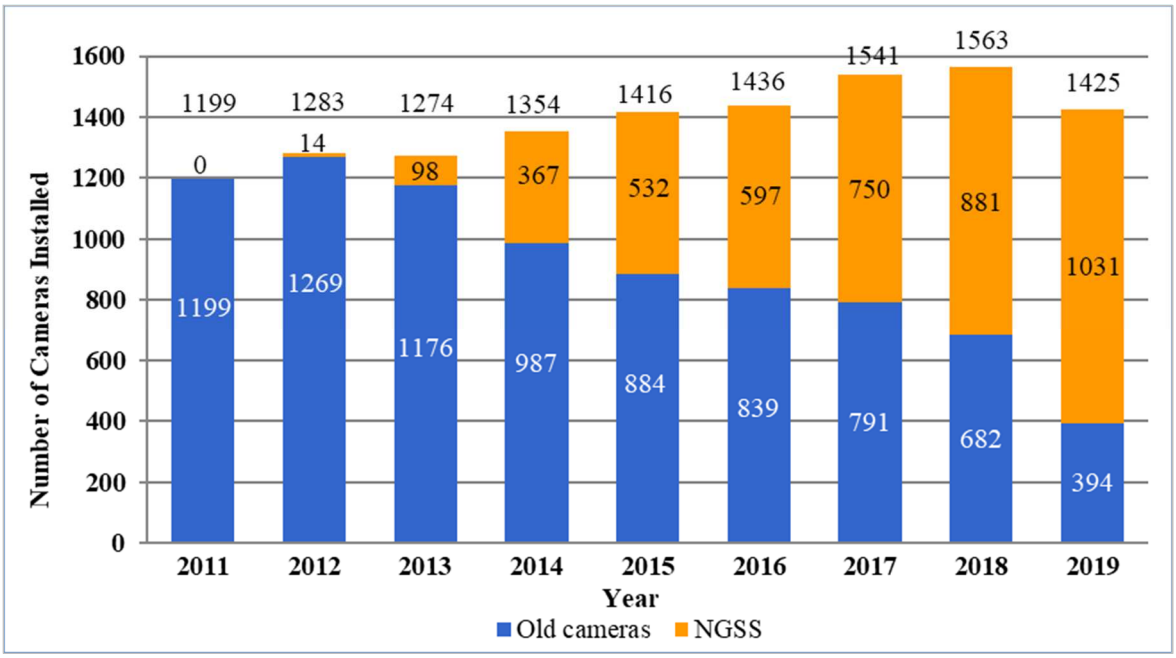


Figure 8. Replacement campaign of old cameras with NGSS technology

156. The following enhancements to surveillance systems were made:

- Several next generation, large-scale unattended surveillance systems (XMOS) were installed at CANDU reactor facilities;
- Twenty-one NGSS analogue camera modules were installed to allow the use of miniature analogue cameras for hot cell monitoring. The NGSS analogue camera module provides enhanced data security of the camera signal cable by Spread Spectrum Time Domain Reflectometry;
- The new software for the review of data collected by surveillance systems was successfully tested by safeguards inspectors;
- New underwater cameras based on NGSS technology were installed at several nuclear spent fuel ponds.

[51] The reduction reflects the replacement of former generation cameras by NGSS systems which are jointly used with, and owned by, States or regional authorities (ABACC, the European Commission and Japan), as well as the repatriation of Agency-owned older generation cameras which had been replaced by Agency-owned NGSS systems in previous years.

E.4.5.3. Containment systems and instrumentation security

157. Maintaining continuity of knowledge through containment and sealing of nuclear material and critical equipment components remains one of the most important elements of the Agency's verification activities. In 2019, the Agency verified approximately 25 900 (24 800) seals that had been installed on nuclear material, facility critical equipment or Agency safeguards equipment at nuclear facilities.

158. Within the framework of the sealing and containment modernization programme, the Agency continues to work on the implementation of new sealing technologies and on the improvement of the overall security of these instruments. In 2019, the following enhancements to sealing systems were made:

- Two alternate designs of a new active optical loop seal were developed. The prototypes were tested, with the anticipation of merging the best features of both into one final design;
- A new laser curtain system was tested and authorized for use at a spent fuel dry storage facility in 2019. This system will greatly assist in reducing verification effort at indoor storages containing a large number of spent fuel casks;
- The laser mapping for cask verification was authorized for inspection use at dry storage facilities, and its use is providing inspectors with a more efficient method to verify spent fuel casks;
- New solutions for a potential replacement of the E-CAP metal seal are under early evaluation.

E.4.5.4. Unattended monitoring systems

159. At the end of 2019, the Agency used 162 (171) unattended monitoring systems (UMS) installed in 23 (24) States. Of these, 138 (147) measure radiation, eight (eight) are thermohydraulic monitors and 16 (16) are solution volume measurement systems.

160. In 2019, the installed unattended monitoring capability was maintained and the following enhancements were made:

- The Unattended UF_6 Cylinder Verification System prototype (UCVS) was successfully tested at a nuclear material bulk handling facility (Figure 9). The UCVS is designed to improve the effectiveness and efficiency of safeguards approaches at gas centrifuge enrichment plants, particularly at modern high-capacity plants;
- A standardized and sustainable UMS data acquisition front end, as well as new industrial computers to improve sustainability and reliability of UMS, were selected through a competitive bidding process for the installation of new systems and for the life cycle support of existing systems.

Figure 9. Unattended UF_6 Cylinder Verification System (UCVS)

E.4.5.5. Remote data transmission and processing of data from unattended systems

161. Remote data transmission (RDT), formerly referred to as remote monitoring, is the Agency capability to receive data at Agency Headquarters in Vienna from unattended safeguards systems installed in facilities. The use of RDT enables greater verification efficiency by relieving inspectors from the task of data collection at facilities and allows early detection of any deterioration in systems' performance.

162. In recent years, the data collection capability evolved to collect, to the extent possible, the data directly from the collection modules such as sensors, cameras, and collect computers, enhancing the reliability of the data acquisition and the efficiency of data transmission. At the end of 2019, 1708 unattended safeguards data streams[52] were collected remotely from 140 (137) facilities in 30 (29) States[4]. Of these, 775 data streams were produced by surveillance systems, 374 by unattended monitoring systems, and 559 by active (electronic) seals.

163. Figure 10 shows how the amount of safeguards data remotely collected from unattended safeguards systems installed in facilities has almost tripled since 2015, as a result of the increasing number of systems connected. Additional resources were required to guarantee the availability of the overall infrastructure and the security of data transmission.

[52] A data stream is a flow of information coming from a data collection module.

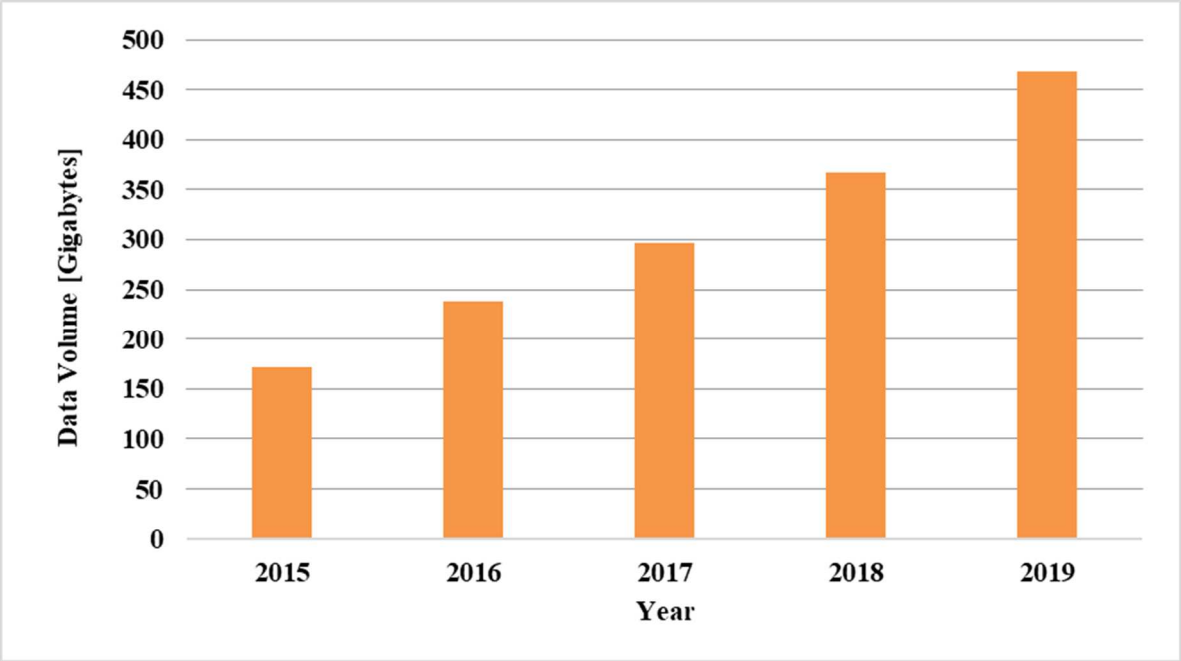


Figure 10. Average data volume collected by RDT on a monthly basis, 2015-2019

164. The Agency continued to develop the following data automation and inspector review tools to help streamline the equipment data collection and review process:

- The Integrated Review and Analysis Package (IRAP), jointly developed with the European Commission, continued to be extended in 2019 to integrate a greater diversity of data streams. In 2019, IRAP was authorized for use in nine specific facilities in three States, integrating 62 unattended monitoring systems data streams;
- The Near Real Time System (NRTS), which is an automated extension of IRAP, was finalized, tested and made ready for deployment at the Interim Storage Facility 2 at Chornobyl, Ukraine. This system increases efficiency in the data analysis process.

E.4.5.6. Instrumentation technology foresight

165. In 2019, activities to identify and evaluate emerging technologies that could support Agency safeguards instrumentation continued. Those activities were performed in close cooperation with MSSPs, under the umbrella of instrumentation technology foresight activities. The main highlights for 2019 were:

- Real time and post-processing of the images recorded by next-generation Cherenkov Viewing Device (XCVD) and related hardware were further developed (Figure 11). As a result, a mature prototype of XCVD with enhanced capabilities was successfully tested at three nuclear facilities;
- A contractor was selected after competitive bidding to develop a robotized unmanned surface vehicle able to autonomously operate the XCVD as part of the Cherenkov verification of spent fuel in underwater storages;
- A new generation of handheld instruments based on x-ray fluorescence and laser induced breakdown spectroscopy was identified, competitively selected and prepared for authorization for verification activities;
- A technology crowdsourcing challenge was organized to assess the performance of existing tomographic reconstruction software packages and identify innovative data processing

approaches that could be applied to the PGET for enhancing its performance during the verification of the integrity of irradiated items. The challenge received 17 proposed solutions from the public, academia, and civil society from Algeria, Austria, Belgium, Canada, Colombia, Croatia, Finland, Germany, India, Italy, Japan, Portugal, Sweden, the United Kingdom and the United States of America.

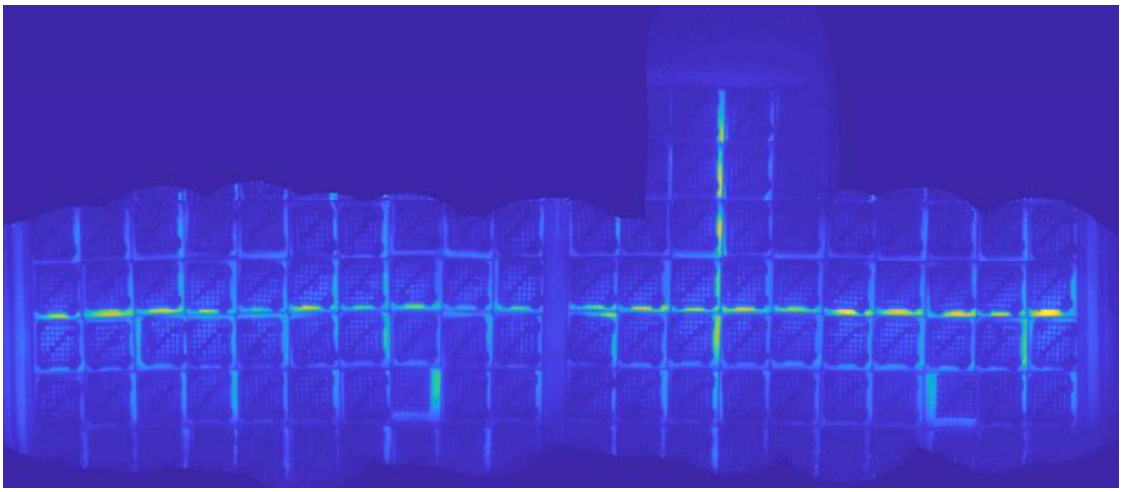


Figure 11. Reconstructed map of Cherenkov emissions digitized with an XCVD from spent fuel assemblies in a centralized storage pond.

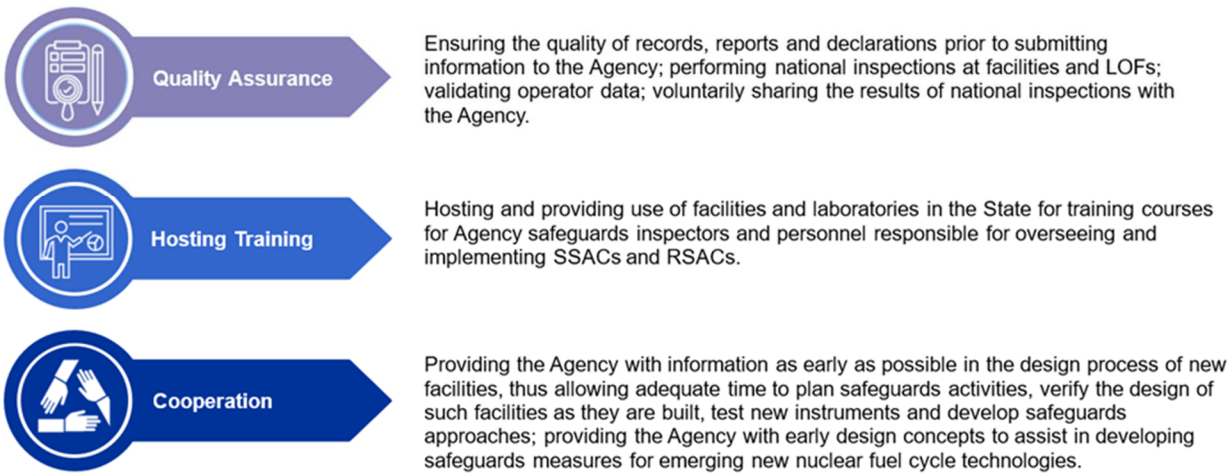
E.5. Cooperation with State and regional authorities

166. The effectiveness and efficiency of Agency safeguards depend, to a large extent, on the effectiveness of SSACs and RSACs and on the level of cooperation between State/regional authorities and the Agency.

167. Actions that contributed to the enhancement of the effectiveness and efficiency of Agency safeguards implementation were undertaken by a number of States.

168. In 2019, the Agency continued discussions with ABACC and the European Commission aimed at strengthening cooperation and enhancing the effectiveness and efficiency of safeguards implementation in the relevant States. A task force with Japan continued to address the long-term verification challenges at the Fukushima Daiichi site. Other actions are shown in Fact box 10.

Fact box 10. State or regional authority actions enhancing effectiveness and efficiency of safeguards implementation

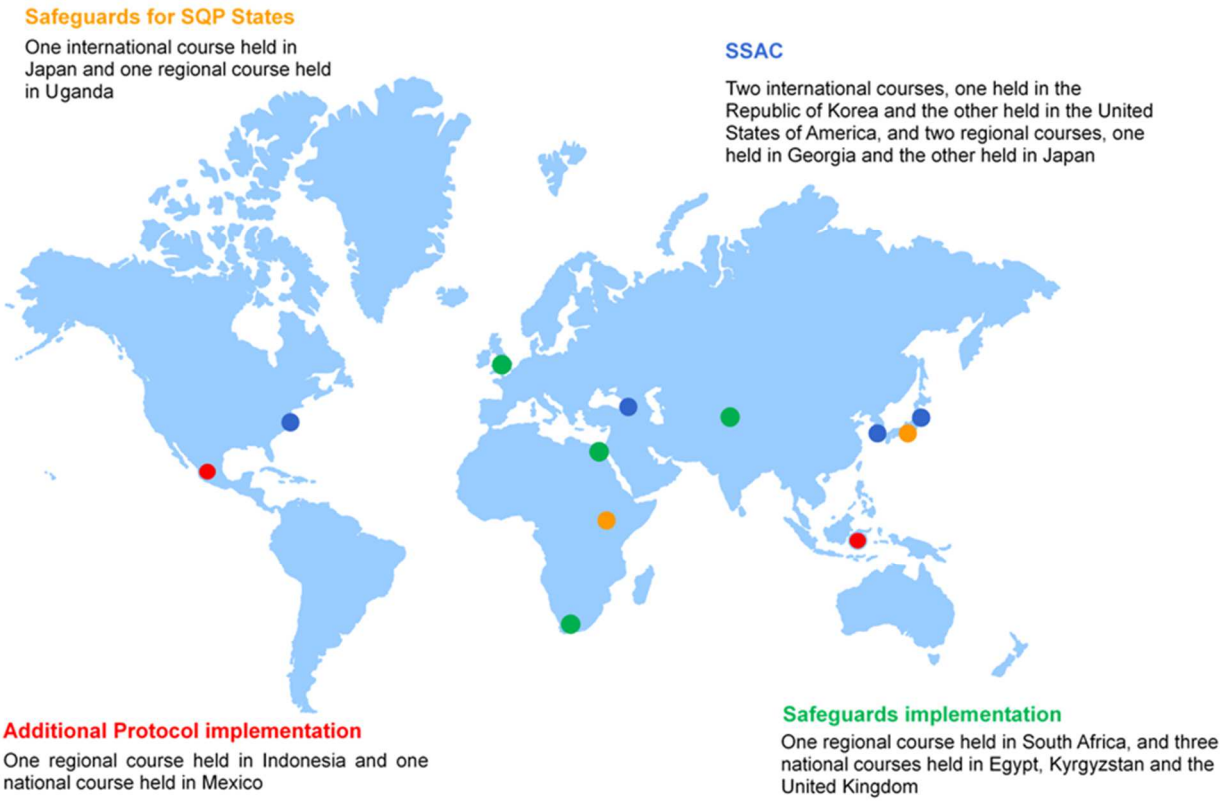


169. The Agency continues to provide the International SSAC Advisory Service (ISSAS) to States, at their request, with advice and recommendations on the establishment and strengthening of such State systems. In 2019, two ISSAS missions were conducted to Belarus and Malaysia. Additionally, the ISSAS Mission Reports were finalized and delivered to three States in which such missions were conducted: Belarus, Malaysia and Mexico. The Department of Safeguards also participated in one Integrated Nuclear Infrastructure Review (INIR) mission to Egypt. The Agency's INIR missions are designed to assist Member States, at their request, in evaluating the status of their national infrastructure for the introduction of a nuclear power programme. These missions cover 19 infrastructure issues, of which one is *safeguards,* to be considered during the different stages of developing a nuclear power programme. For more information see the Agency publication *Milestones in the Development of a National Infrastructure for Nuclear Power.*

170. The Agency also conducted 12 international, regional and national training courses for personnel responsible for overseeing and implementing SSACs and RSACs and participated in several other training activities organized by States on a bilateral basis. In total, more than 300 experts from some 50 States were trained on safeguards related topics.

171. In 2019, the Agency also continued to offer a Learning Management System, CLP4NET, to participants attending SSAC training courses and the safeguards traineeship programme. The CLP4NET provides participants with access to a password protected virtual classroom through which the electronic version of instructional material, including Agency safeguards related guidance documents, can easily be downloaded.

Fact box 11. Training activities provided by the Agency in 2019 to personnel of State and regional authorities, facility and LOFs operators, as well as to representatives of relevant States' ministries.



*The Agency also participated in training courses organized by the United States of America under the International Nuclear Safeguards Engagement Program (INSEP).

E.6. Quality management

172. The quality management system (QMS) within the Department of Safeguards provides regular oversight of the key safeguards processes to ensure impartiality, effectiveness and efficiency of safeguards implementation. The following quality management activities for the Department of Safeguards took place in 2019:

- Four internal quality audits were conducted and another two were initiated;
- Eighty-nine condition reports identifying quality, radiological and industrial safety, and security events were opened. Root cause analyses were performed and actions to prevent recurrence were initiated. Eighty out of 149 open condition reports were closed;
- Twenty-two knowledge management cases were completed for staff separating from the Department;
- Process analysis and improvement activities continued to be performed to standardize process implementation;
- The Department's cost calculation model, which is used to estimate the cost of safeguards implementation by State and to compare costs and effort of options in safeguards approaches, underwent further refinement and improvement. This revision ensures that the model remains applicable to the activities performed by the Department.

173. Regular senior management meetings assess the ongoing effectiveness of the Department's QMS and identify actions for improvement. In 2019, two such senior management review meetings convened. Improvement actions taken in 2019 include:

- Completing a revision and expansion of a number of QMS policies and procedures, strengthening the process approach and integrating risk considerations into QMS processes;
- Initiating a collaborative effort within the Department of Safeguards to refine the process framework for the provision of equipment and technical services for in-field verification activities;
- Conducting a needs assessment of key stakeholders to identify best practices and opportunities for improvement in knowledge management;
- Providing training for staff in the Department of Safeguards to further raise awareness of the QMS, including the principles of quality management and process improvement, management and control of safeguards documents, and the use of the condition report system.

E.7. Business continuity and disaster recovery

174. In 2019, the Department of Safeguards continued its efforts to ensure business continuity and disaster recovery to maintain the continuation of critical business processes and the availability of information during a disruptive event. During the year, the Safeguards Business Impact Analysis (BIA) was completed as part of the Agency's One BIA. As a result, the critical business processes of the Department of Safeguards were identified and the related internal and external dependencies were determined. The top priority critical process of the Department was assessed to be carrying out nuclear verification activities which includes prioritizing verification activities in the field and ensuring the

availability of information and relevant equipment, the use of proper and secure communication channels, and the safe travel of staff.

E.7.1. Information Protection

175. Safeguards information security continued to be a priority throughout 2019. In response to the increasing complexity in technology and changes in the type of threats, the Department has adopted an integrated approach to security, which encompasses: information security; physical security; and business continuity and disaster recovery. An Information Security Management System (ISMS), based on the Agency's overall security framework (ISO 27000 series) has been under development to deliver an optimal return on investment in the security technology gained under the MOSAIC project and ensuring that all security concerns are addressed in a unified strategy. The Department adopted a security control framework to focus its efforts on the most effective mitigation strategies. A pilot key performance indicator for information security was established to measure several key IT operations areas. Additional enhancements were enabled in the Authorization Management (AM) tool to support access attestation and further strengthen the overall functionality.

176. In 2019, a new website for security was launched to deliver targeted awareness campaigns and improve accessibility of security resources among staff members. The Department continues to offer classroom and e-learning training on classification and handling of safeguards information, as well as ad-hoc target training addressing specific topics such as information security issues in the field.

177. Physical security also continued to be a priority in 2019. New operational procedures were rolled out to improve the departmental Physical Security Management System (PSMS) software and reduce the risk of software vulnerabilities. Furthermore, additional resources were dedicated to perform periodic analysis of alarms and anomalies to identify suspicious behaviour and system malfunction.

178. A project to establish high availability for the safeguards IT network was completed within time and budget. Additional activities were carried out through a dedicated working group to identify potential measures to increase resiliency of safeguards business operations.

E.8. Communication

179. During 2019, the Department of Safeguards continued to enhance both its internal and external communication.

180. Wherever possible, the Department of Safeguards is committed to increasing the transparency of its implementation practices. To support this, in 2019 the Department:

- Held a technical meeting for Member States on the use of innovative safeguards technologies to strengthen the effectiveness and efficiency of the Agency's safeguards implementation;
- Organized 26 tours of the SAL in Seibersdorf, Austria, attended by 220 diplomats and members of civil society, and over 30 tours of the Safeguards Equipment Laboratories and ERML at Agency Headquarters, attended by 260 diplomats and members of civil society;
- Held a demonstration of the new PGET tool for the verification of spent fuel and five other side events on the margins of the 63rd regular session of the General Conference;
- Continued to work with the Agency's Office of Public Information and Communication to communicate with civil society through the Agency's website and social media channels.

181. In 2019, the Department developed and implemented a strategic internal communication plan to facilitate valued, trusted and efficient internal communication that enhances teamwork and performance. The plan was designed to meet long-term communication goals, aimed at nurturing a culture of collaboration, teamwork and information and knowledge sharing, as well as increasing staff trust in leadership. Implementation of the plan included improvements in the utilization of various communication tools.

F. Safeguards Expenditures and Resources

182. This section provides information on the level and use of financial and human resources for safeguards implementation during 2019. The activities of Major Programme 4 — Nuclear Verification — were funded primarily through the Regular Budget and extrabudgetary contributions. The Regular Budget appropriation for 2019 was adjusted to €142.9 (€138.7) million at the United Nations operational average rate of exchange for the year. In 2019, extrabudgetary allotments totalled €28.0 million.

183. Total expenditure for Major Programme 4 from the 2019 Regular Budget was €142.9 million. In addition, €20.2 million was spent from extrabudgetary contributions.

184. The total combined safeguards expenditures from the Regular Budget and extrabudgetary contributions were distributed among expenditure categories as follows: staff costs — 71%; equipment and intangibles — 6%; contracts — 8%; travel — 5% and other non-staff costs — 10%.

F.1. Financial resources

F.1.1. Regular Budget expenditures

185. The Regular Budget utilization rate for Major Programme 4 was 100% with an unspent balance of €20 thousand from the 2019 Regular Budget at the end of the year.

186. Major Programme 4 encompasses Overall Management, Coordination and Common Activities and three programmes: Safeguards Implementation; Other Verification Activities; and Development. Major Programme 4 also includes a dedicated programmatic element on Corporate Shared Services.

- Overall Management, Coordination and Common Activities includes the resources necessary to provide a central management and coordination function, programme and resource management, security, and quality management;
- The Safeguards Implementation programme includes projects such as verification activities, information analysis, effectiveness evaluation, concepts and planning, provision of safeguards instrumentation and safeguards analytical services;
- The Other Verification Activities programme includes the activities needed to maintain operational readiness to resume safeguards implementation for the DPRK and the verification and monitoring of Iran's nuclear related commitments in light of the United Nations Security Council resolution 2231 (2015);
- The Development programme includes developing safeguards approaches for special projects in Member States, instrumentation and technologies. This programme also includes activities related to MOSAIC;

- All corporate services supporting safeguards implementation that were formerly distributed under different programmes were consolidated under Corporate Shared Services.

187. The breakdown of the Regular Budget expenditures by programme is shown in Figure 12.

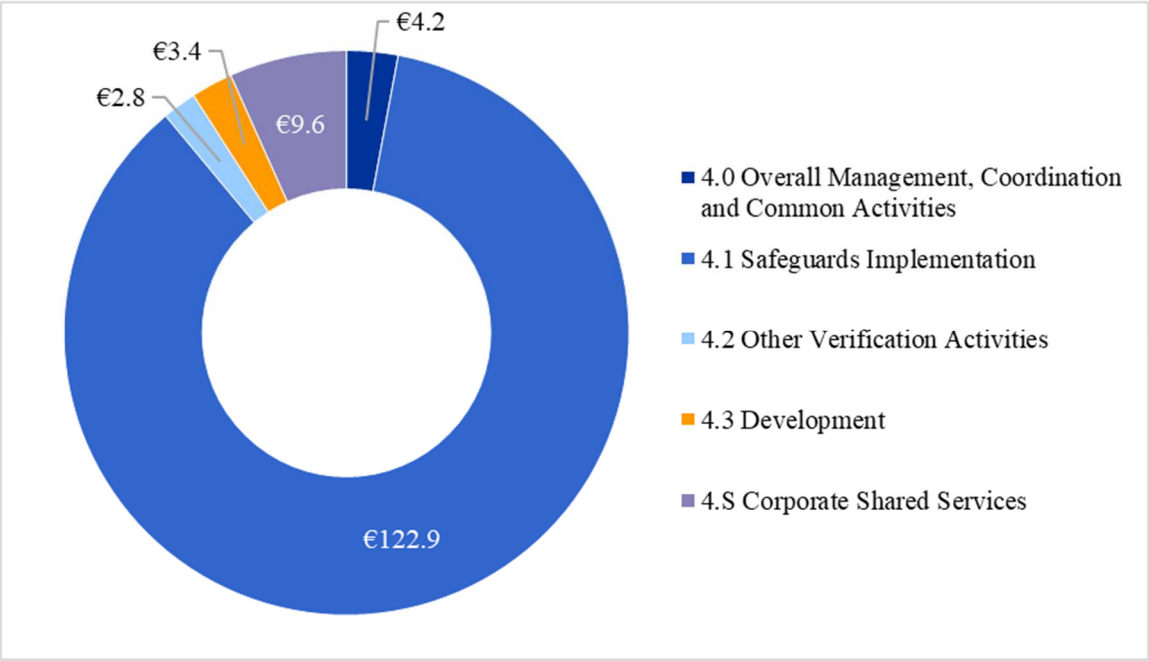


Figure 12. Major Programme 4 structure in 2019 (in € millions)

188. The breakdown of the Regular Budget expenditures by expenditure category is shown in Figure 13.

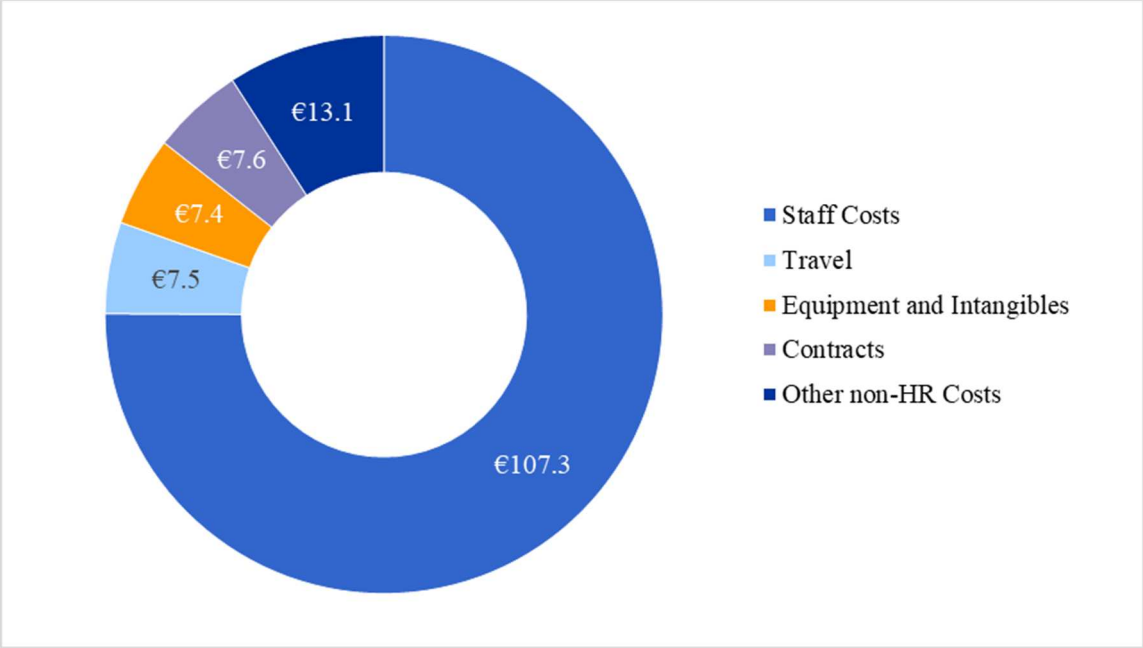


Figure 13. 2019 Regular Budget expenditures by expenditure category (in € millions)

F.1.2. Extrabudgetary contributions and expenditures

189. During 2019, €28.0 million was allotted from Member States' contributions and from the interest earned from the contributions. The allotments were designated to specific safeguards activities to be implemented over each project's life span. The related extrabudgetary allotments by donor are shown

in Table 7. During the year, a total of €20.2 million from the extrabudgetary contributions was spent as follows: €4.1 million was spent for verifying and monitoring Iran's nuclear related commitments in light of the United Nations Security Council resolution 2231 (2015); €5.3 million was spent on Information and Communication Technology; €2.4 million was spent on provision of safeguards instrumentation and €8.4 million was spent on various other operational activities of the Department of Safeguards.

Table 7 – Extrabudgetary allotments by donor during 2019 (in € millions)

Donor	Allotment (in € millions)	%
Belgium	0.33	1.2
Canada	1.18	4.2
Denmark	0.64	2.3
Finland	0.20	0.7
France	0.13	0.5
Germany	0.40	1.4
Japan	1.53	5.5
Korea, Republic of	1.61	5.7
Netherlands	0.20	0.7
New Zealand	0.06	0.2
Russian Federation	0.20	0.7
Sweden	0.56	2.0
United Kingdom of Great Britain and Northern Ireland	0.72	2.6
United States of America	18.95	67.7
Other(1)	1.29	4.6
Grand Total	**28.00**	**100.0**

Table Note:
(1) Represents contributions from various donors to the "single award mechanism" contributing towards verification and monitoring in the Islamic Republic of Iran in light of the United Nations Security Council resolution 2231 (2015).

190. The breakdown of the expenditures from extrabudgetary contributions of €20.2 million by expenditure category is shown in Figure 14. In 2019, the largest share was related to staff costs. Other significant expenditures were related to contracts and equipment and intangibles.

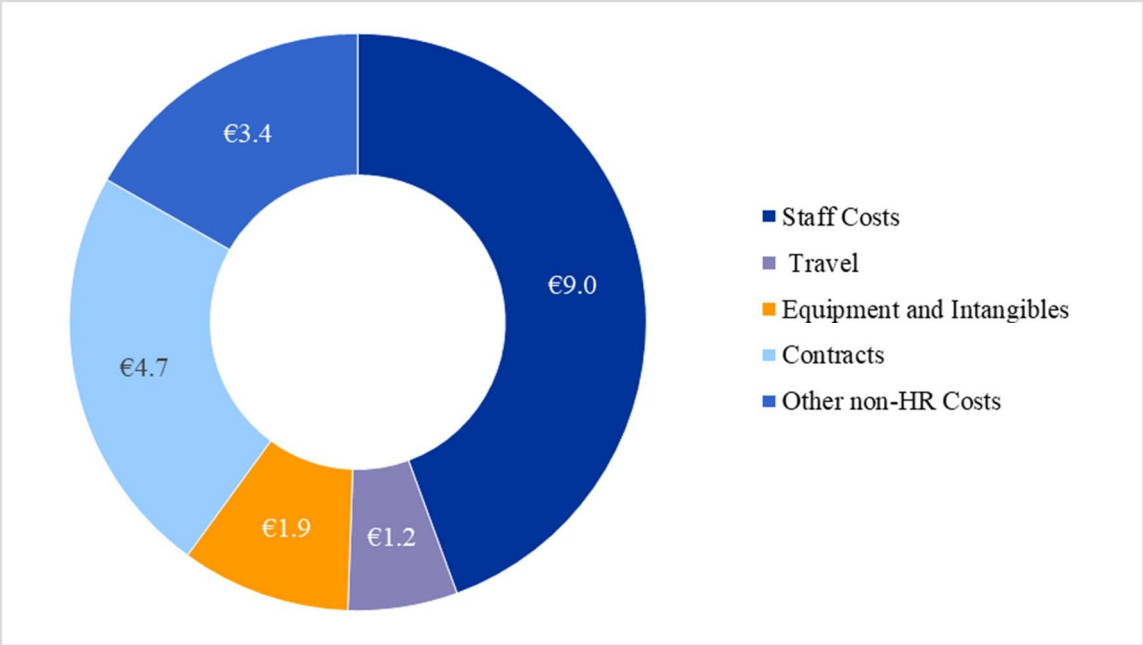


Figure 14. 2019 Extrabudgetary contribution expenditures by expenditure category (in € millions)

F.1.3. Estimation of safeguards costs by State

191. The Agency uses a methodology that allows safeguards implementation costs to be calculated on a State-by-State basis in a consistent manner. This cost calculation methodology was used to produce a product cost model that estimates the resources required to implement the core processes of Major Programme 4. The cost calculation model has now reached a level of maturity and stability such that it captures the Regular Budget costs of the Agency under Major Programme 4 and appropriately assigns those costs to specific products and activities to States. During 2019, the model was further reviewed and refined. Effort estimates in relation to some activities at Agency Headquarters in Vienna were revised and updated in the model.

192. Although the model is based on average costs for products, State-specific adjustments were applied to determine the estimated cost of safeguards implementation by State. These adjustments were made to reflect differences between actual quantities by State and the averages used for the calculation of product costs. Specific adjustments were made with regard to calendar-days in the field for verification, sample analysis and reporting, material balance evaluation, equipment and satellite imagery. Adjustments were also made for those States where extra effort was spent at Headquarters which falls outside the products currently identified for the core processes.

193. Table 8 shows the estimated safeguards expenditures in 2019 that can be attributed to specific States. The estimated efforts for in-field verification and for information analysis and evaluation are components of these estimated costs, as are all other expenditures incurred by the Agency under Major Programme 4 during the calendar year. Special (in-kind) contributions received from Member States on the basis of a 'cost sharing principle' associated with, for example, training and the joint use of equipment are excluded from these figures. In this assessment, 88% (89%) of the money spent from the Regular Budget can be attributed to specific States. The remainder includes costs for other specific products and activities that are not assigned to specific States, and Agency expenditures that are not accounted for by the cost calculation model at this time.

194. Changes in estimated costs from prior years are, for the most part, due to differences in the quantity of specific products, activities or relative effort occurring for a State during the year. These changes are reflected in the costs by State shown in Table 8.

Table 8 – Estimated cost of safeguards by State in 2019

State	Estimated regular budget cost (€)
Afghanistan	26 000
Albania	152 000
Algeria	388 000
Andorra	26 000
Angola	47 000
Antigua and Barbuda	26 000
Argentina	3 599 000
Armenia	271 000
Australia	673 000
Austria	189 000
Azerbaijan	194 000
Bahamas	42 000
Bahrain	46 000
Bangladesh	158 000
Barbados	26 000
Belarus	684 000
Belgium	2 725 000
Belize	26 000
Bhutan	42 000
Bolivia, Plurinational State of	42 000
Bosnia and Herzegovina	112 000
Botswana	120 000
Brazil	3 808 000
Brunei Darussalam	42 000
Bulgaria	594 000
Burkina Faso	35 000
Burundi	26 000
Cambodia	42 000
Cameroon	46 000
Canada	11 852 000
Central African Republic	42 000
Chad	35 000
Chile	203 000
China	794 000
Colombia	197 000
Comoros	26 000
Congo	42 000
Costa Rica	100 000
Côte d'Ivoire	126 000
Croatia	56 000
Cuba	211 000
Cyprus	56 000
Czech Republic	1 678 000

State	Estimated regular budget cost (€)
Liberia	37 000
Libya	305 000
Liechtenstein	69 000
Lithuania	1 349 000
Luxembourg	35 000
Madagascar	35 000
Malawi	43 000
Malaysia	140 000
Maldives	26 000
Mali	35 000
Malta	117 000
Marshall Islands	42 000
Mauritania	42 000
Mauritius	35 000
Mexico	910 000
Monaco	35 000
Mongolia	72 000
Montenegro	129 000
Morocco	222 000
Mozambique	53 000
Myanmar	93 000
Namibia	148 000
Nauru	42 000
Nepal	26 000
Netherlands	2 570 000
New Zealand	35 000
Nicaragua	65 000
Niger	129 000
Nigeria	178 000
North Macedonia	39 000
Norway	495 000
Oman	26 000
Pakistan	1 662 000
Palau	35 000
Panama	35 000
Papua New Guinea	37 000
Paraguay	51 000
Peru	146 000
Philippines	133 000
Poland	440 000
Portugal	170 000
Qatar	53 000
Republic of Moldova	62 000

State	Estimated regular budget cost (€)
Democratic People's Republic of Korea[4]	1 469 000
Democratic Republic of the Congo	134 000
Denmark	174 000
Djibouti	26 000
Dominica	26 000
Dominican Republic	26 000
Ecuador	35 000
Egypt	1 010 000
El Salvador	104 000
Estonia	132 000
Ethiopia	35 000
Eswatini	34 000
Fiji	26 000
Finland	803 000
France	1 400 000
Gabon	35 000
Gambia	37 000
Georgia	261 000
Germany	6 258 000
Ghana	192 000
Greece	204 000
Grenada	26 000
Guatemala	26 000
Guyana	26 000
Haiti	42 000
Holy See	35 000
Honduras	35 000
Hungary	763 000
Iceland	35 000
India	3 700 000
Indonesia	558 000
Iran, Islamic Republic of[3]	18 178 000
Iraq	111 000
Ireland	49 000
Israel	147 000
Italy	949 000
Jamaica	96 000
Japan	20 255 000
Jordan	295 000
Kazakhstan	2 091 000
Kenya	47 000

State	Estimated regular budget cost (€)
Romania	1 714 000
Russian Federation[1]	0
Rwanda	53 000
Saint Kitts and Nevis	26 000
Saint Lucia	26 000
Saint Vincent and the Grenadines	26 000
Samoa	26 000
San Marino	26 000
Saudi Arabia	127 000
Senegal	35 000
Serbia	153 000
Seychelles	35 000
Sierra Leone	26 000
Singapore	129 000
Slovakia	456 000
Slovenia	277 000
Solomon Islands	26 000
South Africa	2 322 000
Spain	1 993 000
Sri Lanka	109 000
Sudan	42 000
Suriname	42 000
Sweden	1 728 000
Switzerland	1 821 000
Syrian Arab Republic	371 000
Tajikistan	98 000
Thailand	353 000
Togo	26 000
Tonga	26 000
Trinidad and Tobago	26 000
Tunisia	26 000
Turkey	505 000
Turkmenistan	49 000
Tuvalu	42 000
Uganda	140 000
Ukraine	3 315 000
United Arab Emirates	366 000
United Kingdom of Great Britain and Northern Ireland	2 190 000
United Republic of Tanzania	35 000
United States of America[1]	0
Uruguay	47 000

State	Estimated regular budget cost (€)	State	Estimated regular budget cost (€)
Kiribati	42 000	**Uzbekistan**	250 000
Korea, Republic of	4 908 000	**Vanuatu**	35 000
Kuwait	46 000	**Venezuela, Bolivarian Republic of**	194 000
Kyrgyzstan	156 000	**Viet Nam**	187 000
Lao People's Democratic Republic	26 000	**Yemen**	42 000
Latvia	108 000	**Zambia**	26 000
Lebanon	130 000	**Zimbabwe**	26 000
Lesotho	35 000		
Total estimation of safeguards cost(2) by State			**124 955 000**
Cost not allocated to individual States			**17 971 603**
Total costs			**142 926 603**

Table Notes:
(1) Safeguards implementation costs for the Russian Federation and the United States of America were covered by extrabudgetary contributions.
(2) For Taiwan, China, costs for safeguards measures applied were reimbursed by contributions to the Regular Budget.
(3) The Agency utilized 1196 calendar-days in the field to carry out verification and monitoring activities in relation to the JCPOA and spent €4.1 million of extrabudgetary resources for this in-field work and the associated Headquarters work.
(4) Cost of activities related to the Agency's readiness to conduct verification in the DPRK.

F.1.4. Asset Management

195. The Department of Safeguards started to develop a comprehensive integrated lifecycle management system for the responsible and sustainable management of its assets. Under the Integrated Lifecycle Management of Safeguards Assets (ILSA) project, the Department is preparing an asset management strategy to provide guidance and ensure consistency for managing the lifecycle of all safeguards assets, including IT equipment, equipment supporting in-field activities and analysis, and both internally developed and commercial off-the-shelf software. This initiative will enable the Department to enhance its foresight of the funding needs required to maintain, replace and renew assets. In support of the asset management strategy, during 2019 several enhancements were added in the safeguards equipment management system application (SEQUOIA) developed under the MOSAIC project.

F.1.5. New Large Geometry Secondary Ion Mass Spectrometer project

196. In 2019, the Agency began a project aimed at the procurement, commissioning and calibration of a new Large Geometry Secondary Ion Mass Spectrometer (LG-SIMS) to sustain analysis capabilities in the area of particle analysis for uranium isotopes. This sustainment and replacement project, which is considered critical for the Department to fulfil its verification responsibilities, is expected to be entirely funded through extrabudgetary contributions. The installation of the new machine is planned to be completed no sooner than the first quarter of 2023.

F.2. Human resources

F.2.1. Staff resources

197. As of 31 December 2019, the total number of regular staff members in the Department of Safeguards was 754 (757): 508 (506) in the Professional and higher categories and 246 (251) in the General Service category. In addition, as of 31 December 2019, 12 (nine) consultants, 29 (39) staff members with temporary assistance contracts — 18 (28) in the Professional and higher categories and 11 (11) in the General Service category — 26 (13) cost-free experts and 41 (38) junior professional officers and other extrabudgetary staff were working in the Department.

198. As of 31 December 2019, the total number of inspectors in the Divisions of Operations and the Office for Verification in Iran was 269 (276). A further 28 staff members in the Professional and higher categories from other Divisions participated in verification activities in 2019 utilizing 371.5 calendar-days in the field for verification.

199. There were 244.8 (223) inspector-years available in 2019. These data represent the time that inspectors were expected to be available for in-field work, i.e. inspection, complementary access and design information verification. The calculation methodology excludes Section Heads and Directors in Operations Divisions from the statistics as they do not directly participate in inspection work, reduces the time available for inspection work of Senior Inspectors to 50% and excludes the time necessary to train the newly recruited inspectors.

F.2.2. Gender parity

200. In line with the IAEA Gender Equality Policy, the Department of Safeguards is committed to supporting gender equality and is seeking to strengthen efforts to promote both gender balance in its staff and gender mainstreaming considerations in relevant programmatic activity.

201. As of 31 December 2019, 35% of all regular staff members in the Department were female. In the Professional and higher categories, women represented 23% of the regular staff and 20% of the safeguards inspectors in the Divisions of Operations and the Office for Verification in Iran. Women in the Department also comprised 16% of senior positions at the Section Head level and above.

202. The Department has taken steps to target female candidates in recruitment exercises, exploring outreach opportunities with the Division of Human Resources in the Department of Management, and seeking to ensure gender balance on recruitment panels. For the 2019 recruitment campaign for new P3 Nuclear Safeguards Inspectors, 24% of the overall applicants were women. Of the 21 candidates offered appointments as new P3 Nuclear Safeguards Inspectors, eight (38%) were female. The Department intends to increase these outreach activities for recruitment in 2020 and explore activities to support career development for female staff.

203. The Department also operates a biennial Safeguards Traineeship Programme for Young Graduates and Junior Professionals in developing Member States. The Department requests that Member States ensure that qualified women are given every opportunity and encouragement to apply for the programme. The 2019 application process, for the programme commencing in 2020, secured gender parity with regards to participants.

F.2.3. Staff training

204. As the knowledge and skills required of its workforce evolve, so does the Agency's training curriculum. Table 9 provides a breakdown of the number of courses offered, the training received by staff and the input of instructor time. Seventy distinct courses were held, some offered several times during the year, which amounted to a total of 107 staff training courses, of which 26 were held outside Agency Headquarters.

Table 9 – Training 2019

Course Competency Areas	Number of Training courses offered	Total Training time (person-days)	Total Agency Instructors (person-days)
Departmental basics and safety	46	937	185
Planning and conducting inspections	22	538	102
Nuclear fuel cycle knowledge	8	530	110
Monitoring, measurement and NDA techniques	13	318	59
Design information verification and complementary access	9	726	133
Analysis and evaluation (including State evaluation)	9	293	55
Total	**107**	**3342**	**644**

205. Courses held at nuclear facilities are designed to enhance practical competencies for safeguards implementation in the field. They enable effective and integrated training of safeguards staff in a realistic environment. In particular they improve inspectors' ability to prepare for, conduct and report on inspection, design information verification and complementary access. Courses held at Headquarters aim to develop skills for analysing safeguards relevant information using different techniques, including collaborative analysis tools. Courses are continuously updated to ensure that they address the training needs throughout the Department.

206. In 2019, new training courses were also delivered, including an industrial safety course for inspectors, a refresher course on performing criticality check at research reactors and critical assemblies and a course on nuclear fuel cycle safeguards (for non-inspectors). Furthermore, new e-learning modules were launched on sample logistics, radiation protection, and the use of the Electrically Cooled Germanium System for NDA measurements. Additionally, as a result of a department-wide training needs analysis, a new strategy has been developed to integrate training on the applications resulting from the MOSAIC project with departmental processes. In 2019, the training course providing overview of the verification process was offered twice. Pilot courses were offered in order to gain feedback to strengthen course design; these courses included a seminar on nuclear material accountancy and training on CAP. The Agency continued to engage with MSSPs in the development of training methodologies tools as well as in the conduct of courses both at Headquarters and at nuclear facilities.

F.3. Support by Member States and outside expert groups

207. In 2019, the Secretariat benefitted from the work and contributions (in cash and in kind) of MSSPs. These partnerships with 20 States[53] and the European Commission focus on enhancing the IAEA's verification capabilities and addressing specific development and implementation support needs for safeguards. At the end of 2019, the Development and Implementation Support Programme for Nuclear Verification comprised 250 discrete support programme tasks in 25 projects. During 2019, MSSP activities resulted in 33 completed tasks while 65 new tasks were initiated during the year. The biennial meeting of the MSSP coordinators was prepared for January 2020. All Member States that expressed interest in considering the establishment of a support programme were invited to observe this meeting and to consult with the Secretariat for details on how to proceed.

208. In 2019, two series of SAGSI meetings addressing technical matters related to safeguards implementation took place and two reports to the Director General were produced. Topics on SAGSI's agenda during the year included: performance targets for the development of State-level safeguards approaches; priority actions by the Secretariat to reinforce State evaluation; updated methodology for managing safeguards implementation issues; addressing cross-border challenges; engaging partnerships on safeguards issues (a follow-up from the 2018 Safeguards Symposium); the use of innovative safeguards technologies in safeguards implementation; and the improvement of verification activities for facilities under decommissioning for safeguards purposes.

G. Further Activities Supporting the Nuclear Non-Proliferation Regime

209. Two additional important areas of Agency work, which are not covered by the implementation of safeguards agreements and additional protocols, are relevant to its verification tasks: the voluntary reporting scheme and monitoring of separated neptunium and americium.

G.1. Voluntary reporting scheme

210. As of the end of 2019, 36 States[54] and the European Commission had committed to participating in the voluntary reporting scheme (VRS) on nuclear material, specified equipment and non-nuclear material. The list of the specified equipment and non-nuclear material to be used for the voluntary reporting scheme is incorporated in the *Model Additional Protocol* (INFCIRC/540 (Corrected), Annex II). Argentina and the European Commission reported under the VRS on the export, import, production or inventory of nuclear material and four States[55] reported on the export or import of non-nuclear material and equipment.

---

[53] MSSPs are provided by Argentina, Australia, Belgium, Brazil, Canada, China, Czech Republic, Finland, France, Germany, Hungary, Japan, the Republic of Korea, Netherlands, Russian Federation, South Africa, Spain, Sweden, United Kingdom and the United States of America.

[54] Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, China, Croatia, Democratic Republic of the Congo, Denmark, Finland, France, Germany, Greece, Hungary, Indonesia, Ireland, Italy, the Republic of Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Peru, Poland, Portugal, Romania, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom and the United States of America.

[55] Reports were received from Argentina, Germany, Sweden and the United States of America.

G.2. Monitoring neptunium and americium

211. In 1999, the Board of Governors endorsed the implementation of a scheme to monitor separated neptunium and decided that the Director General should report to the Board, when appropriate, on information from States regarding separated americium.[56] Following the Board's decisions, letters were sent to 39 States[57] seeking relevant information about inventories, exports and separation of neptunium and americium, and a commitment to provide annual updates. In the intervening years, the Agency's State evaluation process has evolved to consider all safeguards relevant information available about States, including information on separated neptunium and americium. This information complements the initial reports and the annual reports received from States under the neptunium and americium monitoring scheme.

212. During 2019, the Agency received the requested information from six States[4, 58] and the European Commission. Evaluation of the information provided by States under the monitoring scheme, in conjunction with information obtained from open and other sources in the course of the State evaluation process, indicates that the quantities of separated neptunium and americium in the non-nuclear-weapon States that are party to the NPT remain small, the elements are being separated in only very small quantities, and only small quantities of the elements are being exported to these States. This evaluation, therefore, does not indicate that a specific proliferation risk currently exists.

213. In 2019, separation of neptunium and americium did not take place at the European Commission's Joint Research Centre in Karlsruhe, Germany. Consequently, flow sheet verification of neptunium and americium was not carried out at this Centre in 2019. The neptunium flow sheet verification activities at the Rokkasho reprocessing plant in Japan remained on hold due to the shutdown status of this facility during 2019.

---

[56] GOV/1999/19/Rev.2.

[57] Letters were sent to Argentina, Armenia, Australia, Azerbaijan, Belarus, Belgium, Brazil, Canada, China, Czech Republic, Estonia, France, Georgia, Germany, India, Indonesia, Israel, Italy, Japan, Kazakhstan, the Republic of Korea, Kyrgyzstan, Latvia, Lithuania, Norway, Pakistan, Poland, Republic of Moldova, Russian Federation, Spain, Sweden, Switzerland, Tajikistan, Turkmenistan, Ukraine, United Kingdom, United States of America, Uzbekistan and the Bolivarian Republic of Venezuela. Letters were also sent to the European Commission and Taiwan, China. All States responded except Armenia, Georgia, Kyrgyzstan, Republic of Moldova, Turkmenistan and the Bolivarian Republic of Venezuela.

[58] Canada, Czech Republic, the Republic of Korea, Pakistan, Switzerland and the United Kingdom.

Abbreviations

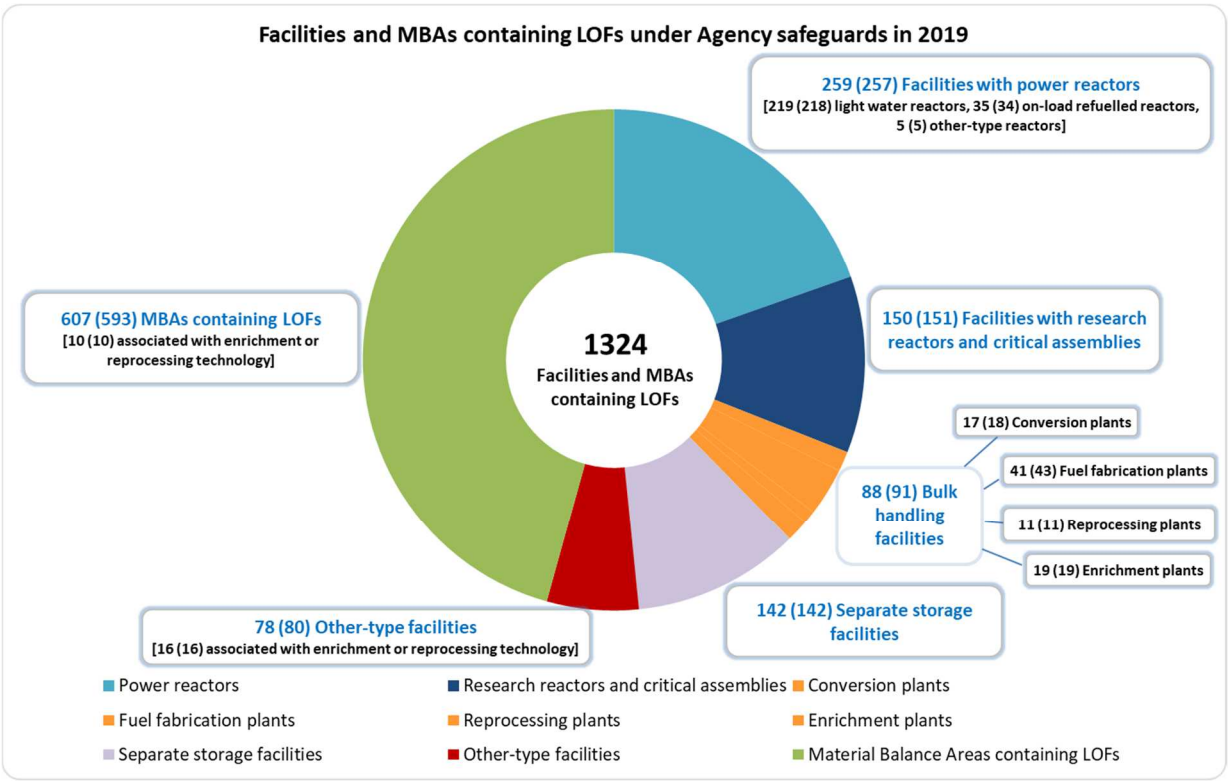
ABACC	Brazilian-Argentine Agency for the Accounting and Control of Nuclear Materials
AP	additional protocol
CANDU	Canadian deuterium-uranium reactor
CSA	comprehensive safeguards agreement
DPRK	Democratic People's Republic of Korea
EPGR	encapsulation plant and geological repository
ESL	Environmental Sample Laboratory
EURATOM	European Atomic Energy Community
ICAS	Introductory Course on Agency Safeguards
ICR	inventory change report
INFCIRC	Information Circular
JCPOA	Joint Comprehensive Plan of Action
LOF	location outside facilities
LWR	light water reactor
MBA	material balance area
MBR	material balance report
MOSAIC	Modernization of Safeguards Information Technology
MSSP	Member State Support Programme
NDA	non-destructive assay
NGSS	next generation surveillance system
NML	Nuclear Material Laboratory (Seibersdorf)
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NWAL	Network of Analytical Laboratories
PIL	physical inventory listing
RSAC	regional system of accounting for and control of nuclear material
SAGSI	Standing Advisory Group on Safeguards Implementation
SAL	Safeguards Analytical Laboratories (Seibersdorf)
SLA	State-level safeguards approach
SQP	small quantities protocol
SRA	State or regional authority responsible for safeguards implementation
SSAC	State system of accounting for and control of nuclear material
VRS	voluntary reporting scheme on nuclear material and specified equipment and non-nuclear material

Appendix I. Data on Safeguards Activities — Aggregated for All States

1. Data regarding safeguards activities in 2019 set out below are aggregated for all States.[3, 4]

I.1. Facilities, LOFs and material under Agency safeguards

2. During 2019, 717 (721) facilities[59] and 607 (593) material balance areas (MBAs) containing locations outside facilities where nuclear material is customarily used (LOFs) were under safeguards. The breakdown per category of the 1324 (1314) facilities and MBAs containing LOFs under Agency safeguards is provided in the diagram below:



3. The change in the number of facilities and MBAs containing LOFs under Agency safeguards over the last ten years is shown in Figure I.1. Since 2009, the number of facilities under Agency safeguards has increased by approximately 7%. Most of the growth (5%) has been observed in the first half of the decade, mainly determined by the increase in the number of power reactors and separate storage facilities under Agency safeguards. In the second half of the decade, a small decrease has occurred in the total number of bulk handling facilities (mainly fuel fabrication plants) and research reactors and critical assemblies, while the increase in the number of power reactors has slowed down. For the first time in ten years, the number of facilities under Agency safeguards has slightly decreased in 2019. The change in the number of MBAs containing LOFs under Agency safeguards is also shown in Figure I.1. Since

[59] The facilities in Figure I.1 are categorized as per GOV/INF/361.

2009, the number of MBAs containing LOFs under Agency safeguards has increased by approximately 33%.[60]

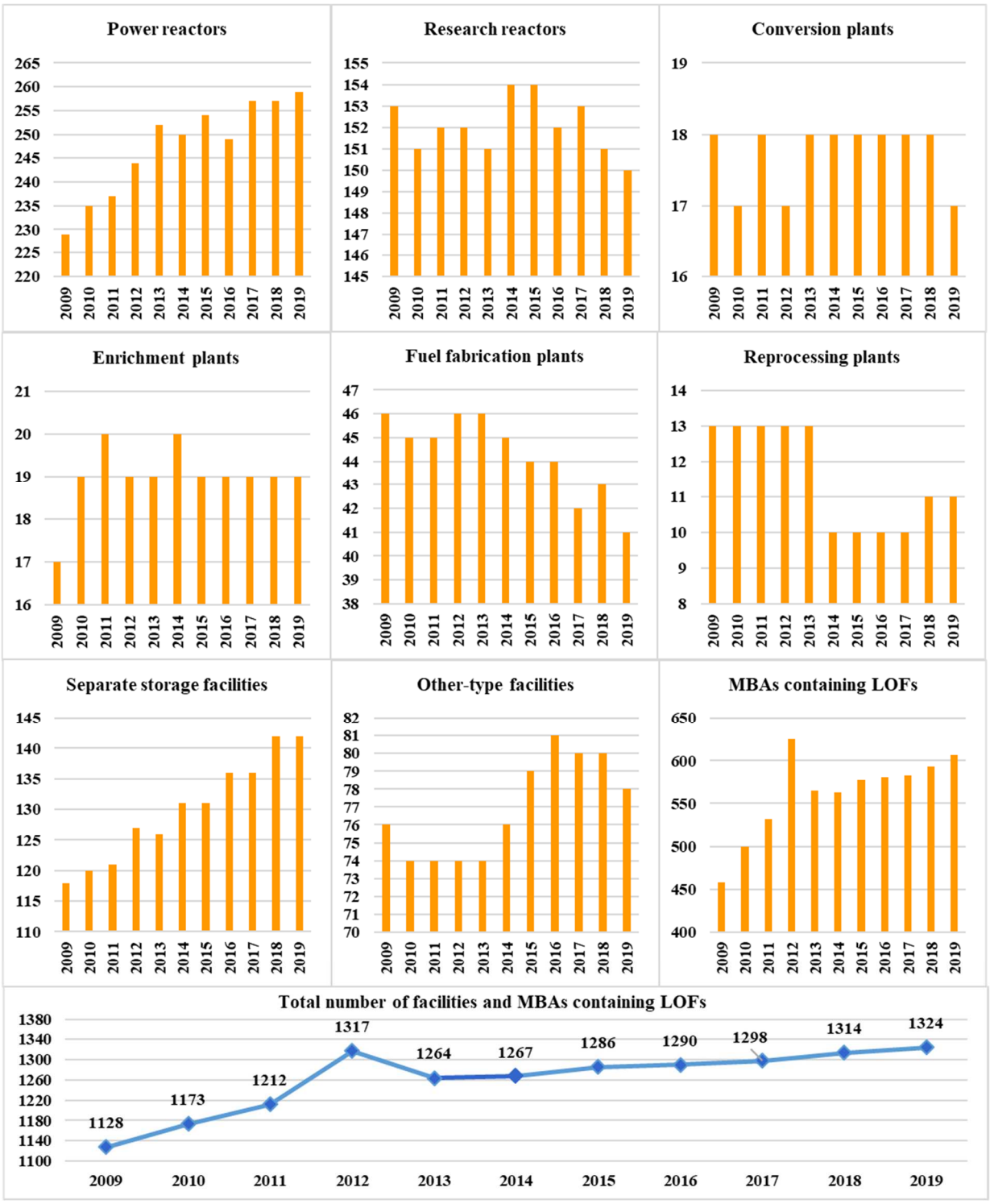


Figure I.1. Facilities and MBAs containing LOFs under Agency safeguards, 2009–2019

[60] A number of MBAs containing LOFs were created in 2012 and then closed during 2013 as a result of the exemption of small amounts of nuclear material in non-nuclear activities at LOFs in one State. For consistency with previous reporting, these LOFs are included in the 2012 totals but are not included in the 2013 totals.

4. At the end of 2019, 216 448 (212 814)[61] significant quantities[62] of nuclear material were under Agency safeguards, an increase of 31% compared with 2009, as shown in Figure I.2. Of this total, 176 701 (173 438) significant quantities were in States[4] with comprehensive safeguards agreements, 4565 (4237) significant quantities in States with INFCIRC/66/Rev.2-type agreements and 35 182 (35 139) significant quantities in facilities or parts thereof selected in States with voluntary offer agreements. Over the last decade, irradiated plutonium has been the main contributor to the steady growth of significant quantities of nuclear material under Agency safeguards, followed by source material and low enriched uranium. However, in 2019, the total amount of low enriched uranium under Agency safeguards continued to decrease slightly for the second consecutive year, reversing a trend of growth that had been observed for more than fifteen years previously. Moreover, for the first time in over a decade, no appreciable growth was observed in 2019 in the total amount of source material under Agency safeguards. Finally, in the last decade the amount of high enriched uranium under Agency safeguards continued to decrease, mainly as a result of return of HEU to suppliers, while the amount of unirradiated plutonium and uranium-233 under Agency safeguards remained approximately constant.

5. Data are presented below according to material type under safeguards:

- 12 077 (12 079) significant quantities of unirradiated plutonium, including fresh mixed oxide fuel, outside reactor cores;
- 167 672 (163 753) significant quantities of plutonium contained in irradiated fuel and in fuel elements in reactor cores;
- 156 (160) significant quantities of high enriched uranium and 18 (18) significant quantities of uranium-233;
- 20 845 (21 136) significant quantities of low enriched uranium;
- 15 680 (15 668) significant quantities of thorium and depleted and natural uranium.

Safeguards were also applied to 430.2 (423.6) tonnes of heavy water.

[61] This amount includes an estimated 9000 significant quantities of plutonium contained in irradiated fuel assemblies in reactors which, under the agreed reporting procedures, had not yet been separately reported to the Agency.

[62] Significant quantity figures rounded to the nearest integer.

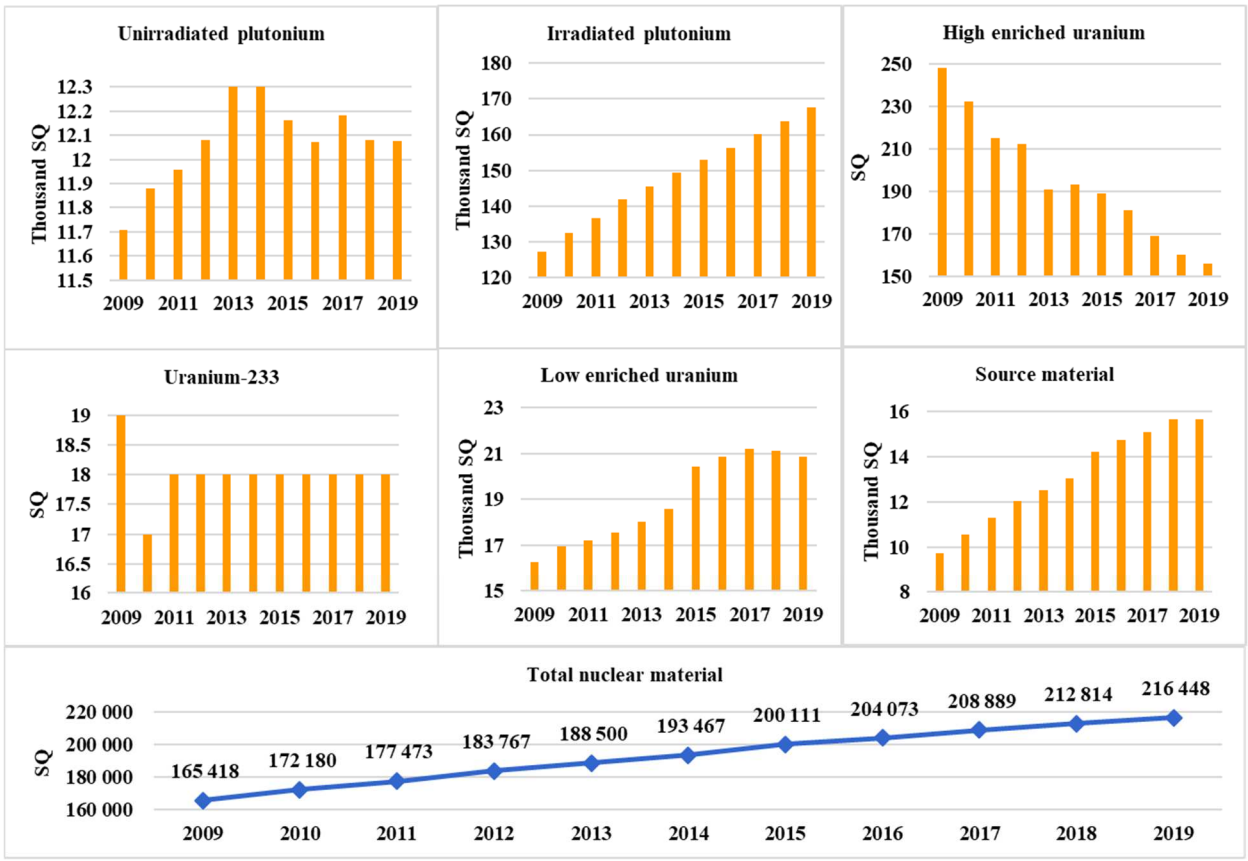


Figure I.2. Significant quantities (SQ) of nuclear material under Agency safeguards, 2009–2019

I.2. Safeguards agreement reporting and verification activities

6. The following accounting reports were received by the Agency in 2019:

- 778 615 (877 373) inventory change reports (ICRs);
- 1295 (1293) physical inventory listings (PILs);
- 1276 (1270) material balance reports (MBRs).

7. The following verification activities were carried out in 2019:

- 2179 (2195) inspections and 625 (633) design information verifications were performed at facilities and LOFs representing 12 857.5 (13 282) calendar-days in the field for verification;
- 2181 (2061)[63] surveillance and monitoring systems were reviewed;
- Agency seals:
  - 13 875 (13 383) metal seals applied to nuclear material or Agency safeguards equipment were detached and subsequently verified at Headquarters;
  - 6878 (6895) electronic and other types of seals;

[63] This figure includes media items and data streams produced by surveillance and monitoring systems and reviewed during 2019.

- Agency/EURATOM common seals:
  - 2908 (2241) metal seals applied to nuclear material or Agency safeguards equipment were detached and subsequently verified at Luxembourg;
  - 2202 (2279) electronic and other types of seals;
- 230 (270) environmental swipe samples and 102 (48) samples for other analysis were collected in 2019.

The Agency dispatched 3063 (3125) statements on the results of inspections, conclusions, safeguards transfer agreement letters (to States with INFCIRC/66/Rev.2-type agreements), design information verification acknowledgement letters and inventories of nuclear material reports.

I.3. Additional protocol reporting and verification activities

8. Since 2015, the number of States with additional protocols in force[5] has increased by 7% and the number of additional protocol declarations evaluated by the Agency has increased by 28%. During 2019, 2785 (2613) declarations were received from 113 (109) States[4] and the European Commission.

9. Over the years, the number of complementary accesses has fluctuated according to the Agency's verification needs in States with additional protocols in force[5]. Data regarding the implementation of additional protocol activities in 2019 are as follows:

- 149 (183) complementary accesses were conducted in 35 (51) States[4] and a location of the European Commission representing 282 (329.5) calendar-days in the field for verification;
- 175 (150) environmental swipe samples and 14 (13) samples for other analysis were taken during complementary access in 28 (31) States[4] and four (four) States, respectively;
- The Agency dispatched:
  - 171 (181) statements on the activities carried out under the additional protocol (10.a. statements);
  - 18 (24) statements on the results of activities in respect of questions or inconsistencies that the Agency brought to the attention of a State (10.b. statements);
  - 66 (49) statements on conclusions drawn from additional protocol activities (10.c. statements).

Appendix II. Data on Safeguards Activities — by Group and by State

Group 1: States with both comprehensive safeguards agreements and additional protocols in force,[4] with the broader conclusion and integrated safeguards implemented during 2019

Table II.1 – Amount of nuclear material[39], in significant quantities, under Agency safeguards at the end of 2019

Unirradiated plutonium	Unirradiated high enriched uranium	Unirradiated uranium-233	Irradiated plutonium	Irradiated high enriched uranium	Irradiated uranium-233	Low enriched uranium	Natural uranium	Depleted uranium	Thorium	Total significant quantities
1131	**31**	**1**	**131 550**	**116**	**17**	**18 809**	**3230**	**7993**	**12**	**162 890**

Note: Heavy water under safeguards: 0.7 tonne. Significant quantity figures rounded to the nearest integer.

Table II.2 – Summary of facility based verification activities by installation category in 2019

	Power reactors	Research reactors	Conversion plants	Fuel fabrication plants	Reprocessing plants	Enrichment plants	Separate storage facilities	Other facilities	Material balance areas containing LOFs	Total
Number of facilities and MBAs containing LOFs under safeguards	220	105	8	27	10	5	121	57	502	**1055**
Number of facilities and LOFs inspected	174	52	7	21	7	5	82	37	64	**449**
Number of inspections	515	146	46	112	36	74	306	84	66	**1385**
Number of design information verification visits	139	56	9	23	8	5	89	37	1	**367**
Number of person-days of inspection	1069	289	218	804	455	344	658	170	108	**4115**

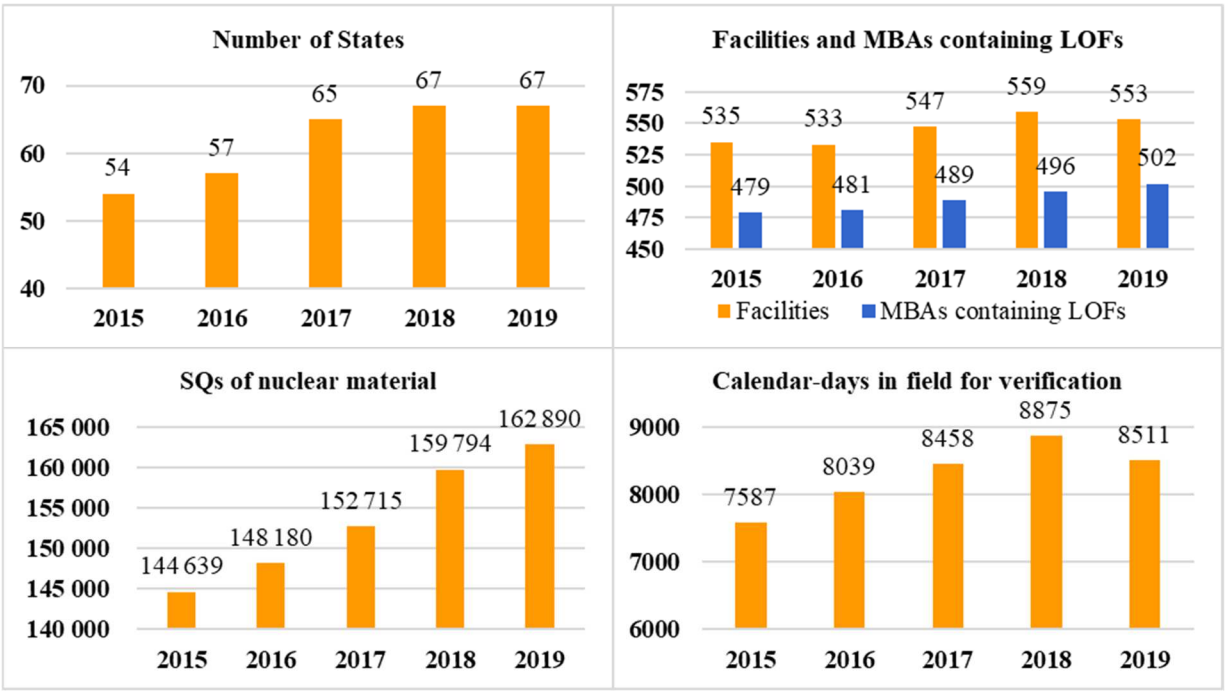


Figure II.1. Group 1: Number of States; number of facilities and MBAs containing LOFs under Agency safeguards; amount of nuclear material[39] in significant quantities under Agency safeguards; number of calendar-days in the field for verification utilized by the Agency, 2015-2019

Figure II.1 shows the number of States[4] in Group 1, together with the number of facilities and MBAs containing LOFs, the amount of nuclear material[39] in significant quantities and the number of calendar-days in the field for verification utilized by the Agency in States in Group 1 from 2015 to 2019. In 2019, the Agency has implemented integrated safeguards in approximately 81% of the facilities and 84% of the MBAs containing LOFs located in States with a CSA, which hold approximately 97% of the nuclear material under Agency safeguards in States with a CSA. Since 2015, the number of States with CSAs and APs in force, with broader conclusion and integrated safeguards implemented during the year has increased by approximately 24%. In 2019, the number of facilities under Agency safeguards slightly decreased compared to 2018, primarily due to the decommissioning of bulk handling facilities and other-type facilities in Europe. Moreover, the number of calendar-days in the field for verification utilized by the Agency in States belonging to Group 1 decreased in 2019 by approximately 4% compared to 2018, partly due to a reduction in the in-field effort related to the verification of transfers of nuclear material in some States. Since 2015, the number of facilities under Agency safeguards in the States belonging to Group 1 increased by 3%, the number of calendar-days in the field for verification increased by 12%, and the amount of nuclear material in significant quantities increased by 13%.

Table II.3 – Verification activities in 2019

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Albania	0	1	1	2	0	0	4	12	7	3	3	14
Andorra	0	1[1]	0	0	0	0	0	0	0	0	0	0
Armenia	3	1	2	5	2	0	14	28	312	5	5	15
Australia	5	2	4	6	3	3	20	62	1019	6	6	63
Austria	1	5	4	4	0	0	4	7	1213	6	6	18
Bangladesh	2	1	2	2	1	0	4	11	0	4	4	14
Belgium	22	9	20	93	20	3	141	233.5	26 495	24	24	22
Botswana	0	1	1	1	0	0	1	3	2	1	1	13
Bulgaria	6	3	5	11	6	1	13	38	1288	9	9	16
Burkina Faso	0	1[1]	0	0	0	0	0	0	0	0	0	14
Canada	33	8	30	246	32	12	751	1423	6568	50	50	53
Chile	4	1	2	2	1	1	6	17	128	5	5	18
Croatia	0	1	0	0	0	0	0	0	43	1	1	13
Cuba	0	2	0	0	0	1	0	14	1	2	2	13
Czech Republic	12	2	10	40	10	2	63	108.5	6313	14	14	22
Denmark[2]	4	4	3	3	4	0	3	5	32	5	5	28
Ecuador	0	1[1]	0	0	0	0	0	0	0	0	0	14
Estonia	1	2	1	1	0	0	1	3	1	2	2	13
Finland	9	4	5	14	7	1	17	49	2255	10	10	20
Germany	67	81	53	168	43	5	308	604	131 344	124	124	73
Ghana	1	1	2	2	1	1	4	6	1	2	2	15
Greece	1	6	1	2	1	1	2	6	92	3	3	17
Holy See	0	1[1]	0	0	0	0	0	0	0	0	0	13
Hungary	6	2	4	14	5	0	23	54.5	2650	9	9	21

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Iceland	0	1(1)	0	0	0	0	0	0	0	0	0	13
Indonesia	7	1	2	3	2	2	14	33	364	8	8	19
Ireland	0	2	0	0	0	0	0	0	29	2	2	15
Italy	19	37	16	20	10	2	24	60	860	53	51	16
Jamaica	1	1	0	0	0	0	0	0	5	2	2	14
Japan	125	198	104	279	72	24	1318	2735	21 633	327	327	221
Kazakhstan	14	2	8	11	10	6	130	303	5917	10	10	20
Korea, Republic of	46	2	35	59	18	7	259	611	7906	44	44	21
Kuwait	0	1(1)	0	0	0	0	0	0	62	1	0	37
Latvia	1	2	0	0	0	0	0	0	2	2	2	14
Liechtenstein	0	1	0	0	0	0	0	0	4	1	1	13
Lithuania	4	17	9	45	4	0	88	127	54 138	16	16	18
Luxembourg	0	2	0	0	0	0	0	0	0	0	0	13
Madagascar	0	1(1)	0	0	0	0	0	0	0	0	0	15
Mali	0	1(1)	0	0	0	0	0	0	0	0	0	13
Malta	0	1	1	1	0	0	1	3	2	0	0	13
Mauritius	0	1(1)	0	0	0	0	0	0	0	0	0	15
Monaco	0	1(1)	0	0	0	0	0	0	0	0	0	13
Montenegro	0	1(1)	1	1	0	0	2	6	0	1	0	15
Netherlands	8	8	7	53	7	2	164	300.5	25 541	17	17	22
New Zealand	0	1(1)	0	0	0	0	0	0	0	0	0	44
North Macedonia	0	1(1)	0	0	0	0	0	0	5	1	0	26
Norway	3	1	4	6	3	2	18	41.5	73	5	5	19
Palau	0	1(1)	0	0	0	0	0	0	0	0	0	111

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Peru	2	1	3	3	2	0	6	10	0	3	3	16
Philippines	2	1	0	0	0	0	0	0	0	4	4	49
Poland	3	3	3	4	1	1	11	22	1622	6	6	15
Portugal	2	0	1	1	2	0	1	6	4	1	1	14
Romania	9	1	7	21	7	0	46	85	70 562	8	8	17
Seychelles	0	1(1)	0	0	0	0	0	0	0	0	0	14
Singapore	0	1(1)	1	1	0	0	4	10	67	1	0	14
Slovakia	7	1	5	13	7	0	14	25	2532	6	6	11
Slovenia	3	14	1	6	2	0	6	17	452	10	10	10
South Africa	18	2	15	49	14	4	134	312.5	1618	19	19	25
Spain	17	18	17	48	15	2	90	173	4004	29	29	28
Sweden	16	9	14	34	16	1	85	161	22 007	22	22	26
Switzerland	13	2	11	55	9	1	101	213.5	2363	16	16	23
Tajikistan	1	1	0	0	0	0	0	0	5	2	2	14
Ukraine	38	10	23	39	24	7	132	306	7060	37	37	27
United Republic of Tanzania	0	1(1)	0	0	0	0	0	0	0	0	0	11
Uruguay	0	1	0	0	0	0	0	0	0	1	1	18
Uzbekistan	1	7	3	3	0	2	8	24	131	7	7	22
Viet Nam	1	1	0	0	0	0	0	0	68	0	0	17
Total for 67 States	**538**	**501**	**441**	**1371**	**361**	**94**	**4035**	**8269.5**	**408 800**	**947**	**941**	**1633**

(1) MBAs in States with SQPs based on the revised standard text.
(2) Includes additional protocol declarations submitted by Denmark with regard to Greenland.

	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Taiwan, China	15	1	8	14	6	6	80	241.5	3327	14	14	24
Total of States and Taiwan, China	553	502	449	1385	367	100	4115	8511	412 127	961	955	1657
Total of EURATOM States[1]	**218**	**234**	**187**	**596**	**167**	**21**	**1105**	**2088**	**353 481**	**379**	**377**	**495**

(1) In addition to 495 additional protocol declarations for EURATOM States, there are 18 additional protocol declarations for locations of the European Commission. In 2019, the Agency conducted one complementary access at one of these locations.

Group 2: States with both comprehensive safeguards agreements and additional protocols in force, with the broader conclusion and integrated safeguards not implemented during 2019

Table II.4 – Amount of nuclear material[39], in significant quantities, under Agency safeguards at the end of 2019

Unirradiated plutonium	Unirradiated high enriched uranium	Unirradiated uranium-233	Irradiated plutonium	Irradiated high enriched uranium	Irradiated uranium-233	Low enriched uranium	Natural uranium	Depleted uranium	Thorium	Total significant quantities
0	0	0	0	0	0	2			0	2

Note: Significant quantity figures rounded to the nearest integer.

Table II.5 – Summary of facility based verification activities by installation category in 2019

	Power reactors	Research reactors	Conversion plants	Fuel fabrication plants	Reprocessing plants	Enrichment plants	Separate storage facilities	Other facilities	Material balance areas containing LOFs	Total
Number of facilities and MBAs containing LOFs under safeguards	1	3	0	1	0	0	2	0	3	**10**
Number of facilities and LOFs inspected	0	2	0	1	0	0	0	0	3	**6**
Number of inspections	0	2	0	1	0	0	0	0	3	**6**
Number of design information verifications	0	2	0	1	0	0	0	0	1	**4**
Number of person-days of inspection	0	4	0	2	0	0	0	0	14	**20**

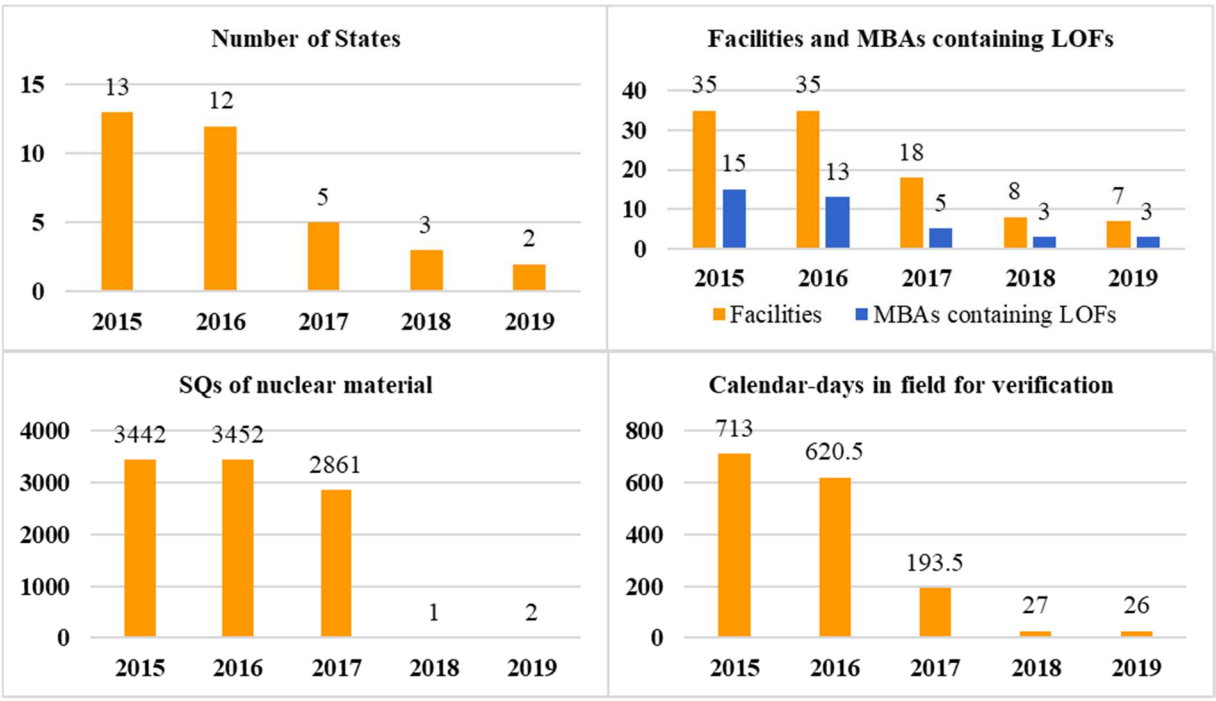


Figure II.2. Group 2: Number of States; number of facilities and MBAs containing LOFs under Agency safeguards; amount of nuclear material[39] in significant quantities under Agency safeguards; number of calendar-days in the field for verification utilized by the Agency, 2015-2019

Figure II.2 shows the number of States in Group 2, together with the number of facilities and MBAs containing LOFs, the amount of nuclear material[39] in significant quantities and the number of calendar-days in the field for verification utilized by the Agency in States in Group 2 from 2015 to 2019. With the implementation of integrated safeguards, the number of States in Group 2 has decreased significantly in the last three years. Since 2015, three States entered Group 2 in the year when the broader conclusion was drawn for them for the first time, and 14 States moved to Group 1 in the year when implementation of integrated safeguards commenced.

Table II.6 – Verification activities in 2019

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Jordan	1	2	3	3	2	1	10	10	19	3	3	27
Turkey	6	1	3	3	2	2	10	16	55	8	8	24
Total for 2 States	**7**	**3**	**6**	**6**	**4**	**3**	**20**	**26**	**74**	**11**	**11**	**51**

Group 3: States with both comprehensive safeguards agreements and additional protocols in force[5], without the broader conclusion

Table II.7 – Amount of nuclear material[39], in significant quantities, under Agency safeguards at the end of 2019

Unirradiated plutonium	Unirradiated high enriched uranium	Unirradiated uranium-233	Irradiated plutonium	Irradiated high enriched uranium	Irradiated uranium-233	Low enriched uranium	Natural uranium	Depleted uranium	Thorium	Total significant quantities
0	**0**	**0**	**970**	**1**	**0**	**201**	**52**	**29**	**0**	**1253**

Note: Significant quantity figures rounded to the nearest integer.

Table II.8 – Summary of facility based verification activities by installation category in 2019

	Power reactors	Research reactors	Conversion plants	Fuel fabrication plants	Reprocessing plants	Enrichment plants	Separate storage facilities	Other facilities	Material balance areas containing LOFs	Total
Number of facilities and MBAs containing LOFs under safeguards	10	17	2	3	0	3	3	5	57	**100**
Number of facilities and LOFs inspected	4	10	2	2	0	3	2	3	14	**40**
Number of inspections	14	17	105	46	0	253	5	9	17	**466**
Number of design information verifications	9	25	25	25	0	36	1	17	0	**138**
Number of person-days of inspection	57	49	259	130	0	622	15	20	48	**1200**

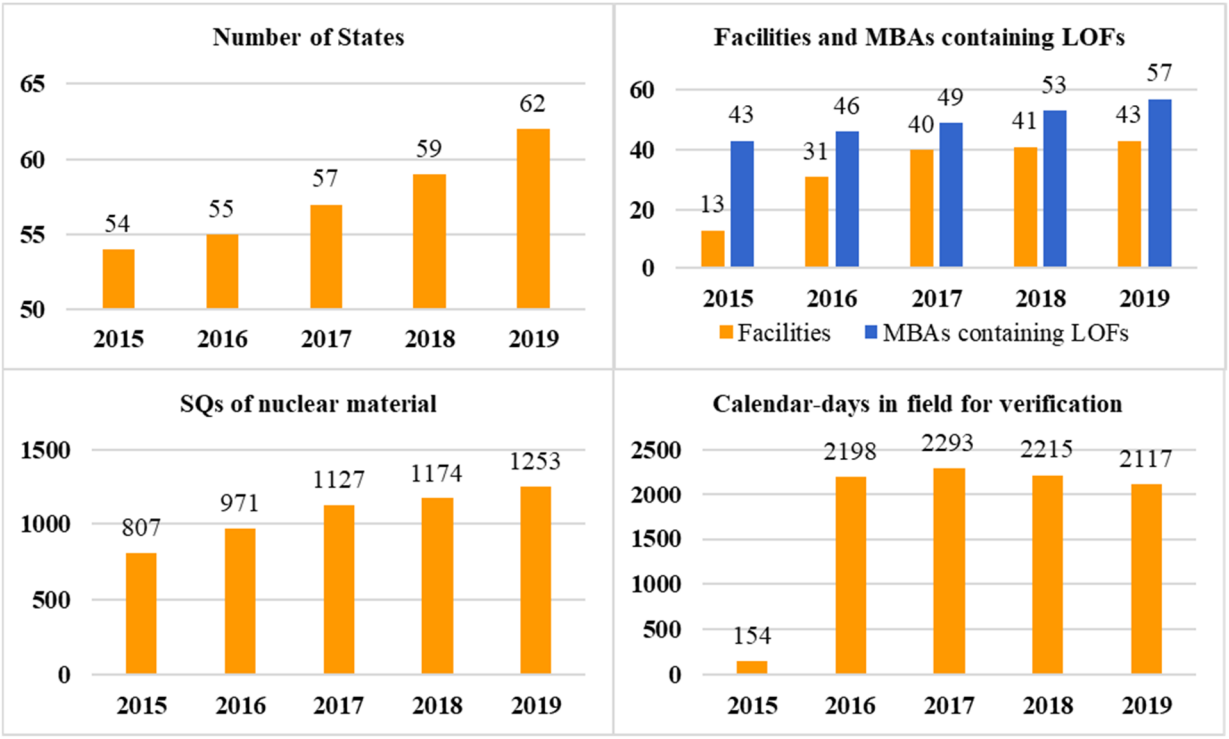


Figure II.3. Group 3: Number of States; number of facilities and MBAs containing LOFs under Agency safeguards; amount of nuclear material[39] in significant quantities under Agency safeguards; number of calendar-days in the field for verification utilized by the Agency, 2015-2019

Figure II.3 shows the number of States in Group 3, together with the number of facilities and MBAs containing LOFs, the amount of nuclear material[39] in significant quantities and the number of calendar-days in the field for verification utilized by the Agency in States in Group 3 from 2015 to 2019. As reported in Section E.1, the number of States in Group 3 has progressively increased over the years. Since 2015, 10 States entered Group 3 by bringing an AP into force[5], two of them together with their CSA, while three States moved to Group 2 in the year when the broader conclusion was drawn for those States for the first time. In 2019, one State moved from Group 1 into Group 3 because, for that year, the Secretariat was unable to draw the broader conclusion that all nuclear material in that State remained in peaceful activities. The most significant changes for Group 3 have occurred in 2015, when the broader conclusion was first drawn for a State with several facilities and a large amount of nuclear material, and in 2016, due to the implementation of the AP in one State with several facilities where a large number of calendar-days in the field for verification were utilized. In 2019, the number of calendar-days in the field for verification utilized by the Agency in States in Group 3 decreased by approximately 4% compared to 2018, mainly due to a reduction of in-field verification activities in States with an operative SQP.

Table II.9 – Verification activities in 2019

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Afghanistan	0	1(1)	0	0	0	0	0	0	0	0	0	0
Angola	0	1(1)	0	0	0	0	0	0	0	1	0	15
Antigua and Barbuda	0	1(1)	0	0	0	0	0	0	0	0	0	0
Azerbaijan	0	1	1	1	0	0	4	8	14	1	1	43
Bahrain	0	1(1)	0	0	0	0	0	0	52	0	0	27
Benin	0	1(1)	0	0	0	0	0	0	0	0	0	0
Bosnia and Herzegovina	0	1	1	1	0	0	6	10	0	0	0	12
Burundi	0	1(1)	0	0	0	0	0	0	0	0	0	0
Cambodia	0	1(1)	0	0	0	0	0	0	0	0	0	14
Cameroon	0	1(1)	0	0	0	0	0	0	0	1	0	14
Central African Republic	0	1(1)	0	0	0	0	0	0	0	0	0	0
Chad	0	1(1)	0	0	0	0	0	0	0	0	0	15
Colombia	1	1	2	2	1	0	4	8	12	4	4	16
Comoros	0	1(1)	0	0	0	0	0	0	0	0	0	0
Congo	0	1(1)	0	0	0	0	0	0	0	0	0	0
Costa Rica	0	1(1)	0	0	0	0	0	0	2	1	0	122
Côte d'Ivoire	0	1	1	1	0	0	4	8	3	1	1	17

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Cyprus	0	1	0	0	0	0	0	0	3	2	2	13
Democratic Republic of the Congo	1	0	1	1	1	0	2	6	1	1	1	0
Djibouti	0	1(1)	0	0	0	0	0	0	0	0	0	0
Dominican Republic	0	1(1)	0	0	0	0	0	0	0	0	0	0
El Salvador	0	1(1)	0	0	0	0	0	0	0	0	0	15
Eswatini	0	1(1)	0	0	0	0	0	0	0	0	0	0
Ethiopia	0	1(1)	0	0	0	0	0	0	0	0	0	9
Fiji	0	0	0	0	0	0	0	0	0	0	0	0
Gabon	0	1(1)	0	0	0	0	0	0	0	0	0	23
Gambia	0	1(1)	0	0	0	0	0	0	0	1	0	0
Georgia	2	1	1	1	0	1	4	10	3	2	2	14
Guatemala	0	1(1)	0	0	0	0	0	0	0	0	0	0
Haiti	0	0	0	0	0	0	0	0	0	0	0	0
Honduras	0	1(1)	0	0	0	0	0	0	0	0	0	39
Iran, Islamic Republic of	21	1	16	432	123	33	1103	1849	4490	26	26	21
Iraq	1	1	1	1	0	0	2	3	5	2	2	16
Kenya	0	1(1)	0	0	0	0	0	0	2	2	0	17
Kyrgyzstan	0	0	0	0	0	3	0	14	0	0	0	21

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Lesotho	0	1(1)	0	0	0	0	0	0	0	0	0	4
Liberia	0	1(1)	0	0	0	0	0	0	0	1	0	0
Libya	2	1	0	0	0	0	0	0	0	2	2	23
Malawi	0	1(1)	0	0	0	0	0	0	0	0	0	0
Marshall Islands	0	0	0	0	0	0	0	0	0	0	0	0
Mauritania	0	1(1)	0	0	0	0	0	0	0	0	0	0
Mexico	5	2	5	15	4	2	46	94	1014	6	6	19
Mongolia	0	0	0	0	0	0	0	0	0	0	0	18
Morocco	1	1	2	2	1	1	4	13	6	4	4	14
Mozambique	0	1(1)	0	0	0	0	0	0	3	1	0	0
Namibia	0	0	0	0	0	2	0	12	0	0	0	13
Nicaragua	0	1(1)	0	0	0	0	0	0	0	0	0	15
Niger	0	1	1	1	0	0	4	8	4	1	1	15
Nigeria	1	1	2	2	1	0	7	10	368	2	2	23
Panama	0	1(1)	0	0	0	0	0	0	0	0	0	42
Paraguay	0	1(1)	0	0	0	0	0	0	0	0	0	14
Republic of Moldova	0	1(1)	0	0	0	0	0	0	2	1	0	18
Rwanda	0	1(1)	0	0	0	0	0	0	0	1	0	0

States	Facilities under safeguards	Material balance areas containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
Saint Kitts and Nevis	0	1(1)	0	0	0	0	0	0	0	0	0	0
Senegal	0	1(1)	0	0	0	0	0	0	0	0	0	4
Serbia	1	2	2	2	1	0	4	8	52	3	3	26
Thailand	3	1	2	2	1	2	2	25.5	19	2	2	17
Togo	0	1(1)	0	0	0	0	0	0	0	0	0	0
Turkmenistan	0	1	0	0	0	0	0	0	0	1	1	49
Uganda	0	1(1)	1	1	0	0	2	5.5	0	0	0	14
United Arab Emirates	4	1	1	1	5	1	2	25	427	3	3	95
Vanuatu	0	1(1)	0	0	0	0	0	0	0	0	0	70
Total for 62 States	**43**	**57**	**40**	**466**	**138**	**45**	**1200**	**2117**	**6482**	**73**	**63**	**976**

(1) MBAs in States with SQPs based on the revised standard text.

Group 4: States with comprehensive safeguards agreements in force but without additional protocols in force

Table II.10 – Amount of nuclear material[39], in significant quantities, under Agency safeguards at the end of 2019

Unirradiated plutonium	Unirradiated high enriched uranium	Unirradiated uranium-233	Irradiated plutonium	Irradiated high enriched uranium	Irradiated uranium-233	Low enriched uranium	Natural uranium	Depleted uranium	Thorium	Total significant quantities
0	**6**	**0**	**3292**	**0**	**0**	**237**	**63**	**263**	**0**	**3861**

Note: Significant quantity figures rounded to the nearest integer.

Table II.11 – Summary of facility based verification activities by installation category in 2019

	Power reactors	Research reactors	Conversion plants	Fuel fabrication plants	Reprocessing plants	Enrichment plants	Separate storage facilities	Other facilities	Material balance areas containing LOFs	Total
Number of facilities and MBAs containing LOFs under safeguards	10	21	7	7	0	8	10	16	38	**117**
Number of facilities and LOFs inspected	5	14	5	7	0	8	4	14	11	**68**
Number of inspections	28	26	9	16	0	35	4	16	12	**146**
Number of design information verifications	9	17	7	8	0	12	7	16	6	**82**
Number of person-days of inspection	143	63	24	55	0	111	7	34	25	**462**

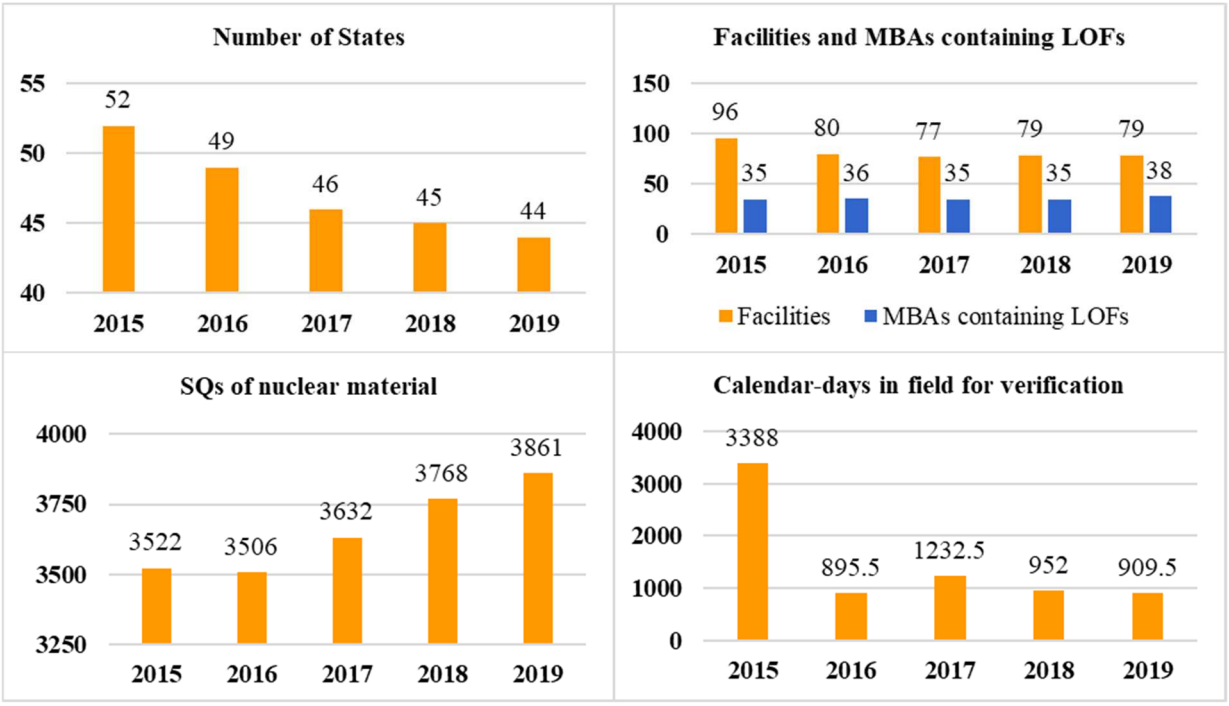


Figure II.4. Group 4: Number of States; number of facilities and MBAs containing LOFs under Agency safeguards; amount of nuclear material[39] in significant quantities under Agency safeguards; number of calendar-days in the field for verification utilized by the Agency, 2015-2019

Figure II.4 shows the number of States in Group 4, together with the number of facilities and MBAs containing LOFs, the amount of nuclear material[39] in significant quantities and the number of calendar-days in the field for verification utilized by the Agency in States in Group 4 from 2015 to 2019. As reported in Section E.1, the number of States in Group 4 has progressively decreased over the years. Since 2015, eight States that had a CSA in force without an AP have brought an AP into force[5], thus moving from Group 4 to Group 3. The most significant change for Group 4 has occurred in 2016 due to the implementation of the AP in one State with several facilities where a large number of calendar-days in the field for verification were utilized.

Table II.12 – Verification activities in 2019

States	Facilities under safeguards	MBAs containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received
Algeria	5	1	4	4	5	10	20	581	8	8
Argentina	34	17	29	53	36	198	364	1863	47	47
Bahamas	0	1(1)	0	0	0	0	0	0	0	0
Barbados	0	0	0	0	0	0	0	0	0	0
Belarus	5	3	1	12	2	34	80	546	3	3
Belize	0	0	0	0	0	0	0	0	0	0
Bhutan	0	0	0	0	0	0	0	0	0	0
Bolivia, Plurinational State of	0	0	0	0	0	0	0	0	0	0
Brazil	23	4	20	59	26	181	375	1273	28	29
Brunei Darussalam	0	0	0	0	0	0	0	0	0	0
Democratic People's Republic of Korea	0	0	0	0	0	0	0	0	0	0
Dominica	0	0	0	0	0	0	0	0	0	0
Egypt	9	1	7	11	10	23	32	890	7	7
Grenada	0	0	0	0	0	0	0	0	0	0
Guyana	0	0	0	0	0	0	0	0	0	0
Kiribati	0	0	0	0	0	0	0	0	0	0
Lao People's Democratic Republic	0	0	0	0	0	0	0	0	0	0
Lebanon	0	1(1)	1	1	0	4	8	0	0	0

States	Facilities under safeguards	MBAs containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received
Malaysia	1	1	1	1	1	2	7.5	0	2	2
Maldives	0	0	0	0	0	0	0	0	0	0
Myanmar	0	0	0	0	0	0	0	0	0	0
Nauru	0	0	0	0	0	0	0	0	0	0
Nepal	0	0	0	0	0	0	0	0	0	0
Oman	0	0	0	0	0	0	0	0	0	0
Papua New Guinea	0	1(1)	0	0	0	0	0	0	1	0
Qatar	0	1(1)	0	0	0	0	0	101	1	0
Saint Lucia	0	0	0	0	0	0	0	0	0	0
Saint Vincent and the Grenadines	0	0	0	0	0	0	0	0	0	0
Samoa	0	0	0	0	0	0	0	0	0	0
San Marino	0	1(1)	0	0	0	0	0	0	0	0
Saudi Arabia	0	0	0	0	0	0	0	0	0	0
Sierra Leone	0	0	0	0	0	0	0	0	0	0
Solomon Islands	0	0	0	0	0	0	0	0	0	0
Sri Lanka	0	1	1	1	0	2	5	2	1	1
Sudan	0	0	0	0	0	0	0	0	0	0
Suriname	0	0	0	0	0	0	0	0	0	0
Syrian Arab Republic	1	1	2	2	1	4	6	3	2	2

States	Facilities under safeguards	MBAs containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received
Tonga	0	1(1)	0	0	0	0	0	0	0	0
Trinidad and Tobago	0	0	0	0	0	0	0	0	0	0
Tunisia	0	1	0	0	0	0	0	0	0	0
Tuvalu	0	0	0	0	0	0	0	0	0	0
Venezuela, Bolivarian Republic of	1	1	2	2	1	4	12	68	3	3
Yemen	0	0	0	0	0	0	0	0	0	0
Zambia	0	0	0	0	0	0	0	0	0	0
Zimbabwe	0	1(1)	0	0	0	0	0	0	0	0
Total for 45 States	**79**	**38**	**68**	**146**	**82**	**462**	**909.5**	**5327**	**103**	**102**
Total for ABACC States	**57**	**21**	**49**	**112**	**62**	**379**	**739**	**3136**	**75**	**76**

(1) MBAs in States with SQPs based on the revised standard text.

Group 5: States with safeguards agreements based on INFCIRC/66/Rev.2 in force

Table II.13 – Amount of nuclear material[39], in significant quantities, under Agency safeguards at the end of 2019

Unirradiated plutonium	Unirradiated high enriched uranium	Unirradiated uranium-233	Irradiated plutonium	Irradiated high enriched uranium	Irradiated uranium-233	Low enriched uranium	Natural uranium	Depleted uranium	Thorium	Total significant quantities
5	**1**	**0**	**2587**	**1**	**0**	**358**	**1114**	**194**	**0**	**4260**

Note: Heavy water under safeguards: 429.5 tonnes. Significant quantity figures rounded to the nearest integer.

Table II.14 – Summary of facility based verification activities by installation category in 2019

	Power reactors	Research reactors	Conversion plants	Fuel fabrication plants	Reprocessing plants	Enrichment plants	Separate storage facilities	Other facilities	MBAs containing LOFs	Total
Number of facilities and MBAs containing LOFs under safeguards	17	3	0	2	0	0	2	0	1	**25**
Number of facilities and LOFs inspected	16	3	0	2	0	0	2	0	1	**24**
Number of inspections	71	3	0	8	0	0	10	0	1	**93**
Number of design information verifications	16	3	0	2	0	0	2	0	0	**23**
Number of person-days of inspection	375	6	0	59	0	0	34	0	2	**476**

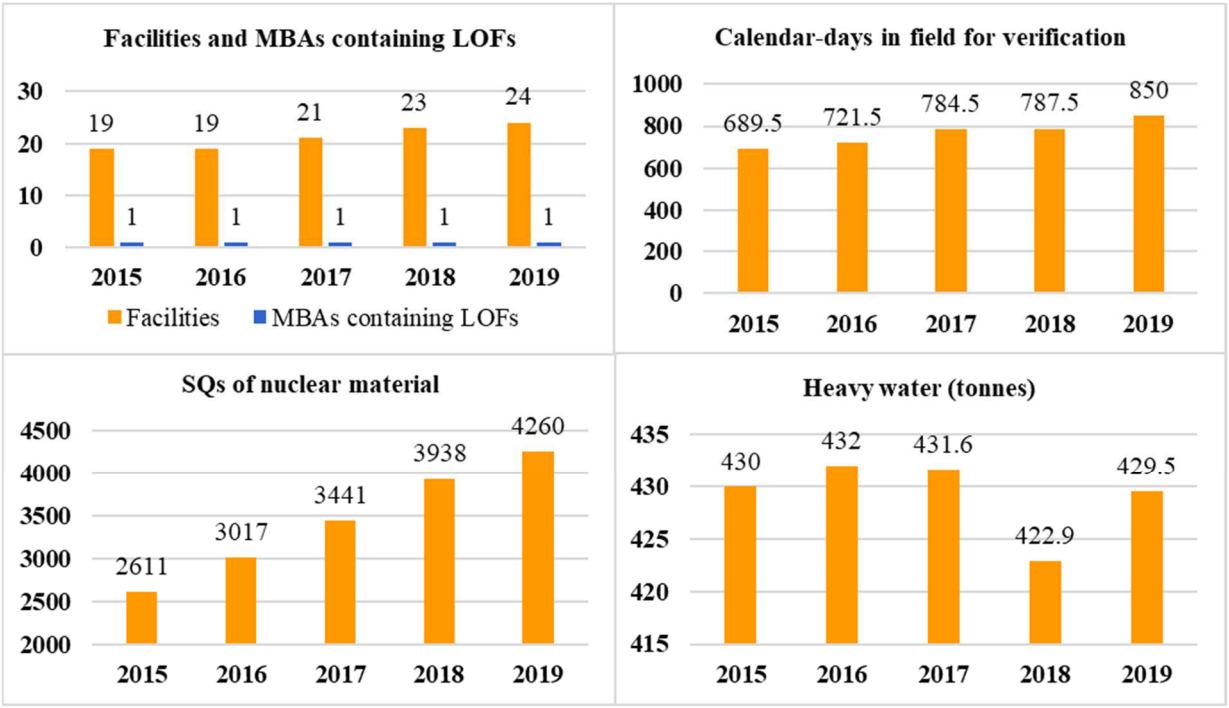


Figure II.5. Group 5: Number of facilities and MBAs containing LOFs under Agency safeguards; number of calendar-days in the field for verification utilized by the Agency; amount of nuclear material[39] in significant quantities under Agency safeguards; amount of heavy water, in tonnes, under Agency safeguards, 2015-2019

For the three States in Group 5, figure II.5 shows the number of facilities and MBAs containing LOFs; the number of calendar-days in the field for verification utilized by the Agency; the amount of nuclear material[39], in significant quantities, under Agency safeguards; and the amount of heavy water, in tonnes, under Agency safeguards, from 2015 to 2019. The verification effort in these States continued to increase in 2019. Compared to 2018, the Agency utilized an additional 8% of calendar-days in the field for verification, mainly at power reactors and fuel fabrications plants.

Table II.15 – Verification activities in 2019

States	Facilities under safeguards	MBAs containing LOFs under safeguards	Number of facilities and LOFs inspected	Total number of inspections	Number of design information verifications	Person-days of inspection	Calendar-days in the field for verification	Number of accounting reports received	Number of ICR reporting units received	Number of PIL reporting units received	Number of MBR reporting units received	Number of additional protocol declarations received
India	14	0	13	54	13	313	559	0	1882	15	15	6
Israel	1	1	2	2	1	4	8	0	34	2	3	0
Pakistan	9	0	9	37	9	159	283	64	0	0	0	0
Total for 3 States	**24**	**1**	**24**	**93**	**23**	**476**	**850**	**64**	**1916**	**17**	**18**	**6**

Group 6: States with both voluntary offer agreements and additional protocols in force

Table II.16 – Amount of nuclear material[39], in significant quantities, under Agency safeguards at the end of 2019

Unirradiated plutonium	Unirradiated high enriched uranium	Unirradiated uranium-233	Irradiated plutonium	Irradiated high enriched uranium	Irradiated uranium-233	Low enriched uranium	Natural uranium	Depleted uranium	Thorium	Total significant quantities
10 941	**0**	**0**	**20 273**	**0**	**0**	**1240**	**832**	**1896**	**0**	**35 182**

Note: Significant quantity figures rounded to the nearest integer.

Table II.17 – Summary of facility based verification activities by installation category in 2019

	Power reactors	Research reactors	Conversion plants	Fuel fabrication plants	Reprocessing plants	Enrichment plants	Separate storage facilities	Other facilities	MBAs containing LOFs	Total
Number of facilities and MBAs containing LOFs under safeguards	1	1	0	1	1	3	4	0	2(1)	**13**
Number of facilities and LOFs inspected	0	1	0	1	1	3	4	0	0	**10**
Number of inspections	0	1	0	1	1	50	26	0	0	**79**
Number of design information verifications	2	1	0	0	1	3	4	0	0	**11**
Number of person-days of inspection	0	2	0	1	12	288	89	0	0	**392**

(1) One MBA containing LOFs in the United States of America's Protocol I territories under the amended SQP to INFCIRC/366, and one MBA containing LOFs in the French Protocol I territories under the amended SQP to INFCIRC/718.

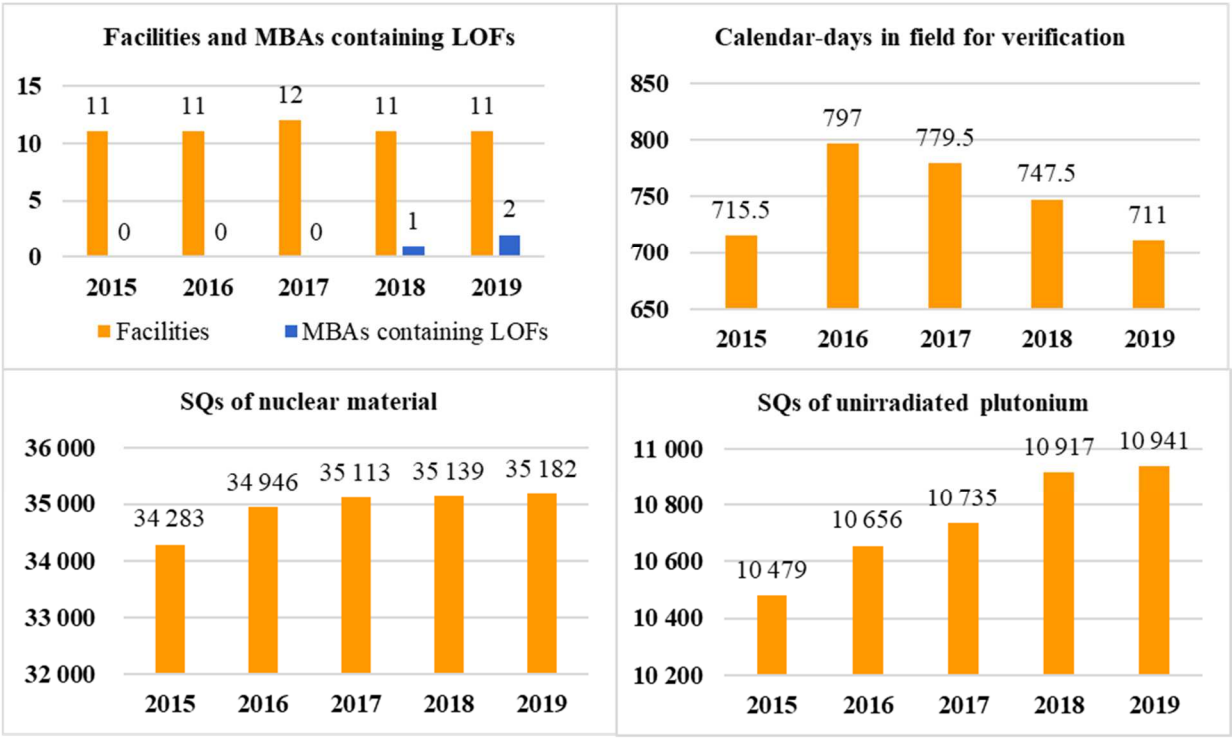


Figure II.6. Group 6: Number of facilities and MBAs containing LOFs under Agency safeguards; number of calendar-days in the field for verification utilized by the Agency; amount of nuclear material[39] in significant quantities under Agency safeguards; amount of unirradiated plutonium in significant quantities under Agency safeguards, 2015-2019

For the five States in Group 6, figure II.6 shows the number of selected facilities and MBAs containing LOFs; the number of calendar-days in the field for verification utilized by the Agency; the amount of nuclear material[39], in significant quantities, under Agency safeguards; and the amount of unirradiated plutonium, in significant quantities, under Agency safeguards, from 2015 to 2019. Since 2015, the number of facilities or parts thereof selected for the application of safeguards in these States has remained relatively constant. The steady growth of nuclear material under Agency safeguards in these States seems to have slowed down in recent years, resulting in an overall increase in significant quantities of approximately 3% since 2015. During this period, the verification effort in the field has fluctuated around an average of 750 CDFVs with a small variance.

Table II.18 – Verification activities in 2019

States	Number of eligible facilities	Number of facilities or parts thereof selected for inspection	Number of facilities inspected	Total number of inspections	Number of design information verifications	Number of complementary accesses	Person-days of inspection	Calendar-days in the field for verification	Numbers of ICR reporting units received	Numbers of PIL reporting units received	Numbers of MBR reporting units received	Number of additional protocol declarations received
China	26	3	2	8	4	0	67	172	1205	3	3	11
France	17	3	3	23	2	0	110	185	72 143	39(1)	38	19
Russian Federation	23	1	1	1	1	0	4	12	0	2	2	9
United Kingdom of Great Britain and Northern Ireland	61	3	3	43	3	0	200	318.5	243 158	73	72	12
United States of America	273	1	1	4	1	0	11	23.5	35 394(2)	12(3)	11	26
Total for 5 States	**400**	**11**	**10**	**79**	**11**	**0**	**392**	**711**	**351 900**	**129**	**126**	**77**

(1) Includes the initial inventory report for the French Protocol I territories received under the safeguards agreement reproduced in INFCIRC/718 which has an amended SQP.
(2) Includes 207 reporting units for the United States of America's Protocol I territories received under the safeguards agreement reproduced in INFCIRC/366 which has an amended SQP.
(3) Includes the updated inventory report for the United States of America's Protocol I territories received under the safeguards agreement reproduced in INFCIRC/366 which has an amended SQP.

IAEA
International Atomic Energy Agency
Atoms for Peace and Development