

# NUCLEAR VERIFICATION



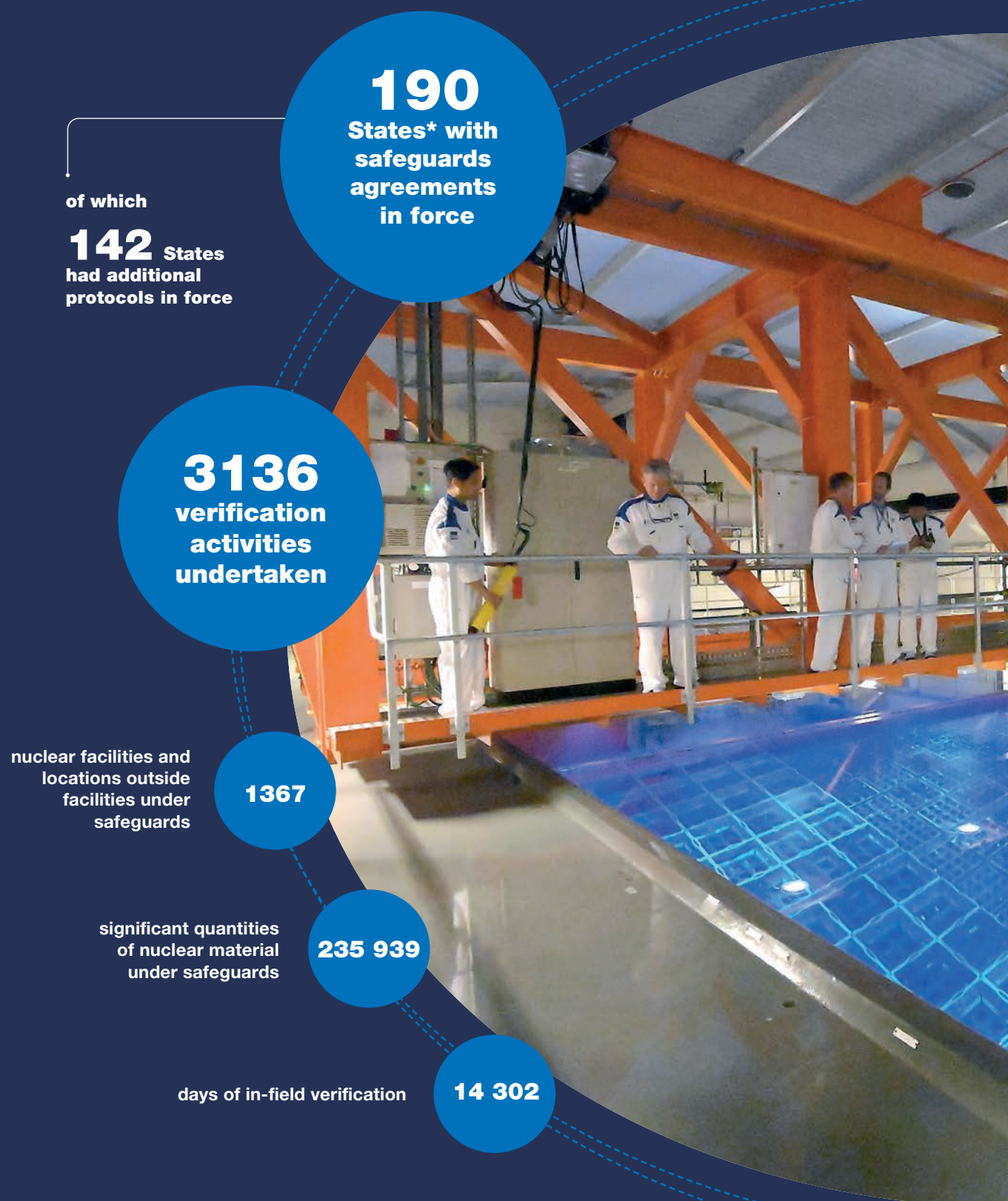


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By implementing safeguards in 189 States during 2023, the IAEA continued to provide the world with assurances that nuclear material and technology remained in peaceful use.

**Massimo Aparo**  
Deputy Director General  
and Head of the Department of Safeguards

# Nuclear Verification



\*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.



## Conclusions\*\*

74

### States

all nuclear material remained in peaceful activities

107

### States

declared nuclear material remained in peaceful activities

3

### States

nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities

5

### States

nuclear material in selected facilities to which safeguards had been applied remained in peaceful activities

\*\* 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.



## NUCLEAR VERIFICATION<sup>1,2</sup>

### OBJECTIVE

To deter the proliferation of nuclear weapons by detecting early the misuse of nuclear material or technology and by providing credible assurances that States are honouring their safeguards obligations, and, in accordance with the Agency's Statute, assist with other verification tasks, including in connection with nuclear disarmament or arms control agreements, as requested by States and approved by the Board of Governors.

<sup>1</sup> The designations employed and the presentation of material in this section, 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.

<sup>2</sup> The referenced number of State Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) is based on the number of instruments of ratification, accession or succession that have been deposited.



**26 000**

seals  
verified



**600**

environmental  
samples and

**565**

nuclear material  
samples collected



**1376**

surveillance  
cameras  
maintained at  
nuclear facilities



**1768**

commercial  
satellite images  
acquired

## KEY OUTPUTS

### Implementation of Safeguards in 2023

Over the course of 2023, the Agency carried out 3136 verification activities (2975 in 2022) and spent 14 302 days in the field conducting those activities (14 066 in 2022). This ensured that the Agency was able to draw soundly based conclusions for all States for which safeguards were implemented by the Agency for 2023.

At the end of 2023, the Agency drew a safeguards conclusion for each State for which safeguards were applied. This conclusion was based on an evaluation of all safeguards relevant information available to the Agency in exercising its rights and fulfilling its safeguards obligations for the year.

In 2023, safeguards were applied for 189 States<sup>3,4</sup> with safeguards agreements in force with the Agency. Of the 136 States that had both a comprehensive safeguards agreement (CSA) and an additional protocol (AP) in force, the Agency drew the broader conclusion that *all* nuclear material remained in peaceful activities for 74 States<sup>5</sup>; for the remaining 62 States, as the necessary evaluation regarding the absence of undeclared nuclear material and activities for each of these States remained ongoing, the Agency concluded only that *declared* nuclear material remained in peaceful activities. Similarly, for the 45 States with a CSA but with no AP in force, the Agency concluded only that *declared* nuclear material remained in peaceful activities.

For States with a CSA in force with an operative small quantities protocol (SQP) based on the original standard text, the Agency will no longer be able to continue to draw a safeguards conclusion for such States unless the States concerned respond positively to the repeated calls by the Director General to amend or rescind such SQPs.

Safeguards were also implemented with regard to nuclear material in selected facilities in the five nuclear-weapon States Parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) under their respective voluntary offer agreements. For these five States, the Agency concluded that nuclear material in the selected facilities to which safeguards had been applied remained in peaceful activities or had been withdrawn from safeguards as provided for in the agreements.

For three States not party to the NPT, the Agency implemented safeguards pursuant to item-specific safeguards agreements based on INFCIRC/66/Rev.2. For these States, the Agency concluded that nuclear material, facilities or other items to which safeguards had been applied remained in peaceful activities.

<sup>3</sup> 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.

<sup>4</sup> And Taiwan, China.

<sup>5</sup> And Taiwan, China.

As of 31 December 2023, four States Parties to the NPT had yet to bring CSAs into force pursuant to Article III of the Treaty. For these States Parties, the Agency could not draw any safeguards conclusions.

### **Conclusion of safeguards agreements and APs, and amendment and rescission of small quantities protocols**

The Agency continued to facilitate the conclusion of safeguards agreements and APs, and the amendment or rescission of SQPs through implementation of the *Plan of Action to Promote the Conclusion of Safeguards*

*Agreements and Additional Protocols*, which was updated in September 2023. During 2023, a CSA with an SQP and an AP entered into force for Sao Tome and Principe. An AP entered into force for the Plurinational State of Bolivia. An SQP was amended for Nauru.

The status of safeguards agreements and APs as of 31 December 2023 is shown in Table A6 in the Annex to this report. At the end of 2023, 100 States with CSAs in force had operative SQPs, of which 79 SQPs were based on the revised standard text. Eleven States had rescinded their SQPs.



**The Director General signs Sao Tome and Principe's CSA, SQP and AP on 31 March 2023, at which point these instruments entered into force.**



## **Naval Nuclear Propulsion**

The use of nuclear material subject to safeguards under a CSA by a State in a nuclear activity such as naval nuclear propulsion is foreseen by the CSA. Australia and Brazil have informed the Agency of their plans related to the use of nuclear material — subject to safeguards under their respective CSAs — for naval nuclear propulsion. The use of nuclear material in such an activity requires arrangements under their respective safeguards agreements and the development of

appropriate safeguards approaches. Hence, during 2023, the Secretariat continued to engage in consultations with the States concerned to consider the possible implications for the application of Agency safeguards. The Director General submitted two reports to the Board of Governors on naval nuclear propulsion in 2023, one for Australia and the other for Brazil.

**The Deputy Director General and Head of the Department of Safeguards with staff of the Office for Verification in Iran.**



## Islamic Republic of Iran

Since February 2021, Iran has not been implementing any of its nuclear-related commitments under the Joint Comprehensive Plan of Action (JCPOA), including implementation of the AP. This has seriously affected the Agency's JCPOA-related verification and monitoring. During 2023, the Director General submitted to the Board of Governors, and in parallel to the UN Security Council, four quarterly reports and two update reports, entitled *Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015)*.

By the end of 2023, outstanding safeguards issues related to the presence of uranium particles of anthropogenic origin at two undeclared locations in Iran remained unresolved. Unless and until Iran clarifies these issues, the Agency will not be able to provide assurance about the exclusively peaceful nature of Iran's nuclear programme. The Director General submitted to the Board of Governors four quarterly reports and one update report, entitled *NPT Safeguards Agreement with the Islamic Republic of Iran*.

## Syrian Arab Republic

In August 2023, the Director General submitted a report to the Board of Governors entitled *Implementation of the NPT Safeguards Agreement in the Syrian Arab Republic*. The 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.<sup>6</sup>

## Democratic People's Republic of Korea

In August 2023, the Director General submitted a report to the Board of Governors and the General Conference entitled *Application of Safeguards in the Democratic People's Republic of Korea*. In 2023, no verification activities were implemented in the field, but the Agency continued to monitor developments in the nuclear programme of the DPRK and to evaluate all safeguards relevant information available to it. The

Agency did not have access to the Yongbyon site or to other locations in the DPRK. Without such access, the Agency cannot confirm the operational status or configuration/design features of the facilities or locations, or the nature and purpose of the activities conducted therein. The continuation of the DPRK's nuclear programme, a clear violation of relevant UN Security Council resolutions, is deeply regrettable.

<sup>6</sup> The Board of Governors, in its resolution GOV/2011/41 of June 2011 (adopted by a vote), had, inter alia, found that Syria's undeclared construction of a nuclear reactor at Dair Alzour and failure to provide design information for the facility constituted non-compliance by Syria with its obligations under its NPT Safeguards Agreement with the Agency in the context of Article XII.C of the Agency's Statute and called upon Syria to remedy urgently its non-compliance and resolve all outstanding questions so that the Agency could provide the necessary assurances as to the exclusively peaceful nature of Syria's nuclear programme.

## Enhancing Safeguards

### State-level safeguards implementation

The Agency concluded its project aimed at improving the development and implementation of State-level safeguards approaches (SLAs). This resulted in standardization of the assessment of State nuclear fuel cycle capabilities, standardized technical objectives, and the introduction of technical objective performance targets. IT tools were enhanced and extensive internal guidance documentation was prepared to ensure consistent application. During the year, SLAs for 14 States<sup>7</sup> with the broader conclusion were updated or developed applying the improved methodology.

### Cooperation with State and regional authorities

In 2023, the Agency conducted over 25 training events for personnel responsible for overseeing and implementing State systems of accounting for and control of nuclear material (SSACs) and regional systems of accounting for and control of nuclear material (RSAC). These events were a combination of in-person and virtual training courses, as well as scientific visits. In total, more than 400 experts from 80 States were trained on safeguards-related topics. This work was carried out with the support of Australia, Japan, the Republic of Korea, the United States of America and the European Commission. The Agency also worked with partners and regional networks, including the Japanese Atomic Energy Agency's Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN), the US Department of Energy's International Nuclear Safeguards and Engagement Program (INSEP), the Asia-Pacific Safeguards Network (APSN) and the African Commission on Nuclear Energy (AFCONE).

The Agency updated the safeguards e-learning website on the Cyber Learning Platform for Network Education and Training ([elearning.iaea.org](https://elearning.iaea.org)), which was visited by

more than 3000 new users over the course of the year. In total, more than 8000 representatives from over 110 States were registered on the safeguards e-learning site by 31 December 2023.

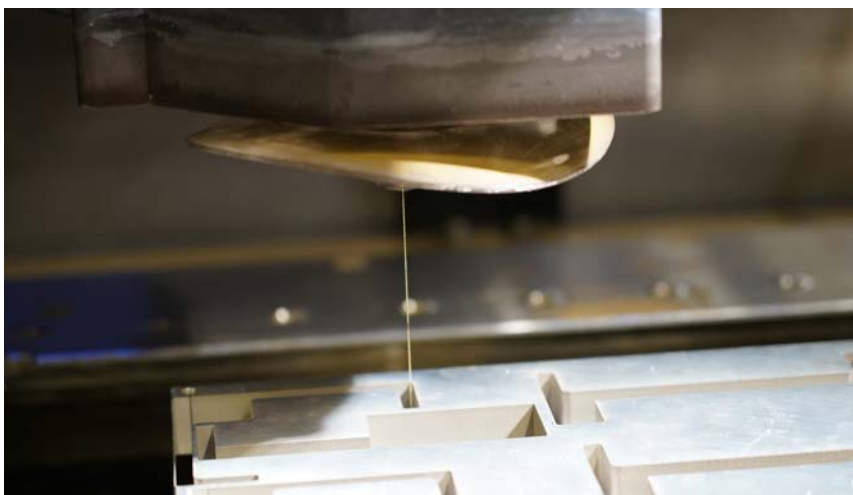
The Agency continued its series of interactive webinars aimed at enhancing national authorities' understanding of their Agency safeguards obligations, and supporting effective and efficient safeguards implementation. Four webinars were held, covering topics such as strengthening SSACs, assistance to States, design information and nuclear material accountancy. With an average of 135 participants for each session, a total of over 750 individuals representing over 100 States participated.

### Safeguards equipment and tools

By the end of the year, the Agency had 757 surveillance systems with 1376 (1414) cameras operating or ready to use at 232 (238) facilities in 35 (35) States<sup>8</sup>. The Agency also supports and jointly uses 406 surveillance cameras which are owned by State or regional authorities. The transition to the latest generation of surveillance systems (based on DCM-C5/-A1 camera modules) was almost complete by the end of 2023.

In 2023, the next generation Cherenkov viewing device was used routinely at facilities with large inventories of low burnup and/or long-cooling-time spent fuel assemblies. The robotized Cherenkov viewing device was successfully tested thanks to Member State Support Programme support and was used for safeguards verification in one Member State.

▶  
**A Mitsubishi MP1200 Connect wire electrical discharge machine (EDM), used to create the unique identification and authentication features for the new field-verifiable passive seal (FVPS).**



<sup>7</sup> And Taiwan, China.  
<sup>8</sup> And Taiwan, China.

The Agency started to replace traditional E-CAP metal seals with field verifiable passive seals, which can be verified on site more quickly and simply, thus reducing the need to repatriate seals to Agency Headquarters for verification. A new high resolution cadmium zinc telluride detector was validated by Agency technical experts and authorized for verification activities. Its integration into various non-destructive assay systems will support the replacement of previous generation non-destructive assay equipment. Authorization for the laser curtain for containment, which uses lasers to detect possible intrusion in a safeguarded area in a nuclear facility, was extended to all facilities worldwide.

## Safeguards analytical services and methodologies

As of December 2023, the Agency's Network of Analytical Laboratories (NWAL) consisted of the Agency's Safeguards Analytical Laboratories and 25 other qualified laboratories in various Member States. During the year, four additional laboratories for various forms of sample analysis were in the process of qualification.

In 2023, the Agency collected 565 nuclear material samples for nuclear material accountancy and 140 nuclear material samples for material characterization. The large majority of these were analysed by the Agency's Nuclear Material Laboratory. In addition, two heavy water samples were collected for analysis by the NWAL. The Agency also collected 600 environmental samples, resulting in the analysis of 1158 subsamples.

## Developing the Safeguards Workforce

In 2023, the Agency conducted 63 distinct safeguards staff training courses (as some were held more than once, a total of 116 offerings were provided overall, of which 27 were held outside Vienna), helping to provide safeguards inspectors, analysts and support staff with the necessary core and functional competencies. The Introductory Course on Agency Safeguards for Agency inspectors was held for 15 inspectors.

The Safeguards Traineeship Programme for young graduates and junior professionals commenced in February 2023, involving eight participants with a 50/50 female/male ratio from Bangladesh, Georgia, Lesotho, Madagascar, Sierra Leone, the Sudan, Viet Nam and Zambia. Since 1983, the Agency has trained 183 safeguards trainees from 73 States.

## Partnerships

The Agency forged new partnerships in support of Agency safeguards during the course of the year. In 2023, it established two new Member State Support Programmes (MSSPs), with Norway and the United Arab Emirates, bringing

the total number of MSSPs to 24. To further broaden the support base for Agency safeguards, it also signed Practical Arrangements with the Vienna Center for Disarmament and Non-Proliferation.

**Agency inspectors undergoing training at IAEA Headquarters.**

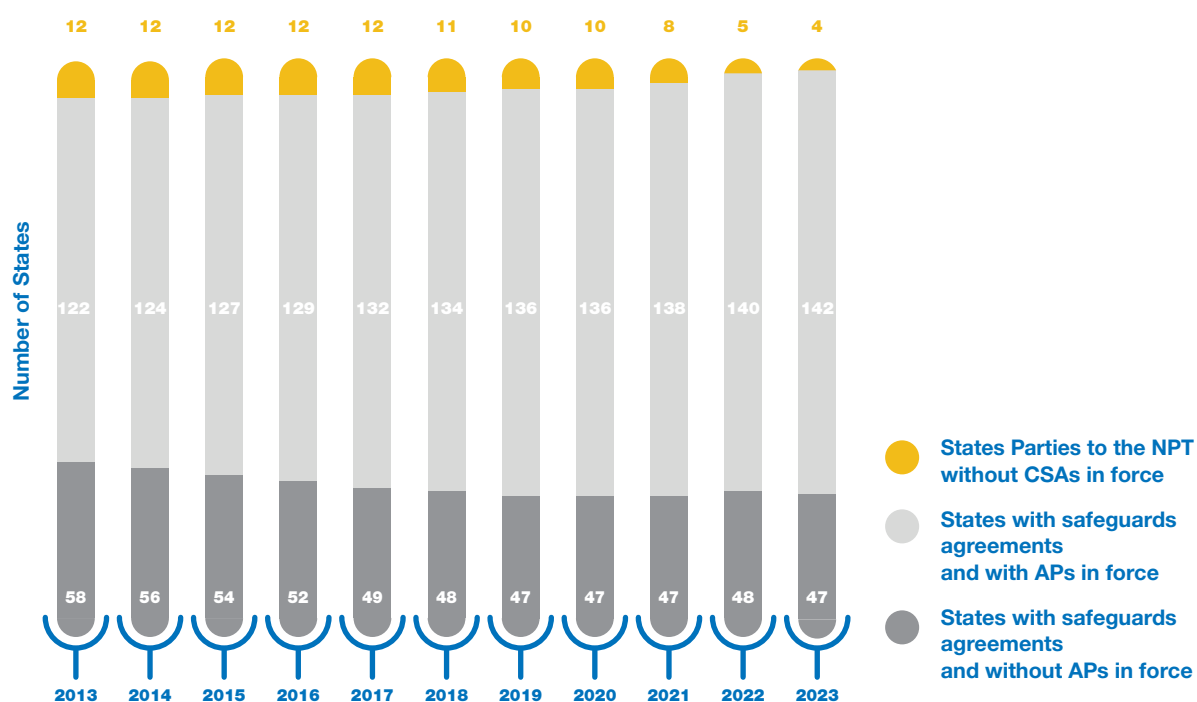




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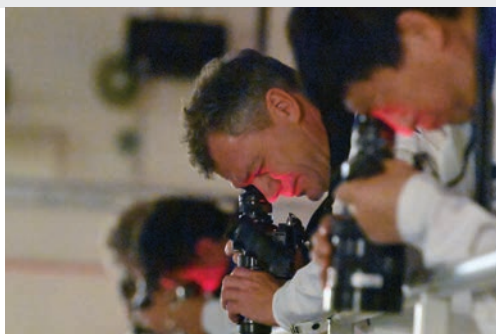
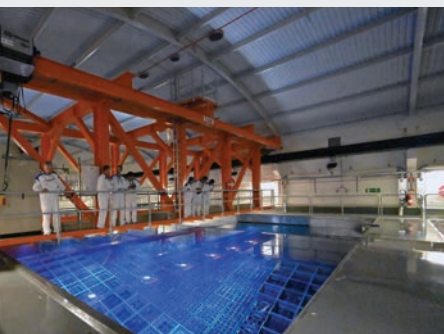
### States with safeguards agreements and APs in force, 2013–2023

(the Democratic People's Republic of Korea is not included)



### Number of States with SQPs, 2013–2023





## Status of Agency safeguards in 2023

(the Democratic People's Republic of Korea is not included)

