Strål
säkerhets
myndigheten
Swedish Radiation Safety Authority

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Research

2018:23

Evaluation of the Impact of the Model Additional Protocol on Non-Nuclear-Weapon States with Comprehensive Safeguards Agreements

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SSM perspective

Background

The Swedish Radiation Safety Authority (SSM) called for research proposals related to Non-Proliferation. This call resulted in SSM accepting a proposal from the Vienna Center for Disarmament and Non-Proliferation (VCDNP) to evaluate the impact of the implementation of Additional Protocols (AP).

The Additional Protocol, which was approved by the International Atomic Energy Agency's (IAEA) Board of Governors in 1997, has since been implemented by a growing number of states and the IAEA. By December 2017, there were 127 states where such APs were implemented. SSM, and thereby Sweden, have long been proponents of the AP. At an early phase, Sweden was engaged in the evolution of the AP, and volunteered to test some of the measures relating to the AP, as part of the 'Programme 93+2'. Sweden signed the AP in 1998 and ratified it in 2000, although it was not implemented until April 2004, when all EU Member States and the European Commission had ratified it.

In the interests of states that already are signatories to the AP, and especially on the part of states considering signing and ratifying the AP, SSM assesses that there is a high level of interest in an analysis of the impact on states that have implemented the AP.

Results

The report describes the experiences of states when implementing the AP. The information is predominantly based on the responses of states submitted as part of an outreach query conducted by the VCDNP. The query was directed at a number of states divided into three categories, relating to the extent of the fuel cycle in that state.

Objectives

The report can serve as an instrument that illustrates how the AP will affect safeguards implementation for a signatory state, thereby facilitating awareness of required resources. Ultimately, the aim is that this will promote an increased number of signatories, resulting in strengthened nuclear safeguards worldwide.

Need for further research

There is always room for improvement, and although the AP has not yet been implemented by all states, more than 20 years of implementation experience has been gained, and new technologies have been developed. There is a continual interest in further strengthening of international nuclear safeguards or, as a minimum, ensuring that available measures and their implementation are sufficient effective, and efficient when verifying declarations.

The VCDNP will continue to conduct the research project by assessing not only possible options for further strengthening of safeguards, but also the feasibility of achieving such strengthening measures. SSM attaches great importance to the latter.

Project information
Contact person at SSM: Joakim Dahlberg
Reference: SSM2017-2253 / 7030193-00

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This report concerns a study which has been conducted for the Swedish Radiation Safety Authority, SSM. The conclusions and viewpoints presented in the report are those of the author/authors and do not necessarily coincide with those of the SSM.

The VCDNP would like to express its appreciation to the participating States and to EURATOM for their willingness to engage in this project, and to the many individuals who dedicated the time and effort necessary to respond to the survey. The VCDNP would also like to thank the Swedish Radiation Safety Authority for funding this project.

Content

Sammanfattning

I maj 1997 godkände styrelsen för det Internationella atomenergiorganet (IAEA) *Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards (Model Protocol)*, INFCIRC/540 (Corr.). Modellprotokollet används som grund för tilläggsprotokoll (AP) som icke-kärnvapenstater tecknar i tillägg till kärnämneskontrollavtalet (CSA). Syftet med modellprotokollet är att effektivisera och förbättra systemet inom kärnämneskontrollen som ett bidrag till de globala målen inom nukleär icke-spridning.

IAEA har stöttat staters implementation av tilläggsprotokollet under 20 år. Den 31 december 2017 hade tilläggsprotokollet implementerats i 127 stater. Med ekonomiskt stöd från Strålsäkerhetsmyndigheten (SSM) har Vienna Center for Disarmament and Non-Proliferation (VCDNP) genomfört ett projekt för att utvärdera inverkan av genomförandet av tilläggsprotokollet för de stater där de implementerats.

Projektet omfattade en enkätundersökning till en målgrupp på 20 stater, som var och en hade ingått både ett kärnämneskontrollavtal och ett tilläggsprotokoll med IAEA, av vilka några också hade ingått ett protokoll för små kvantiteter (SQP). Målgruppen inkluderade stater från varje geografisk region, med olika omfattning på sina kärntekniska aktiviteter: från stater med en omfattande kärnbränslecykel till stater med liten eller ingen kärnteknisk verksamhet. EURATOM deltog också i undersökningen.

Undersökningen fokuserade på nio specifika sakområden: tilläggsprotokollens inverkan på den statliga eller den regionala myndighet som ansvarar för implementeringen; lagstiftnings- och förordningsregelverket; assistans från IAEA eller andra parter vid förberedelser eller implementering av tilläggsprotokollet; utbildning för myndigheter och operatörer; utmaningar vid förberedelser och implementering av tilläggsprotokollet; tilläggsprotokollets inverkan, den *bredare slutsatsens* och *integrerad kärnämneskontrolls* påverkan på frekvens och intensitet av IAEA:s besök utbildning och samverkan med akademier och forskningsinstitutioner; fördelar som härrör från slutsatser dragna med hjälp av tilläggsprotokoll; och dessutom dragna lärdomar.

Rapporten innehåller en övergripande analys av de insamlade svaren samt en mer detaljerad analys som utforskar den påverkan som rapporterats utifrån omfattning och typ av respektive staters kärntekniska verksamhet. För den detaljerade analysen indelades staterna i en av tre kategorier:

Kategori 1: stater med omfattande kärnbränslecykler;

Kategori 2: stater med forskningsreaktor (varav vissa har antingen konverteringsanläggningar eller bränslefabriker), men inga operativa kraftreaktorer; och

Kategori 3: stater som för närvarande har liten eller ingen operativ kärnteknisk verksamhet

Trots spridningen i svaren från projektdeltagarna kan ett antal allmänna slutsatser dras. Implementeringen av tilläggsprotokollen var inte problemfri, detta oavsett omfattningen av de kärntekniska aktiviteterna. Alla deltagare identifierade ett antal utmaningar och extra arbete, detta särskilt i början av implementeringen. Utmaningarna inkluderade: ändring av lagstiftning och förordningar; behov av ytterligare ekonomiska och personella resurser till andra parter än myndigheter och i mindre utsträckning också av myndigheter, samt behovet av utbildning eller uppsökande verksamhet för myndigheter, anläggningsoperatörer och forskningsinstitut. Enligt svar från nästan alla projektdeltagare kvarstod ansvaret hos den myndigheten som även före tilläggsprotokollens införande ansvarat för genomförandet av

kärnämneskontroll (förutom vad gäller delningen av förpliktelserna mellan EURATOM och EU:s icke-kärnvapenstater).

Det finns dock resurser som kan minska de utmaningar som uppstår genom implementeringen. Dessa resurser omfattar inte bara IAEA:s och Euratoms utbildningskurser och IAEA:s kärnämneskontrollrådgivning, utan också stöd och bistånd från andra stater samt organisationer som *European Safeguards Research and Development Association* (ESARDA) och *Institute of Nuclear Materials Management* (INMM). Enligt projektdeltagarna övervägde fördelarna med AP-genomförandet utmaningarna. Genomförandet av tilläggsprotokollet ledde, enligt vad som rapporterats av nästan samtliga deltagare, till en minskning av frekvensen av IAEA-inspektioner och andra besök (även om frekvensen och antalet besök varierade beroende på de berörda staternas nukleära aktiviteter).

Genomförandet av tilläggsprotokollet har också lett till indirekta fördelar för deltagarna, till exempel bättre övervakning av kärnämne och relaterad verksamhet, bättre export- och importkontroll och förbättrat inomstatligt samarbete. Det bidrog också till att stärka det rättsliga ramverket för kärnsäkerhet, fysisk säkerhet, kärnämneskontroll och beredskap, förbättrat samarbete med IAEA och ökat förtroende från det internationella samfundet i staternas exklusivt fredliga karaktär gällande de respektive kärnprogrammen. Euratom noterade för sin del att informationen som förvärvats genom tilläggsprotokollet möjliggör en bredare kunskap om de nukleära programmen vilket i sin tur möjliggör en strategisk planering av kärnämneskontrollen. Vad gäller lärdomar menade många deltagare (oavsett kategoritillhörighet) att arbeta med IAEA på ett öppet, proaktivt och kooperativt sätt erbjöd maximal nytta för den berörda staten. Deltagarna betonade också vikten av att arbeta för ökad medvetenhet och med utbildning av berörda parter såväl som med kontinuerlig uppföljning och samråd med IAEA, särskilt i början av processen.

Ett gemensamt tema i deltagarnas svar, oavsett omfattning av deras nukleära verksamhet, var att tilläggsprotokollet var oumbärligt för ett transparent kärntekniskt program, vilket i sin tur ledde till ökat förtroende från det internationella samfundet om statens fredliga intentioner gällande sitt kärnämnesprogram och även ledde till ett förstärkt samarbete på kärnenergiområdet.

Summary

In May 1997, the Board of Governors of the International Atomic Energy Agency (IAEA) approved the text of *Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards (Model Protocol)*, reproduced in INFCIRC/540 (Corr.). As described in the Foreword to the Model Protocol, the purpose of protocols concluded on the basis of the Model Protocol — hereinafter referred to as "additional protocols" or "APs" — is "to strengthen the effectiveness and improve the efficiency of the safeguards system as a contribution to global nuclear non-proliferation objectives."

The IAEA has been implementing APs to CSAs in non-nuclear-weapon States (NNWSs) for 20 years. As of 31 December 2017, there were 127 States in which such APs were being implemented. With the financial support of the Swedish Radiation Safety Authority (SSM), the Vienna Center for Disarmament and Non-Proliferation (VCDNP) carried out a project to evaluate the impact of the implementation of such APs from the point of view of the States in which APs have been implemented.

The project involved a survey of a target group of 20 States, each of which had concluded with the IAEA both a CSA and an AP, some of which had also concluded a small quantities protocol to the CSA. The group included States selected from each geographic region, with a range of nuclear activities: from States with extensive nuclear fuel cycle activities to those with little or no nuclear activity. EURATOM also agreed to participate in the survey.

The survey focused on nine specific areas of inquiry: the impact of the AP on the State or regional authority responsible for the implementation of safeguards (SRA); the legislative and regulatory framework; assistance provided by the IAEA or other parties in the preparation or implementation of the AP; training for SRAs and operators; challenges in preparing for and implementing the AP; the impact of the AP, the broader conclusion and integrated safeguards on the frequency and intensity of IAEA access; training and outreach to academic and research institutions; benefits derived from the conclusion and implementation of the AP; and finally, lessons learned.

The report includes an overall analysis of the collective responses, as well as a more detailed analysis exploring the reported impacts as a function of the scope and scale of the States' respective nuclear activities. For purposes of the detailed analysis, the States were identified as falling into one of three categories:

Category 1: Those States with extensive nuclear fuel cycles;

Category 2: Those States that have a research reactor (some of which also have either conversion or fuel fabrication facilities), but no operational power reactors; and

Category 3: Those States that currently have little or no operational nuclear activity.

Despite the broad range of responses provided by the project participants, a number of general conclusions can be drawn.

Implementation of the AP was not all plain sailing, as each of the participants, regardless of the scale of nuclear activities, identified a number of challenges and the need for extra work, in particular in the early stages of implementing the AP. The challenges included modification of legislation and regulations; the need for additional financial and human resources by parties other than the SRA and, to a lesser extent, by the SRA; and the need

for training or outreach activities for the SRA, facility operators and research institutions. For virtually all project participants, the only aspect that remained largely unaffected by the AP was the authority responsible for the implementation of safeguards (except as regards the sharing of obligations as between EURATOM and the EU NNWSs).

However, there are resources available that can minimize the challenges posed by its implementation. These resources include not only IAEA and EURATOM training courses and IAEA safeguards advisory missions, but support and assistance provided by other States as well as professional associations such as the European Safeguards Research and Development Association (ESARDA) and the Institute of Nuclear Materials Management (INMM).

According to the project participants, the benefits of AP implementation outweighed the challenges. Implementation of the AP led to a reduction in the frequency and numbers of IAEA safeguards missions reported by almost all of the States and by EURATOM (although that frequency and number fluctuated depending on the nuclear activities of the States concerned).

The implementation of the AP also resulted in collateral benefits, such as better oversight of nuclear material and related activities, better export and import controls and improved cooperation between State entities. It also contributed to a strengthening of the legal and regulatory framework for safety, security, safeguards, and emergency preparedness, improved cooperation with the IAEA and increased confidence of the international community in the exclusively peaceful nature of their respective nuclear programmes. For its part, EURATOM noted that the information acquired through the AP "allows a wider knowledge of the nuclear programmes and, as such, enables a strategic planning of safeguards activities." In terms of lessons learned, the most often cited by States, regardless of the category, was that working with the IAEA in a transparent, proactive and cooperative manner offered the maximum benefit to the State concerned. The participants also emphasized the importance of investing in increased awareness and training of the parties involved, as well as continuous follow-up and consultation with the IAEA, particularly at the beginning of the process.

A common theme in the responses of the participants, again regardless of the scope and scale of nuclear activities, was the indispensability of an AP for a transparent nuclear programme, which in turn led to increased confidence on the part of the international community in the peaceful nature of States' nuclear programmes and strengthened cooperation in the nuclear field.

Chapter I: Introduction

In May 1997, the Board of Governors of the International Atomic Energy Agency (IAEA) approved the text of *Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards (Model Protocol)*, reproduced in INFCIRC/540 (Corr.).[1] As described in the Foreword to the Model Protocol, the purpose of protocols concluded on the basis of the Model Protocol — hereinafter referred to as "additional protocols" or "APs" — is "to strengthen the effectiveness and improve the efficiency of the safeguards system as a contribution to global nuclear non-proliferation objectives."

As the title of INFCIRC/540 (Corr.) indicates, protocols concluded on the basis of the Model Protocol are intended to be concluded in connection with safeguards agreements, not as stand-alone instruments. In approving the text, the Board requested the Director General to use of the Model Protocol as the standard for APs that are concluded by States and other parties to comprehensive safeguards agreements (CSAs) with the IAEA, and that such protocols must contain all measures of the Model Protocol. Thus, a State wishing to conclude an AP to a CSA may not select just some but must accept all of them.[2]

As is reiterated in the annual Safeguards Implementation Reports published by the IAEA each spring, "[a]lthough 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 … 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."[3]

The IAEA has been implementing APs to CSAs in non-nuclear-weapon States (NNWSs) for 20 years. As of 31 December 2017, there were 127 States in which such APs were being implemented.[4] An analysis of the impact of the implementation of such APs, from the point of view of the States in which they have been implemented, was thought to be timely.

With the financial support of the Swedish Radiation Safety Authority (SSM), the Vienna Center for Disarmament and Non-Proliferation (VCDNP) implemented a project involving a survey of twenty NNWSs, and EURATOM, with a view to contributing to a more complete understanding of that impact. This report presents the results of that project.

[1] *Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards*, IAEA document INFCIRC/540 (Corr.), 1997.
[2] The Board also requested the Director General to negotiate APs or other legally binding agreements with nuclear-weapon States (NWSs) incorporating those measures that each NWS identifies as "capable of contributing to the non-proliferation and efficiency aims of the Model Protocol, when implemented with regard to that State, and as consistent with that State's obligations under Article I of the [Treaty on the Non-Proliferation of Nuclear Weapons]." The Board further requested the Director General to negotiate APs "with other States that are prepared to accept measures provided for in the Model Protocol in pursuance of safeguards effectiveness and efficiency objectives." IAEA document INFCIRC/540 (Corr.), Foreword.
[3] See, e.g. *Safeguards Implementation Report for 2016*, Background to the Safeguards Statement and Summary, para. 7, available at https://www.iaea.org/sites/default/files/statement_sir_2016.pdf .
[4] APs were also being implemented in six other States. As of June 2018, an additional five States with CSAs had concluded APs.

Chapter II: Project description

1. Project process

An initial target group of non-nuclear-weapon States, each of which had concluded both a CSA and an AP with the IAEA, was identified by the VCDNP. The target group included States that had also concluded small quantities protocols (SQPs).[5] It also included States selected from each geographic region with a range of nuclear activities: from States with extensive nuclear fuel cycle activities to those with little or no nuclear activity.

Twenty-five such States, and EURATOM, were invited to a series of briefings at the VCDNP on the purpose and scope of the study. Among the points made during the briefings were the following:

- The target group had been kept relatively small simply for reasons of feasibility. However, if there were other States that wished to be included in the project, they would be welcome.
- The identities of the participating States would not be published unless the States agreed.
- Participation in the project would entail the completion of a questionnaire by current/former officials from the State or regional authority responsible for safeguards (SRA), and possible follow-up consultations.
- All communications with the participants would be handled in accordance with the requests of the respective Missions and Governments.

Following these briefings, a letter of invitation was sent to each of the Vienna-based Missions inviting them to participate. The letters contained a brief introduction to the project, and a copy of the questionnaire (described in greater detail below), along with an indicative time frame.

Ultimately, twenty States, and EURATOM, agreed to participate in the project.

After receiving initial responses from all participants, the VCDNP carried out follow-up consultations with the participants with a view to seeking clarification and additional information in connection with some of the responses.

The responses of the participants were then analysed both collectively and according to the relative scale of their respective nuclear programmes. The findings are described below.

2. Literature review

In parallel with the analysis of the responses, the VCDNP also conducted a literature search for information previously published by or on behalf of the participating States and EURATOM.

[5] Of the SQPs concluded by these States, one was based on the 1974 standard SQP text contained in Annex B of GOV/INF/276 (22 August 1974), accessible at https://ola.iaea.org/ola/documents/GINF276.pdf., and the other based on the 2005 revised standardized text reproduced in GOV/INF/276/Mod.1 (21 February 2006), accessible at https://ola.iaea.org/ola/documents/ginf276mod1.pdf, and GOV/INF/276/Mod.1/Corr.1 (28 February 2006), accessible at https://ola.iaea.org/ola/documents/ginf276mod1corr1.pdf.

Publications relevant to the present study addressed the implementation of the AP by more than half of the participants, but did not provide a comprehensive outlook as each of them focused on different aspects of the AP. However, they contained additional details relevant to some of the responses, in particular those concerning changes in the legal framework, the number of inspections and instances of complementary access (CAs), training of operators and modifications of integrated safeguards (IS) State-level approaches (SLAs) as a result of the State-level concept (SLC) review.

3. Questionnaire

To ensure consistency, and a mechanism for assessing the results of the inputs received, a questionnaire was developed to serve as the basis for the consultations. As indicated during the initial briefings, the questions were intended to focus on the practical impact of the conclusion and implementation of APs, not on any political aspects of States' decision-making processes. While the questionnaire was lengthy, it was hoped that much of the information it sought would have already been compiled for purposes other than this study, which would facilitate its completion.

The questionnaire began with preliminary questions regarding the number of operational facilities and locations outside facilities (LOFs), and the identity of the SRA, including its organigram.

The remaining 23 questions were intended to elicit comparative information on a set of nine issues, each of which is analysed in detail in the next sections in this report:

1. What impact has the AP had on the SRA, whether in the preparation for its implementation or its actual implementation? Have there been changes in the entity/entities responsible for implementing the States' safeguards obligations? Have there been consequences for staffing/budgets?
2. Has the conclusion of the AP required changes in the State's national legislation? If so, which ministries were responsible for securing those changes?
3. Was assistance sought from and/or provided by the IAEA or other entities in preparation for implementing the AP or in its implementation?
4. What types of outreach/training was conducted for the SRA and/or facility operators?
5. What challenges were encountered in preparing for and implementing the AP?
6. What has been the impact of the AP, the broader conclusion and/or IS on the frequency or intensity of IAEA access?
7. What training/outreach has been conducted for academic and research institutions, and has the implementation of the AP led to the discovery of any nuclear-related research of which the State was not previously aware?
8. What benefits have been derived from the conclusion and implementation of the AP?
9. Are there lessons learned that can be shared with other States?

Chapter III: Analysis

1. Overall results

1.1. Impact on SRA

In terms of institutional responsibility, all but three of the respondents indicated that the national authority responsible for the implementation of the relevant AP is the same as the entity responsible for implementing the CSA. The exceptions included two States and EURATOM.

Has the national authority changed?

18 States indicated that the national authority responsible for the implementation of the relevant AP is the same as the entity responsible for implementing the CSA

EURATOM and the States concerned are jointly responsible for the implementation of the AP

In **2 States**, additional national authorities had become co-responsible for AP implementation with the SRA

Both of the States indicated that, while the original SRA remained responsible for safeguards, additional national authorities (e.g. the foreign ministry, the ministry for economy) had become co-responsible for certain aspects of information collection.

EURATOM and the States concerned are jointly responsible for providing information to the IAEA under the AP to the CSA concluded with the NNWSs of the European Union (INFCIRC/193/Add.8). In accordance with that AP, States are permitted to delegate some of their obligations under the CSA to EURATOM through a side letter to the agreement ("side-letter States").[6] These include, for example, the obligations to provide declarations concerning: nuclear fuel cycle-related research and development (R&D) not involving nuclear material; uranium mines and concentration plants and thorium concentration plants; imports of specified equipment and non-nuclear material; and general plans for the development of the nuclear fuel cycle. EURATOM reports to the IAEA nuclear material-related information under the AP for all Member States. In addition, the Commission prepares reports to respond to the extended information requirements of the AP for the side-letter

[6] The participants in the study included nine NNWSs party to INFCIRC/193 and INFCIRC/193/Add.8, among which were four side-letter States.

States. While the side-letter States retain the responsibility for the accuracy of data provided, the Commission has accepted to collect the data and submit the reports for them to the IAEA.

Two-thirds of the States (and EURATOM) indicated that there had been some changes in the national authority responsible for safeguards since the entry into force of the relevant CSA. While some of the changes involved the renaming of the SRA, most of the changes involved reassignment to another ministry or department or the creation of a new SRA. Only six States and EURATOM responded that there had been changes in the SRA since the AP's entry into force. They described most of those changes in general as changes in the identity, name or responsible entity since the conclusion of an AP, but added that the changes may not have been due to the conclusion of the AP but rather, more generally, to restructuring/reorganization of the State's nuclear policy or programme.

In terms of the impact of the AP on staffing, over half of the respondents (11 States and EURATOM) replied that the conclusion of the AP did not require the hiring of additional staff by the SRA or other responsible national authority (Figure 1). EURATOM had assigned existing human resources to the implementation of the AP and, between its signature and entry into force six years later, had assigned eight officials to AP tasks. Due to reorganization, staff involved in such activities had decreased since then.

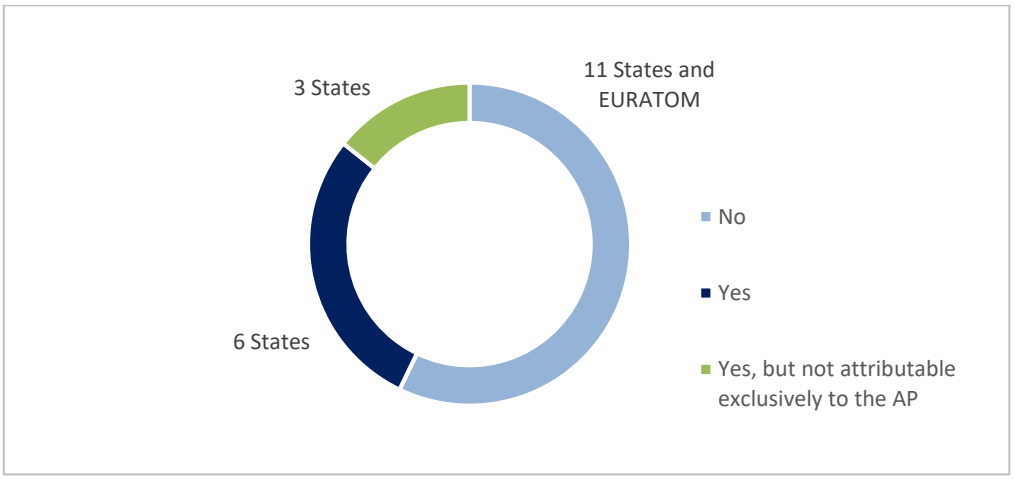


Figure 1: Were additional staff hired by the SRA or other responsible national authority?

Three other States indicated that there had been an increase in the number of staff, but that the hiring was not attributable exclusively to the AP. One of these States employed four additional staff between the AP's entry into force and the drawing of the broader conclusion "to increase broader safeguards compliance activities and to perform related duties". Another State cited a small increase in staff (estimated to amount to approximately half of full time employee) but noted that it had had more to do with increases in the overall workloads across all areas of safeguards.

Six other States confirmed that they had secured additional personnel, including: one State that hired a person who spent 30% of his/her time on the AP; one that hired two external consultants who spent approximately 40% of their time on AP-related matters for the two years between signing and the entry into force of the AP; two States that hired one person each after the AP's entry into force; one State that hired three people with more than a half

of their time dedicated to other tasks, such as export controls; and one State that hired four additional people.

"States signing the AP should review and consider whether additional staff may be required to ensure that the AP is implemented effectively."

As regards budgetary impacts, 14 States replied that there had been no increase in the budget for the SRA or other responsible national authorities as a consequence of the conclusion of an AP (although one reported that it had requested a budget increase but had not received it) (Figure 2).

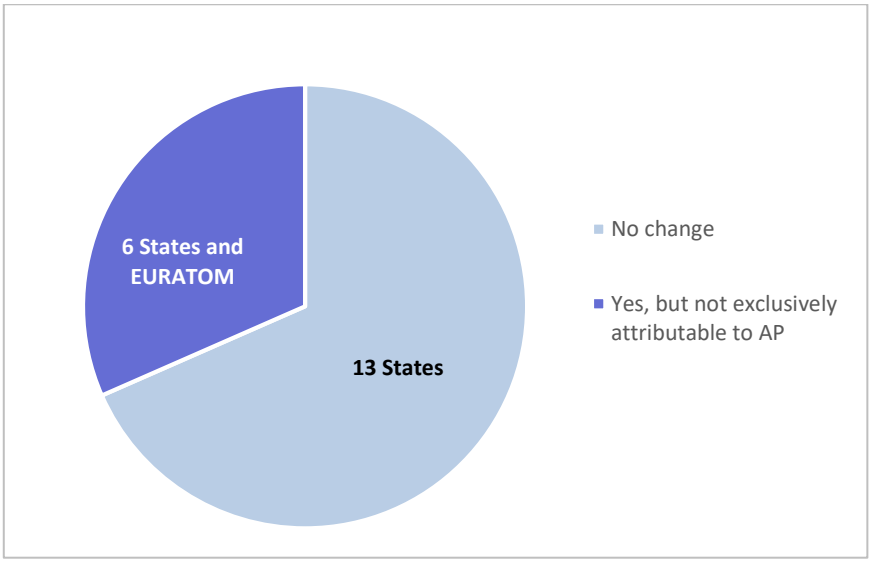


Figure 2: Have there been changes in the budget attributable to the AP?

Three other States, and EURATOM, responded that there had been increases in their respective budgets, some of which were not due exclusively to the AP, while the remaining three responded simply that it was difficult to determine costs associated with the AP as opposed to the implementation of safeguards in general. The States identified the costs as being associated with: the employment of an additional expert to collect data for the State's initial report; carrying out physical verification at the nuclear material holder level to verify the accuracy of the declarations concerning the production of yellow cake; and staff training, equipment acquisition and recruitment. In one State, a new section on export/import control was created within the SRA, and a relevant increase in the SRA's budget was reflected to cover salaries, inspections and CAs that fulfil the AP requirements. However, the

State noted that the majority of AP functions, such as software and management systems, had been absorbed in the initial budget.

EURATOM reported that, distributed over the five years between signature and entry into force of the AP, the total financial impact had been approximately 3 million euro in support of the implementation of the AP operations, meetings with States and the IAEA, developing software, and in training and field tests. The costs were associated with: support to the nuclear operators (e.g. missions in different locations to establish the AP site definition); IAEA/EURATOM working groups involving technical visits to complex and sensitive sites; meetings with the States and/or the IAEA to establish implementation arrangements; development of software tools to support the AP declaration and implementation by operators, Member States and EURATOM; and the conduct of training and pilot CAs.

As to whether additional resources were required by parties other than the SRA, nine States responded negatively, while another ten States and EURATOM replied affirmatively (Figure 3). Among the comments offered with regard to additional resources, one State noted that, while some reporting requirements under the AP did not require much in the way of new resources since much of the information was centralized (e.g. reporting of exports), others, particularly with regard to the reporting of R&D activities, required significant additional resources. One State hired an expert to prepare the initial site declarations under Article 2.a.(iii) of the AP. Two other States secured temporary support from other national authorities (e.g. export licensing authority, public health authority) mainly for data/information collection.

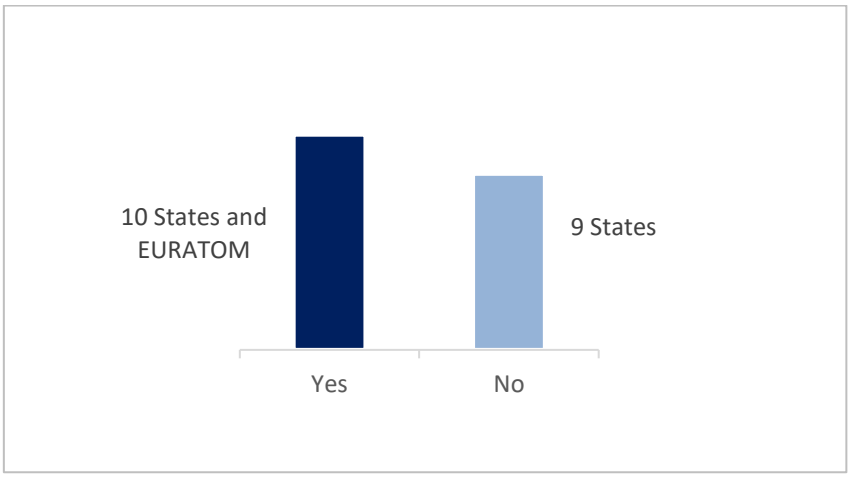


Figure 3: Were additional resources required for or by parties other than the SRA?

Among the additional resources required for or by parties other than the SRA, the responses included the following:

- A sizeable additional effort by major licensees with large reporting obligations, including the appointment by operators at AP sites of a representative tasked with preparing site declarations and participating in CAs;
- A similar, albeit less intensive, effort by operators at LOFs;
- Temporary support for the export licensing and public health authorities in the collection of data;
- The additional effort by academic research institutes and corporate research facilities in connection with requirements to report nuclear fuel cycle-related R&D;

- In the context of the EU States, the appointment by each State of staff responsible for follow-up and producing specific State-related declarations and participating in CAs (in particular for non-side-letter States); and
- Training for operators in nuclear material measurement and detection (i.e. training associated with the CSA and the AP).

1.2. National legislation and regulations

The next question addressed whether the conclusion of an AP required changes in the relevant legal framework and, if so, when the process was begun, how long it took and who was responsible for promoting and implementing such changes.

A significant majority of the 20 States (16 States, i.e. 80%) and EURATOM replied affirmatively, indicating that changes were required in their respective nuclear laws/regulations (Figure 4). Two other States replied that, although there had been changes in their laws, the changes had not been exclusively attributable to the AP, with one indicating that the changes had been "part of a broader modernization of legislation and regulations for nuclear substances and activities".

Only two States responded that a change in the nuclear law had *not* been necessary as an immediate consequence of concluding an AP. Of those, however, one indicated that changes were later made to reflect the AP obligations more fully, and one indicated that existing national legislation did not currently address safeguards, but was in the process of being revised to incorporate requirements with regard to all aspects of nuclear law, including safeguards, security and safety.

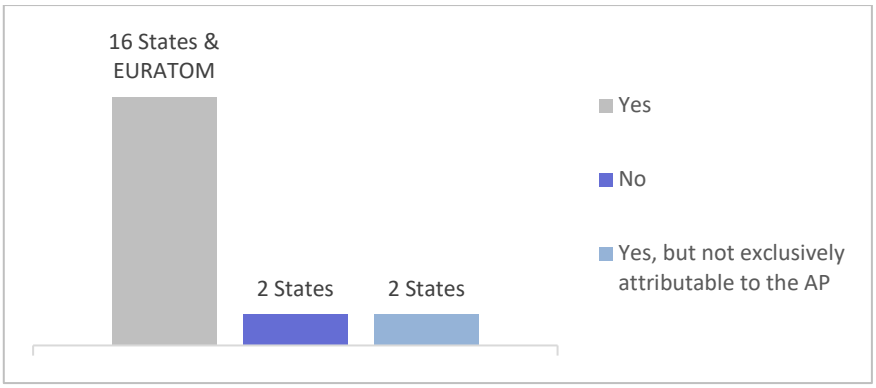


Figure 4: Have the relevant laws/regulations of the State been modified?

The nature of the changes indicated by the participants varied from the adoption of a new national law to the modification of regulations. New legislation was adopted by several States; existing legislation was changed or updated by others, and some responded that more than one set of actions had been required (e.g. updating legislation or decrees, and updating or adopting new regulations).

EURATOM reported that the AP required a change in the EURATOM regulation in force at the time in order to include specific AP provisions applying to the EU nuclear operators. The process was initiated immediately after the signature of the AP in 1998, and resulted in the final approval by the European Council in February 2005 (approximately nine months after the entry into force of the relevant AP).

"Obviously, the conclusion of the AP required work to amend the domestic legislation to respond to complementary access and to provide AP declarations."

Among the changes was a redefinition of term "use of nuclear energy" to cover not only nuclear material but also sites and R&D activities not involving nuclear material and the term "inspections" to include CA. Others introduced reporting obligations for importers and exporters of equipment and non-nuclear material specified in Annex II.

The modification of the legal framework took from a few months to two, four and seven years to complete. Given the complex governance structure in the EU, and the sheer number of States involved, the new regulations concerning AP implementation took seven years to be adopted.

In eleven of the responses, the SRA was identified as the authority responsible for the promotion of the relevant changes, while five of the project participants identified more than one entity as being responsible for promoting the changes (e.g. the SRA and a ministry for energy; the SRA and parliament; the SRA and an electricity board; the SRA, with input from an operator, and the ministry of health). EURATOM indicated that the European Commission and, more specifically, the EURATOM Safeguards Service, the European Council and its Atomic Questions Group, were responsible for spearheading the changes.

1.3. Assistance provided by the IAEA or other entities in preparation for the AP or its implementation

The next three questions were intended to elicit information about resources for providing assistance to States in its preparations for an AP or its implementation, and the point in the process at which such assistance had been sought.

Fourteen States and EURATOM replied that they had received assistance from the IAEA (Figure 5). The forms in which assistance was sought and received varied: meetings (10); training/trials (4); seminars/workshops/conferences (4); correspondence (3); technical visits (2); working groups (1); and software for reporting (1).[7] Six of those States and EURATOM identified more than one mechanism for seeking clarification or assistance, including those just cited. Six other States replied that they had not specifically requested such assistance from the IAEA but had participated in meetings and training courses on the future implementation of the AP.

[7] The numbers in parentheses indicate the number of respondents that commented accordingly.

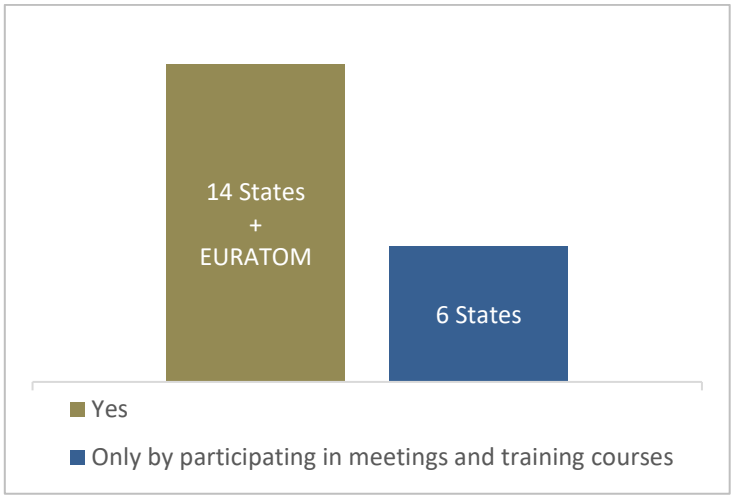


Figure 5: Has the State received IAEA assistance?

Several States referred to the value of site visits and field trials, both those conducted with the IAEA and those conducted with the IAEA and EURATOM, in connection with the collection, review and analysis of information, the preparation of the initial declarations and in the conduct of CAs. Trilateral meetings between EURATOM, the IAEA and individual States were also held. Bilateral working groups established by the IAEA were also cited as having provided the opportunity to receive useful clarifications, in particular with regard to the AP's reporting requirements.

One of the later advances in assistance provided by the IAEA was the development of the Protocol Reporter, a computer software programme that facilitates the preparation of AP declarations in electronic form. Now on its third iteration, the latest version has met with mixed reviews about its user-friendliness; however, efforts are under way in the IAEA to develop a further iteration that will improve the interface with users.

The regular meetings of the IAEA's Policy Making Organs (the Board of Governors and the General Conference) offer regular opportunities for representatives of the SRAs to consult with the IAEA about the implementation of safeguards. The IAEA also offers a free-of-charge SSAC advisory service (ISSAS) missions at the request of States. The service consists of a one-week preparatory mission, followed by a one-week mission in the State. The ISSAS team prepares an agreed action plan after evaluating the mission findings. An ISSAS mission covers all aspects of safeguards implementation, including AP reporting, export control, nuclear material accounting and reporting, and the legal and regulatory framework.

In most cases, the States requested advice or assistance on: preparation of AP declarations, in particular with regard to site declarations; AP subsidiary arrangements; CA; and reporting with regard to exports.

"Several meetings [with the IAEA] were held to explain the specific case of [the State]. All major sites were visited together with the IAEA to decide on site limits and what should be declared and in what detail."

In terms of the frequency of requests for IAEA assistance before the entry into force of the AP, three States indicated that it was an ongoing process; two others responded that they had held three bilateral consultations with the IAEA before the AP's entry into force. For the remainder of the States, the frequency ranged from once to monthly to occasional and from participating in IAEA international and regional training courses to meetings "mainly during the General Conference". EURATOM also referred to a joint working group with the IAEA that met monthly prior to the entry into force of the NNWSs' AP, and 14 ad hoc technical visits.

After an AP's entry into force, the form and frequency of requests for assistance also varied. Thirteen States and EURATOM indicated that they had continued to request and receive assistance in the form of: meetings (6); training sessions (3); working groups (2); emails (2), workshops (1); phone calls (1); and ISSAS missions (2). Five States and EURATOM indicated that they continued consultations on an ongoing or regular basis (one State noted about 10–20 times a year). The frequency of such requests after entry into force, not surprisingly, was reported to have decreased, with one State indicating that it had sought assistance frequently during the first year of the implementation of the AP and rarely afterwards; six States responded that they had not requested assistance after the entry into force of their respective APs. Six States reported that they had, on average, sought clarifications or meetings with the IAEA two to three times a year; two States reported that it sought such assistance irregularly.

EURATOM specifically mentioned that the joint IAEA/EURATOM Working Group on the implementation of APs continued to be active for the first two years after the entry into force of the AP in the EU. Since then AP implementation matters are dealt with routinely within the Working Group of Safeguards Implementation, as and when required. EURATOM referred a series of 14 ad hoc technical visits, annual CA exercises and biannual training sessions and workshops. EURATOM also cited the "continuous and effective cooperation between EURATOM and the IAEA", in particular for training; working groups; ad hoc meetings; workshops; technical visits; and the institutional meetings of the High Level Liaison Committee and the Low Level Liaison Committee.

9 States benefited from assistance provided by other States or NGOs, such as:

***Finnish Safeguards Support Programme**

***US Department of Energy training courses**

***Scientific visits funded by Norway**

***Joint US/Australian workshops**

***ESARDA**

***INMM**

States and non-governmental organizations (NGOs) also contributed to the provision of training and assistance, according to the replies received from nine of the responding States.[8] One such programme was provided through the Finnish Safeguards Support Programme, specifically a pilot training course in 2004 on "Additional Protocol, Complementary Access". Several other examples of State-to-State assistance were also cited, including the US Department of Energy's training courses on commodity identification, joint US/Australian workshops on the implementation of APs, and scientific visits funded by the Norwegian Government on the use of software for AP reporting.

Another mechanism cited by several States was the exchange of information in the Implementation of Safeguards Working Group (ISWG) of the European Safeguards Research and Development Association (ESARDA).[9] The objective of the ISWG, as described on its website, is "to provide the Safeguards Community with proposals and expert advice on the implementation of safeguards concepts, methodologies and approaches aiming at enhancing the effectiveness and efficiency of safeguards on all levels and serve as a forum for exchange of information and experiences on safeguards implementation."

As described by one of the study's participants, the ESARDA ISWG was founded in the early 2000s, with meetings once or twice a year. It convened national safeguards staff and officials of the IAEA and EURATOM "to think, to learn and to share experiences on AP matters," including the collection of information and the preparation of declarations. The comment continued, noting that the forum was unofficial and a "good field for open debate".

The Institute for Nuclear Materials Management (INMM) was also cited as offering opportunities to exchange views on the implementation of APs at its annual conference and during various workshops and meetings throughout the year.

[8] Twelve other States and EURATOM replied that they had not requested or received assistance from other States or from NGOs.

[9] See https://esarda.jrc.ec.europa.eu/index.php?option=com_content&view=article&id=66&Itemid=216 for more information about the ISWG.

1.4. Training for SRA/operators

The following questions were intended to elicit information about the training needs of the SRA and facility operators as a consequence of the State's conclusion/implementation of an AP, the financial impact of such training and the numbers of people trained. The responses varied in terms of detail and specific costs. However, it is possible to derive some conclusions from the information provided by the participants.

Ten States replied that additional training had been provided to national authorities. Most of them referred to training provided by the SRA, while some also indicated training provided by the US Department of Energy (US DOE) and EURATOM and international courses on State systems of accounting for and control of (SSACs) provided by the IAEA. The participants were predominantly SRA staff members; some of the costs were covered by the IAEA. The number of staff trained ranged from a few (4–5), to between 15 and 25, with a large number of customs officials also trained.

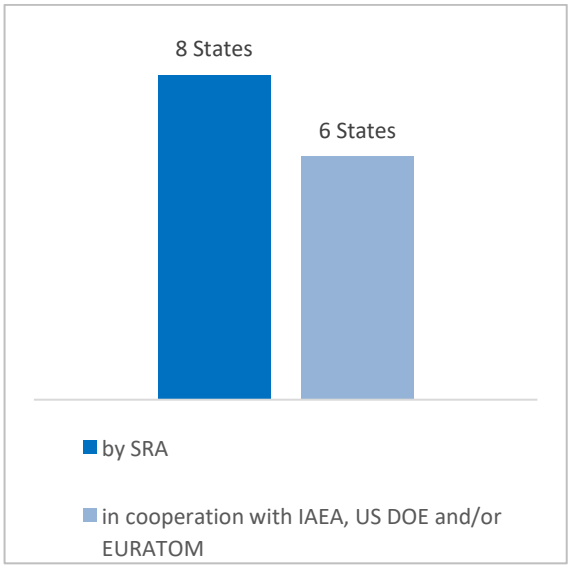


Figure 6: Training provided for operators in 14 States

Given the range in responses, it was not possible to estimate the costs of such training, although some of the respondents did offer examples: one State specified that the costs associated with training 20 people consisted in the cost of catering and room rentals; the cost of training four to five SRA staff members was estimated at around 10,000 euro; another State reported that it had held six workshops, training a total of 22 SRA staff members and 50 customs administration employees at a cost of approximately 18,000 euro per workshop. The costs associated with training included the cost of flights, accommodation, daily subsistence allowances, catering and room rentals. Some States replied that the costs had been covered by the IAEA.

Eight States replied that no training dedicated to the implementation of the AP had been provided to the SRA, with one State indicating that new SRA staff routinely attended the IAEA's SSAC course as part of their compulsory training (only a portion of which is dedicated to the AP) at a cost of approximately $8,000 a year. EURATOM reported that it provided one training session and one workshop to EU States and nuclear site operators jointly with the IAEA every year (biannually between the signature of the AP and its entry into force), which cost 10,000 euro annually.

Fourteen States responded that training had been provided for operators (Figure 6). Several States cited the importance of training for the site operators who had to prepare AP declarations, in particular for the major nuclear installations. Eight of the fourteen States indicated that the SRA had provided such training; the other six States reported having provided training to operators in cooperation with the IAEA, US DOE and/or EURATOM.

One State noted that training had not been necessary for either the SRA or the facility operator since both had been actively involved with the IAEA in the development of the safeguards strengthening measures eventually incorporated in Programme 93+2, in particular CA.

One State reported that, starting in 2012, it had organized (jointly with EURATOM in the beginning) dedicated training sessions for the staff responsible for safeguards at locations using small quantities of nuclear material. Since then, some 160 people have been trained by staff of the SRA. The costs were borne by the State and amounted on average to 2,500 euro per session. The same State, jointly with EURATOM, also organized training courses for staff responsible for safeguards from the major nuclear installations, focusing on legislation, IS and use of the relevant software. In addition, staff of the SRA had participated in a seminars offered by the IAEA and by EURATOM on the implementation of safeguards (including the AP).

1.5. Challenges in preparing for and implementing the AP

One of the principal inquiries in the questionnaire was about the challenges faced by States in preparing for and implementing their respective APs, whether in preparing and submitting the necessary declarations or in securing access under the provisions for CA, and how those challenges were addressed. Replies to this question were provided by all participating States and EURATOM.

Top challenges associated with preparation and submission of declarations

- Identification of the relevant stakeholders and locations not subject to “traditional safeguards”
- Declarations of nuclear fuel cycle-related related R&D activities not involving nuclear material
- Collection and submission of the necessary information to the IAEA

Preparation and submission of declarations

Regarding challenges associated with the submission of the initial and subsequent declarations, there were a number of general comments. Among the most prevalent were remarks related to the identification of the relevant stakeholders and locations not subject to "traditional safeguards".

Other challenges identified by the participants included the following:

- *Collecting information, verifying and harmonizing information and submitting declarations to the IAEA*. States used a variety of mechanisms for identifying the stakeholders, including accessing relevant databases (such as databases on export control, research carried out by PhD candidates and State-funded nuclear-related activities), briefing relevant professional and industrial society on the reporting obligations, and conducting interviews with other national authorities responsible for the information (e.g. the export control authority) and industry officials (current and retired). Perhaps not surprisingly, many of the responses indicated that the effort was greater in preparation for submission of the initial declarations than for subsequent declarations. Many of the challenges of preparing the quarterly and annual reports and declarations were addressed through training.
- *Uncertainty about what was required to be declared*. Many of these difficulties were alleviated through the use of resources that were later developed by the IAEA, such as the State Declarations Portal (SDP), and the series of guides that were eventually published by the IAEA.
- *The need for training and expertise*. In the early days of the implementation of APs, the learning curve was steep; there was a shortage of staff with relevant expertise and of a robust management system. Most States reported a reduction in difficulties simply through experience in implementing the AP. This challenge was further alleviated with the publication by the IAEA of guides on AP reporting.
- *Possible conflicts between safeguards and security*, i.e. ensuring that the information provided was not considered "classified". One State noted that this was addressed through practical arrangements for managed access. Another State pointed to the importance of communicating with the stakeholders clearly and from the very outset applying the principal of "all the information [being] open if there is no reason to keep it secret".
- *Transitioning between two CSAs.* As the EU was enlarging, and NNWSs were transitioning from bilateral safeguards with the IAEA to multilateral safeguards with the IAEA and EURATOM, a new set of initial declarations was required.
- *Difficulties with the reporting software*. The IAEA is aware of these difficulties and is working on issuing a new version of the software that is intended to be more user friendly.
- *The need for additional regulations*. Most States needed to modify existing regulations to ensure that information about nuclear material used or intended for non-nuclear purposes could be collected and reported.[10]

[10] Article 2.a.(vi) requires reporting on source material which has not reached the composition and purity suitable for fuel fabrication or for being isotopically enriched, including material used, or intended, for non-nuclear use. Article 2.a.(vi) requires the State to provide the IAEA with information regarding nuclear material which has been exempted from safeguards for non-nuclear purposes pursuant to paragraph 36(b) of INFICRC/153.

As regards the more specific declaration challenges, the most often cited was in connection with declarations under Article 2.a.(i), i.e. nuclear fuel cycle-related related R&D activities not involving nuclear material that are funded, specifically authorized or controlled by, or carried out on behalf of, the State. For one participant, this issue arose in the case of multinational R&D being carried out jointly by more than one State, as it was not clear in the beginning which State was required to declare the project (ultimately, it was the responsibility of each State to report such activities). For several participants, there were challenges in respect of universities, understanding what should be declared and identifying those who should declare their research. Related challenges arose in the context of Article 2.b.(i), which requires the State to "make every reasonable effort" to provide the IAEA with information on certain nuclear fuel cycle-related activities that are *not* funded specifically authorized or controlled by, or carried out on behalf of, the State. Specifically, these are activities related to enrichment, reprocessing of nuclear fuel or the processing of intermediate or high-level waste containing plutonium, high enriched uranium or uranium-233.

An approach reported to have been adopted by one State to the issue of R&D declarations involved: identifying the relevant institutions; contacting the management of those institutions; sending official letters informing them of the obligations under the AP and requesting relevant information; and clarifying, where necessary, responses received by the SRA. Most of the respondent States implemented a similar approach to R&D activities, which also included regular (annual) follow-ups with the identified institutions.

An approach to the issue of R&D declarations

Of particular interest was the response by one State that described the challenges associated with collecting historical information in the light of its plans during the 1950s and 1960s for a nuclear weapons programme. The SRA decided to perform its own historical survey with the aim of attaching the results of that survey to the initial declaration for transparency purposes.

Three other States cited difficulties with the collection of historical information, not because it was required under the AP, but because it was necessary to ensure that all information relevant to current activities was being collected and reported. In this context, interviews with retirees from government and industry proved to be of invaluable assistance. Among the related issues were difficulties in tracking nuclear material that had previously been exempted from safeguards and providing information about source material that had not yet reached the composition and purity for fuel fabrication or isotopic enrichment (e.g. tracking such material produced at mines that had long since been closed).

"Do not take a narrow, legalistic approach to reporting, but rather operate with a mindset of being transparent and consultative with the IAEA."

Among the specific challenges cited by the participants were those associated with the preparation of site declarations under Article 2.a.(iii), specifically in ascertaining the boundaries and which buildings fell within those boundaries. These issues were reported as having been addressed though technical visits and training for the SRA and facility operators on the legal requirements of the AP.

The obligation to provide quarterly declarations regarding export of equipment and material listed in Annex II of the AP, as required under Article 2.a.(ix), identified as a specific challenge by four States, was addressed through training, meetings with national authorities responsible for customs and export controls and checking both export lists and regular exporters of relevant items.

One State described the Article 2.a.(x) declarations on the general ten-year plans for development of the nuclear fuel cycle as challenging, and another described the challenges of the re-introduction of previously exempted material after the State had joined the EU (a challenge more attributable to the CSA itself than the AP).

Complementary access

Five States identified no challenges in the implementation of CA. The challenges described by the other participants as being associated with CA generally fell into one of four main groups: specific types of locations; security; resources and logistics; and communication.

Issues related to specific types of locations were predominantly focused on the difficulties of defining the boundaries for Article 2.a.(iii) sites and which buildings should be included within the defined site.

One State indicated minor difficulties in connection with CA to a location from which nuclear material had long been removed and where an unrelated commercial activity was then under way because of concerns on the part of management about the interruption of commercial operations. Similarly, another State had experienced some difficulties during CA in identifying the correct location where past activities had been carried out (because buildings no longer existed or had changed purposes and knowledgeable people were not available).

According to the respondents, most of these challenges were also addressed over time in consultation with the IAEA and, where relevant, with EURATOM. EURATOM also cited the definition of "sites", the identification of other locations not subject to "traditional" safeguards and declarations of relevant exports as challenges it had experienced. According to EURATOM, these challenges were addressed through technical visits at the AP sites and other locations, training in the legal basis of the AP and meeting with the national authorities responsible for the relevant information (e.g. customs officials).

Top challenges associated with CA

Specific types of locations

Security concerns raised by operators

Resources and logistics

Communication

The issues described as relating to security centred on concerns expressed by operators about the need for additional security measures with regard to nuclear facilities and material, given the broader access rights of the IAEA. However, these concerns were addressed through explanations by both the State and the IAEA about the purpose of CA and the negotiation of managed access arrangements. One State with a particularly sensitive facility (enrichment) was able to agree with the IAEA on managed access arrangements. These arrangements provide that, at the commencement of CA at the site, IAEA inspectors are to discuss with the facility operator the order of activities and the routes to be followed during CA, with due consideration of its objectives and of the operational activities of the facility. As noted by the State, this allows the operator to make the necessary arrangements to prevent the proliferation of sensitive information, to meet safety and physical protection requirements and to protect proprietary or commercially sensitive information, as indicated in the site declaration, as provided for in Article 7 of the AP.

"There are many synergies between safeguards and security, but also some conflicts. The main conflict might be between the implementation of international safeguards and [national] security measures ..."

In terms of resources and logistics, one difficulty cited was poor transport connection with locations to which the IAEA may request CA with up to 24 hours' notice, necessitating short-time readiness, including radiological protection arrangements, at any time. The solution put in place with the IAEA by one State was for the SRA to delegate permission to

escort inspectors to a local official near the location (e.g. a local sheriff); another solution was to use the SRA emergency system to respond to the request for access in an expedited fashion in order to ensure that the SRA could inform the relevant operator and that the SRA inspector would have sufficient time to participate in the CA.

Effective communication was also highlighted as another issue that had arisen in connection with CA: lengthy discussions and explanations with non-nuclear operators/companies were sometimes necessary, particularly at places other than facilities and sites. Several States referred to the need to establish regulations and/or internal procedures to ensure that the staff in charge of safeguards at the nuclear facilities understood the requirements for CAs, and ensure that the legislation was updated to provide for IAEA access to locations to which it would not normally have had access on a routine basis under the CSA. Most of the States commented that these hurdles to access were generally addressed through outreach, national workshops, continued cooperation and engagement with the relevant entities, while one State underlined that having a State safeguards authority present on a site when CA was being conducted facilitated the conduct of CAs.

Other challenges

Eleven of the twenty States and EURATOM identified one or more of the following other challenges in the implementation of APs.

One of the more frequently cited challenges was not in the implementation of the AP per se, but rather in the preparation for it, including the need to have legislation and regulations in place by the time the AP had entered into force. In one instance, this problem was alleviated through the conduct of field trials to monitor the preparation of the first declaration, with the assistance of the IAEA.

With the entry of new countries into the European Union and their transitioning to safeguards with both EURATOM and the IAEA, a clear delineation was required of the roles and responsibilities of the SRAs and EURATOM in implementing the AP and in coordinating the information flow between all parties (e.g. IAEA, EURATOM, Member States, site operators and equipment suppliers). An additional challenge was establishing secure communications between the two inspectorates, as well as between the State party and the two inspectorates.

Establishing the status of installations that are no longer operational but are still listed as nuclear facilities, albeit with zero inventory, required additional effort as well. In a similar vein, EURATOM cited IAEA requests that sometimes required investigation of historical information or information that was not always available.

Top 3 Other Challenges

Adopting necessary legislation

Loss of institutional memory

Clear delineation of the roles and responsibilities in implementing the AP

Coordination and exchange of information between different institutions of the State, educational institutions and the private sector can also be a challenge, with regard to which one State recommended the establishment of a domestic mechanism for the flow of information.

A related issue concerned the need for strong procedural controls to maintain data integrity and to ensure that data were not overwritten, declarations were not duplicated and cross references to other declarations were not invalidated. Where data integrity is at risk, software tools should manage the risks with engineering controls rather than relying of user procedural controls.

A recurring challenge cited by the participants was the loss of institutional memory, particularly in research and academic institutions, and the mobility of persons responsible for safeguards at locations where small quantities of nuclear material were used or where the entities had become insolvent or bankrupt.

1.6. Impact of the AP, broader conclusion and integrated safeguards on frequency or intensity of IAEA access

The questionnaire included a series of questions designed to elicit responses as to how the conclusion of an AP, the drawing of a broader conclusion[11] and the implementation of IS had impacted the frequency and intensity of IAEA access.

Of the twenty States that participated in the project, the broader conclusion (that all nuclear material remained in peaceful activities) had been drawn by the IAEA for 16 of them.[12] The average time between the AP's entry into force for a given State and the drawing of the broader conclusion was 3.5 years overall, ranging from one year for one State to ten years for another.

[11] If the IAEA Secretariat has found for a State no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities, it may be able to conclude that all nuclear material remained in peaceful activities, i.e. a "broader conclusion".

[12] Three of the four States had little or no operational nuclear activity, one of which still has an SQP based on the 1974 model text and one had an SQP but which the State has declared to be non-operational.

3.5 years

Average length of time between the AP entry into force and the drawing of the broader conclusion for a given State

As of 2017, in 15 of the 16 States for which the broader conclusion had been drawn, the IAEA had been implementing IS, i.e. an optimized combination of safeguards measures available under CSAs and APs, which, due to increased assurance of the absence of undeclared nuclear material and activities for the State as a whole, permitted the IAEA to consider reducing the intensity of inspection activities at declared facilities and LOFs. In most but not all instances, it was possible to begin the implementation of IS in the State between one and three years after the broader conclusion had been drawn.

Thirteen of the 15 States in which IS was being implemented reported a reduction in the frequency of routine access to facilities, locations or other places in the State(s), with reductions ranging from a bit less than 10% to almost 70% overall, and others reporting reductions with regard to certain facilities or types of facilities (Figure 7).[13] One of these States reported that the frequency had decreased immediately after the broader conclusion was drawn, but that that trend had been reversed, noting that this may have been due to matters unrelated to the AP. Only one State reported that it had experienced an increase in the frequency of IAEA access. The remaining State in which IS was being implemented reported that there were "a number of factors affecting the level of inspections, other than the implementation of the AP", and that it was therefore unable to answer the question.

[13] These figures correspond to data provided by EURATOM about changes in the annual inspection effort in NNWSs which have been party to INFCIRC/193/Add. 8 since its entry into force. The average reduction in inspections for those States ranged between 37 and 40 % for all but three of those States between 2004 and 2017 (all three of which have little or no nuclear activity, with a resulting doubling of inspections from 1 to 2 and from 2 to 4 in two States, respectively, and no change in the third).

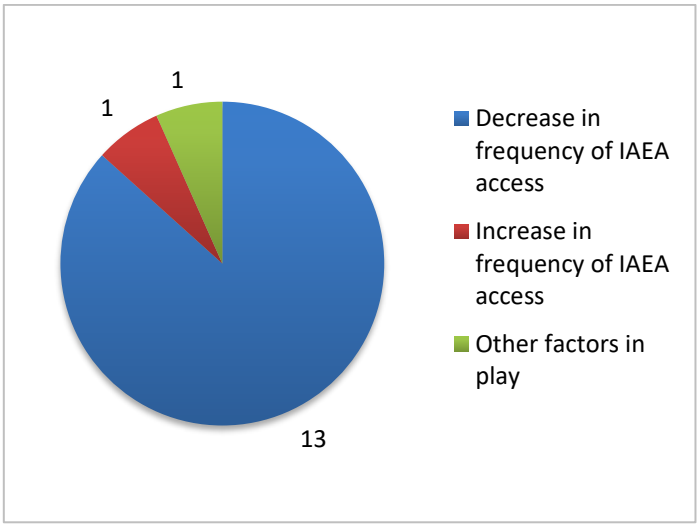


Figure 7: Has IS had an impact on the frequency of IAEA access?

The other State for which the broader conclusion had been drawn, but in which IS was not being implemented as of 2017 reported an initial increase in IAEA access after the entry into force of the AP, but with an eventual decline in the number of CAs.

Of the remaining four States for which neither the broader conclusion had been drawn nor was IS being implemented, one also reported a decrease in the total number of CAs (although no change in the number of inspector days), two reported no change in the frequency of IAEA access and one reported an increase in the number of missions and inspector days due to CAs.

In 2011, the IAEA Secretariat informed the Member States that it would extend the SLC to States for which it had not drawn a broader conclusion and would develop SLAs for those States. After extensive consultations with IAEA Member States, the Director General announced that he would initiate that process by first reviewing the existing SLAs implemented on the basis of IS.

As of 2016, all existing IS SLAs had been reviewed by the Secretariat.[14] The Director General also reported that SLAs had been approved for implementation for 61 NNWSs with a CSA and an AP in force and a broader conclusion and for seven NNWSs with a CSA and an AP in force but without a broader conclusion.

Of the 15 participating States in which IS was being implemented at the end of 2017, three replied that no modifications had been made to the IS SLA as a result of the Secretariat's review. Ten States and EURATOM replied that there had been some modifications. Of those, three States and EURATOM noted that there was a decrease in the frequency of IAEA inspections after the review (two of which reported only small reductions); three others responded that there had been only minor modifications. Four States and EURATOM noted the introduction of randomized inspections (specifically short notice random inspections, SNRIs), which had resulted in a decrease in access to some facilities, while increasing access to others. Two States responded that there had been an increase in the frequency of inspections following the review of the IS SLA.

[14] Report of the Director General, *Strengthening the Effectiveness and Efficiency of Agency Safeguards*, GC(61)/16, 26 July 2017, at para. 10, (reproduced at https://www.iaea.org/About/Policy/GC/GC61/GC61Documents/English/gc61-16_en.pdf)

The following questions focused on the frequency of requests for CA and the provisions of the AP under which they were requested. They also addressed the number of questions or requests for clarification the States had received and how much time was spent annually on average responding to such questions and requests for clarification.

Seventeen States and EURATOM responded to the question concerning the annual average number of requests for CAs, with the responses ranging from an average of less than one CA a year (three States), to between one and four (thirteen States) and 25–26 per year (one State and EURATOM) (Figure 8).

As to the provisions pursuant to which the CAs were requested, all but one participant responded, with another replying that the State had not yet received a request for CA. As regards the remaining respondents (including EURATOM), the question itself led to different types of responses:

- Responses in terms of the relevant declaration in Article 2;
- Responses on the basis of the reason for access as articulated in Article 4.a.(i), (ii) and (iii);
- Responses based on the notice period provided for in Article 4.a. or 4.b; and
- Responses based on Article 5.

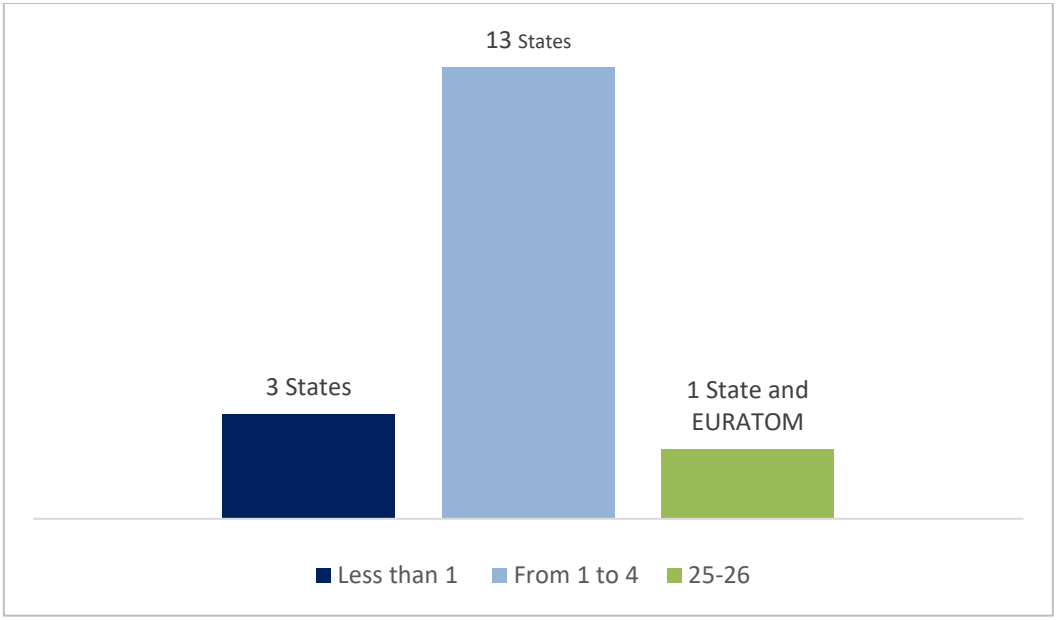


Figure 8: What is the annual average number of requests for CA?

The wide range of responses yielded the following findings:

- Requests for access under the AP were predominantly made in connection with places on sites (Article 2.a.(iii) locations) as provided for in Article 5.a.(i). By way of example, data provided by EURATOM indicated that 86% of the CAs carried out in the EU NNWSs had been requests for access to sites. While there were a few references to requests for access to other locations declared by a State normally associated with the presence of nuclear material (Articles 2.a.(v)-(viii)), as provided for in Article 5.a.(ii), only three States referred to CAs carried out to verify the decommissioned status of a facility as provided for in Article 5.a.(iii).

- There were also only a few reported requests for access pursuant to Article 5.b: requests for access to locations declared by States under Article 2.a.(iv) (locations engaged in activities identified in Annex I of the Model Protocol), Article 2.a.(ix)(b) (location of imported equipment or material identified in Annex II of the Model Protocol), and two States that reported requests for access to nuclear fuel cycle-related R&D not involving nuclear material, one with regard to State funded/authorized location (Article 2.a.(i)) and one in connection with privately sponsored R&D (Article 2.b.(i)).
- Only one State and EURATOM reported requests pursuant to Article 5.c, which authorizes the IAEA to seek access to locations in the State that are not declared by the State.
- The predominant justification for the CA requests was to provide assurance of the absence of undeclared nuclear material and activities, as contemplated in Article 4.a.(i) of the Model Protocol. Very few were reported to have been triggered by a need to resolve a question or inconsistency, as provided for under Article 4.a.(ii).
- In terms of notice, a significant majority of the requests were made in accordance with Article 4.b.(i), which provides for advance notice of at least 24 hours, rather than under Article 4.b.(ii), which applies only to access to sites, and provides for two-hour notice if access is requested in conjunction with design information verification or an ad hoc or routine inspection at that site. Again, by way of example, EURATOM reported only 17% of CAs involving access to sites as having been conducted on short notice (two-hour notice).

All but one of the participants responded to the inquiry about questions/requests for clarification received from the IAEA. The responses consistently indicated that the number and frequency of such questions and requests was significantly higher in the first year or two following the AP's entry into force (one State reported that it had received some 50 such questions over the course of the first year), with a tapering off to an average of anywhere from one a year to one every two to four years thereafter. Several States reported not having received any such requests "in the last few years". Seven States indicated that they received, on average, less than one request a year; ten States cited an annual average of between one and four requests from the IAEA.[15] EURATOM reported that it had received a total of 125 requests with regard to all NNWSs party to INFCIRC/193 since the entry into force of the AP to that agreement in 2004, for an average of fewer than five requests per country. The experience of the project's participants shows that, upon the AP's entry into force, a State could expect to receive many questions or requests for clarification, but that the number would decrease eventually with the AP's implementation.

[15] One State indicated a higher average of between 10 and 20 requests for clarification per year However, this appears to have been more related to questions concerning the implementation of the CSA rather than the AP itself.

"Questions or inconsistency letters are not uncommon and should not be viewed as an accusation from the IAEA."

In terms of the average time spent annually in responding to the IAEA's questions or requests for clarification under the AP, 19 States and EURATOM provided answers. Most of the replies suggested that the IAEA's inquiries required very little staff time for response, with average estimates from negligible, to a couple of hours, to a week to one month per year. A few indicated a higher annual average, ranging from one to three months a year to the equivalent of the work of one to two full-time employees. However, ultimately the amount of time required to provide responses to the IAEA is highly dependent on the nature of the question or clarification.

1.7. Academic and research institutions

During the negotiation of the Model Protocol, considerable debate centred around the importance of understanding what nuclear fuel cycle-related activities *not* involving nuclear material were being conducted in States. It was ultimately decided to include a definition of such activities, which is set out in Article 18.a. of the Model Protocol[16], and to distinguish between those activities which are "funded, specifically authorized or controlled by, or carried out on behalf of" the State concerned, and those that are not. For those activities that fit that description, the State has an affirmative obligation to provide declarations to the IAEA. For those that are not funded, specifically authorized or controlled by, or carried out on behalf of" the State concerned, the State is only obliged to "make every reasonable effort" to provide the IAEA with relevant information, and only with regard to activities which are "specifically related to enrichment, reprocessing of nuclear fuel or the processing of intermediate or high-level waste containing plutonium, high enriched uranium or uranium-233", the theory being that a State would want to know for its own purposes whether such activities were being carried out within its territory given their proliferation sensitive nature.

Apart from one State, which responded that it had no such activities being carried out on its territory, all other participants responded with a variety of mechanisms they had used to collect the required information. The majority of the responses (from 17 of the 21 participants) cited outreach efforts, e.g. through seminars, presentations, training sessions, technical meetings, technical visits and correspondence with academic and research institutions. Several States cited searches of such open source information (such as publications, research grants, patents, State managed databases on PhD research topics and grants) and tracking funding sources. Many also established communication channels through a point

[16] Nuclear fuel cycle-related R&D is defined in Article 18.a. as those activities which are specifically related to any proves of system development aspect of conversion of nuclear material, enrichment of nuclear material, nuclear fuel fabrication, reactors, critical facilities, reprocessing of nuclear fuel or processing of intermediate or high-level waste containing plutonium, high enriched uranium or uranitum-233, but do not include activities related to theoretical or basic scientific research or to R&D on industrial, radioisotope applications, medical, hydrological and agricultural applications, health and environmental effects and improved maintenance.

of contact at the SRA. One State cited the involvement of Government agencies that had roles related to nuclear power and/or R&D in sharing information on academic institutions/researchers. Two States reported that they had incorporated the requirements of Article 2.a.(i) of AP into licencing conditions or other legal compliance.

Top 3 steps to raising awareness about the AP among researchers/academics

Searching open source information (publications, research grants, patents, and State managed databases on PhD research topics, and tracking funding sources)

Conducting outreach (seminars, presentations, training sessions, technical meetings, technical visits and correspondence)

Incorporating AP requirements in licensing conditions

A demonstrably positive outcome of the reporting requirements in connection with nuclear fuel cycle-related R&D not involving nuclear material for some States was the improvement of States' awareness of where and by whom such activities were carried out within their own respective territories.

Five States responded that they had acquired knowledge of R&D activities, offering the following explanations:

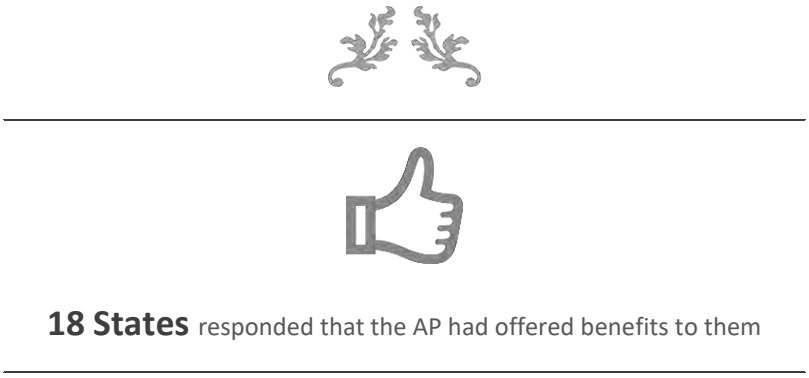
- The State had become aware of some four to five small-scale research activities over recent years through open source literature searches.
- The State had acquired information on international multilateral projects not involving nuclear material.
- The State was made aware of R&D being carried out, usually in academic institutions, but occasionally at smaller supplier firms. While some of these activities had been known to the State, they had not been specifically tracked by the SRA.
- One State responded that the discovery of the R&D activities had occurred as a direct result of the AP's entry into force as the State had not previously kept track of such activities.

While most of the States and EURATOM responded that the AP had not led to the actual discovery of any nuclear-related R&D being undertaken that was hitherto not known to the SRA, two States noted that it now had a better understanding in greater detail of what researchers were doing.

According to one respondent State, AP implementation in connection with R&D activities led not only to a better view than before of the R&D that was being conducted in the State, but also to the experts and researchers acquiring a better knowledge of safeguards.

1.8. Benefits

Recognizing that the implementation of APs by States would entail additional responsibilities for the States concerned, the IAEA Secretariat was of the view that, in addition to strengthening the IAEA's ability to fulfil its own safeguards responsibilities, it would also be of benefit to the States themselves. To assess whether that expectation had been realized, the participants were asked specifically whether the implementation of the AP had resulted in any specific benefits to them.



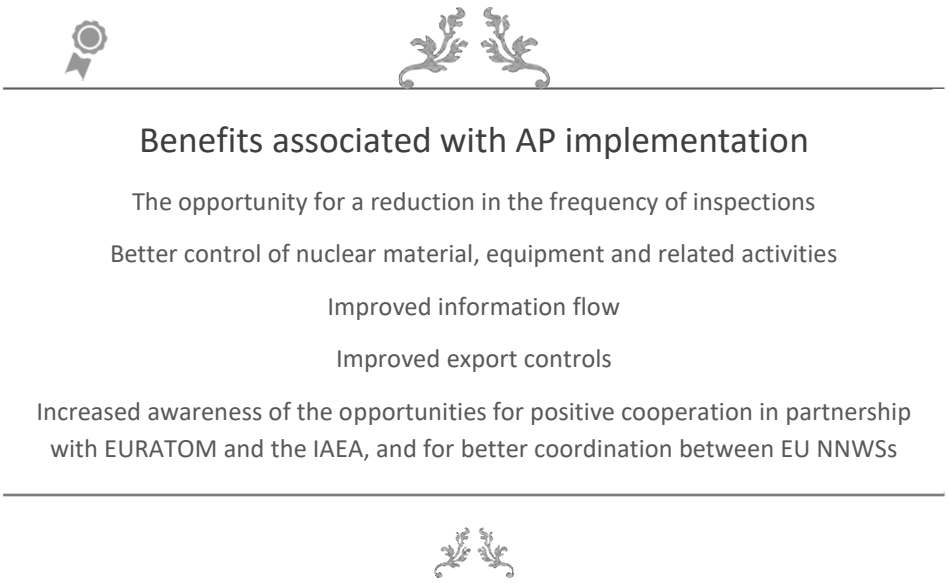
Eighteen States responded affirmatively and specified a number of examples of how the AP had offered benefits to each of them. Among the benefits reported were: better overall oversight of nuclear material and nuclear-related activities, including more information on past activities; more effective import/export controls; control of nuclear material on a smaller scale; and the placing under safeguards of previously exempted nuclear material.

Seven States pointed to better cooperation among State authorities and between the SRA and other stakeholders, as well as increased knowledge about safeguards and their importance. A number of States also indicated that the AP's implementation had resulted in the strengthening of the legal and regulatory framework for safety, security and safeguards and emergency preparedness.

States also noted that the implementation of the AP had strengthened cooperation with the IAEA and increased the confidence of the international community in the exclusively peaceful nature of their respective nuclear programmes. Similarly, EURATOM responded that, while the implementation of the AP had not had any real impact on the control of nuclear material, the information acquired through the AP "allows a wider knowledge of the nuclear programmes and, as such, enables a strategic planning of safeguards activities".

1.9. Lessons learned

Finally, the participants were asked what, if any, lessons could be learned from their experience in the conclusion/implementation of the AP and shared with other countries, especially those that had not yet concluded an AP. All project participants offered contributions in this regard.



While there was more work associated with AP implementation in the beginning, such as revising legislation and introducing new declaration tools, and subsequently, in replying to IAEA requests and collecting information from small users, there were also rewards, including but not limited to the opportunity for a reduction in the frequency of inspections. Among the most commonly cited were those related to the value to the State of implementing an AP, which included better control of nuclear material (including material that had previously been exempted from safeguards), equipment and related activities, and also improved export controls.

Many of the participants commented on the improvement in information flow, which had become "faster and more structured". A number of the participants noted an increased awareness of the opportunities for positive cooperation in partnership with EURATOM and the IAEA, and for better coordination between EU NNWSs.

The participants also offered advice on AP implementation. In more general terms, this should be part of the legal and regulatory framework for safety, security and safeguards, and also emergency preparedness. It was noted that, in this regard, precise and specific requirements should be established in the relevant legislation/regulations. High on the most-recommended list was that States should invest in capacity building for the SRA and in outreach to other stakeholders (for example, through implementation trials). The next most frequently offered suggestion was that the maximum benefits were derived when the State worked with the IAEA in a transparent, proactive and cooperative manner with continuous follow-up, including the offer of access on a voluntary basis. One State noted the importance of the SRA participating in all IAEA inspections and visits.

A common theme in the responses was the indispensability of an AP for a transparent nuclear programme. According to several participants, implementation of the AP enhanced the credibility of the whole safeguards system, which led to increased confidence on the

part of the international community in the peaceful nature of States' nuclear programmes and strengthened cooperation in the nuclear field.

"Safeguards is connecting State organisations and operators to find reasonable way[s] to succeed together. The main finding is that, with the AP, safeguards cannot be alone: it should be a part of a regulatory framework along with safety, security and also with emergency preparedness."

It was noted, however, the potential benefits of AP implementation would be fully realized only when States recognized that CAs are not punitive but rather part of a larger safeguards system, and when the IAEA fully leveraged the value of CAs and information from the AP in the implementation of the SLAs.

The results derived from the literature research conducted in the course of the project echoed these lessons, stressing the importance of the early adoption of the necessary legislative framework and early and frequent consultation and cooperation of the SRA with the IAEA (and the regional inspectorate, where appropriate) and a clear delineation of responsibilities, and also outreach to industry (including potential exporters and importers), research centres and other State authorities.

2. Detailed analysis of results

The second part of this report is intended to provide a more detailed analysis of the impact of the implementation of an AP and the extent to which it may, or may not, be dependent or affected by the relative size of a State's nuclear fuel cycle. For purposes of this analysis, the States have been sorted into one of three categories:

Category 1: Those States with extensive nuclear fuel cycles (12 States);

Category 2: Those States that have a research reactor (some of which also have either conversion or fuel fabrication facilities), but no operational power reactors (five States); and

Category 3: Those States that currently have little or no operational nuclear activity (three States).

The 3 Categories

Category 1: Extensive nuclear fuel cycles

Category 2: Only a research reactor, without operational power reactors

Category 3: Little or no operational nuclear activity

2.1. Impact on SRA

The two States that replied that other ministries shared some of the responsibilities for implementing the AP were both States with extensive nuclear fuel cycles (Category 1 States). The five EU non-side letter States (four in Category 1 and one in Category 2) under the AP to the European NNWSs' CSA, now bear joint responsibility with EURATOM for the implementation of safeguards.

In terms of human resources, of the six States that indicated the need to engage either a consultant or additional staff because of the AP, four were States with significant nuclear fuel cycles (Figure 9). The other two States were those with no operational nuclear activities, both of which had operational SQPs in place at the time of the AP's entry into force. As indicated above, however, approximately two-thirds of the States responded either that no additional staff had been hired or that the increase in hiring was not exclusively attributable to the AP. Those States included the majority of States in Category 1, all States in Category 2 and one State in Category 3.

As stated above, the majority of States responded that the conclusion of an AP had not required an increase in the budget for the SRA or other responsible national authority. This included nine of the 12 States in Category 1, four of the five States in Category 2 and one

of the States in Category 3. Of the remaining six States that responded (three in Category 1, one in Category 2 and two in Category 3), four indicated that, while there had been a budget increase, the increase was not attributable exclusively to the AP, that the costs had been incurred during the field trials that preceded the AP's entry into force or, in one instance, that there was little additional burden attributable to AP implementation since the SRA had already been collecting much of the information required under the AP. It was notable that the majority of the States in Category 3 responded that the SRA had required increased funding which they attributed at least in part to the AP (e.g. the creation of an export/import control section within the SRA). However, the budget increases included costs associated with training and the acquisition of equipment associated with the implementation of safeguards in general.

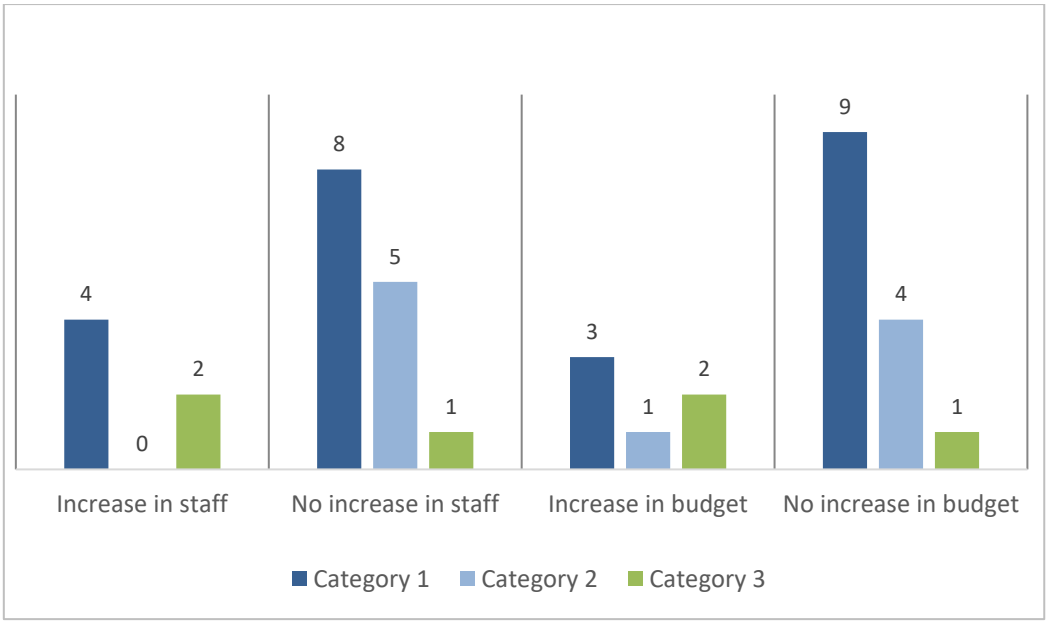


Figure 9: Has AP implementation required an increase in staff or budget?

The responses were somewhat different with regard to additional resources (human and financial) required by entities other than the SRA in the implementation of the AP, with nine States responding negatively, and ten States and EURATOM replying affirmatively. Category 1 was almost evenly split, with resources required by LOF operators and facility licensees to prepare declarations and participate in CAs. Several States in both Categories 1 and 2 referred to additional effort by universities and other academic institutions to report nuclear fuel cycle-related R&D. In both categories as well, States reported the support provided by other national authorities (e.g. export licensing authority, public health authority) mainly for data/information collection. Only one State in Category 3 cited the need for additional resources for training in nuclear material and detection.

2.2. National legislation and regulations

The scope of the State's nuclear activities did not seem to have an impact on the need for legislative/regulatory modifications. Not surprisingly, most of the respondents indicated that their respective legislation/regulations required modification, even if not all of the changes had been attributable exclusively to the AP.

In most instances where changes were necessary, the process generally took place between the signing of the AP and its entry into force or simultaneously with its entry into force, regardless of the scale of the State's nuclear fuel cycle. Only three States reported changes after the AP's entry into force (two in Category 2 and one from Category 3), but those changes were, in one case, not attributable to the AP, and in the other two appear to have been with regard to regulations rather than the underlying legislation.

In most instances, the SRA was solely responsible for the promotion of the necessary legislative and regulatory changes. However, in Categories 1 and 3, at least one respondent indicated that the SRA shared that responsibility with at least one other authority (e.g. the ministry of energy, health or economic affairs, an electricity board and/or parliament).

2.3. Assistance provided by the IAEA or other entities in preparation for the AP or its implementation

The need for such assistance before the AP's entry into force seemed to be independent of the scope of the State's nuclear programme, except that a higher percentage of States in Category 2 indicated that they had not found such assistance necessary. The States in Category 1 cited a wide range of types of assistance, predominantly through meetings with the IAEA and IAEA training and field trials (also cited by the States in Category 3), as well as seminars, workshops, conferences, technical visits, software for reporting and correspondence. Few concrete data were provided on the frequency of such requests for assistance, except to note that all three categories of States cited the IAEA's annual General Conferences as opportunities to meet with IAEA officials to discuss implementation issues.

In terms of States seeking assistance/clarification after the entry into force, slightly fewer Category 1 States responded affirmatively whereas in the other two categories, there was a slight increase in the number of States that had sought such assistance, predominantly through meetings with the IAEA, exchanges of emails and occasional workshops.

By and large, the frequency with which all categories of States sought assistance after the entry into force of the AP was cited as "ongoing" or "regularly", with an average of two to three times a year. Two of the States in Category 1 indicated that the initial frequency after the AP's entry into force was higher and had then tapered off with time and experience. Another State with a large nuclear fuel cycle programme reported consultations in the order of 10 to 20 times a year, while another State in Category 1 had held discussions in an AP working group established with the IAEA for several years until the IAEA had confirmed the quality of the AP declarations.

"[When we ratified the AP], there was no State with practice in the implementation of the AP at that time. Later on [we] shared [our] AP experience with other States and at several European and international level events."

Other resources for assistance were also made available from other States and non-governmental organizations in the conclusion or implementation of the AP. Among the States in each of the categories, several cited assistance in the form of workshops and training sessions provided through the US Department of Energy. The countries with the largest nuclear fuel cycles also cited information exchanges with EU experts on an informal basis, discussions and exchanges of information through ESARDA, and capacity building projects under the 2009–2014 Norwegian Financial Mechanism.

2.4. Training for SRA/operators

Among the responding States in Category 1, five States indicated that there was no additional training provided to the SRA as a consequence of the State's conclusion/implementation of the AP (Figure10). However, one of those States noted that there was proactive communication with the Operations Divisions of the IAEA's Department of Safeguards on implementation issues. Five other States in that category indicated that additional training was offered to SRA staff, mostly through the IAEA's training courses for SSACs, while others apparently hosted training courses in country. The figures provided would not permit a generalization of costs. However, EURATOM noted that it had jointly provided annual training and workshops to States and nuclear sites (training prior to entry into force of the AP, however, was conducted twice a year).

Some of the Category 2 States also offered training to the SRA staff. However, most of the training was not specialized in AP implementation, but rather part of the IAEA's SSAC courses as part of their compulsory training. The cost to one State was estimated on the order of $8,000 a year.

In Category 3, all States indicated that they had been provided with training, for which, at least in one case, the IAEA covered the costs. One State had also trained 15 people, which cost several thousand euro. Another State organized six domestic workshops, at a cost of approximately 18,000 euro per workshop, at which they trained 22 SRA staff and 50 customs administration employees.

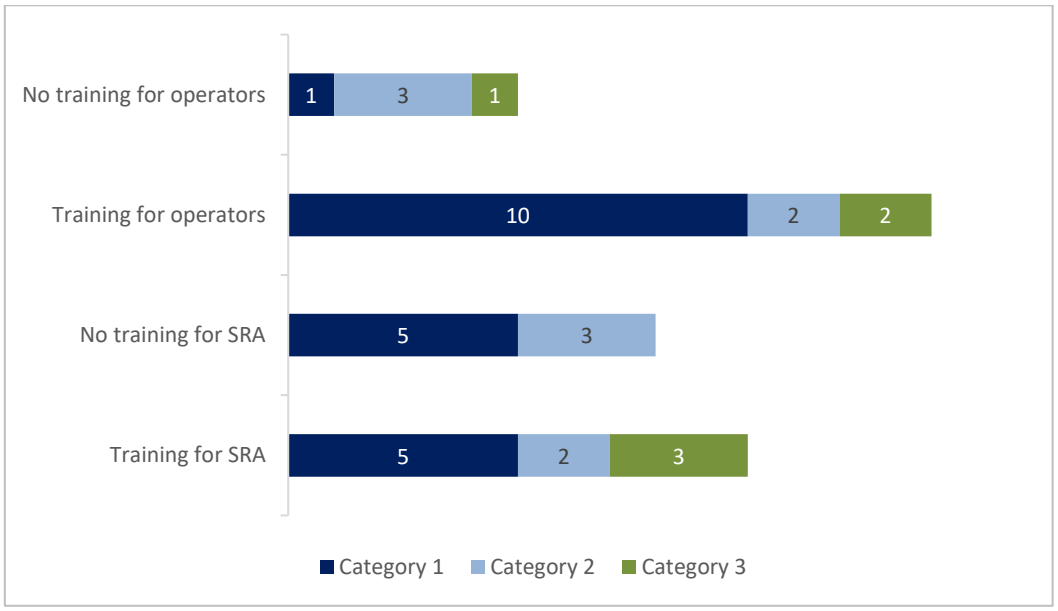


Figure 10: Was specialized AP training provided for operators or SRA staff?

As regards additional training for operators, all but one of the Category 1 States had secured additional training for operators by the SRA, jointly by the SRA and the IAEA, and/or by EURATOM, often jointly with the SRA. Slightly less than half of the States in Category 2 and slightly more than half of the Category 3 States offered training to operators with the support of the US government, the IAEA and/or the SRA.

2.5. Challenges in preparing for and implementing the AP

While many States shared similar challenges, there was a slightly different emphasis among the different categories of States. However, several States commented on the positive value of IAEA and EURATOM support in addressing these challenges through training, the publication of guidance documents and the development of reporting software.

Preparation and submission of declarations

The general challenge by far most commonly cited by States in Category 1 was identifying stakeholders and making them aware of the new requirements. Most of these issues arose in the preparation of the initial declarations and were described as having been largely resolved over time in consultation with the IAEA and through operator training.

As regards specific declaration requirements, over half of the States in Category 1, and EURATOM, indicated difficulties in collecting information about nuclear fuel cycle-related R&D not involving nuclear material under Articles 2.a.(i) and 2.b. and about other locations not subject to "traditional safeguards" (e.g. manufacturers of material and equipment specified in Annex II of the AP, required to be reported under Article 2.a.(iv)). These issues were addressed by the States in a variety of ways, including information collection from different sources (e.g. State databases on all State funded nuclear activities; export licensing lists; open sources), reaching out to regional authorities and stakeholders through meetings and interviews and adopting legislation that made reporting to the SRA compulsory. These challenges were echoed in the responses of several of the Category 2 States. In the words of one of the respondents:

> "Stakeholders were made aware by outreach letters through the Chamber of Commerce for the commercial sector and by personal contacts through external advisers (experts from academia) as far as universities were concerned. Stakeholders exporting relevant items were also informed directly by [the SRA]. Reporting obligations for experts were originally implemented through the terms and conditions of export licenses. After amendments in our legislation, export licenses now contain a reminder of the legal obligation to report."

One State in Category 1 noted an associated issue of clarifying the responsibility for declaring nuclear fuel cycle-related R&D not involving nuclear material in cases where the project was multinational and resolving discrepancies in the reporting.

A third of the countries in Category 1 and a majority of the Category 2 countries also reported having experienced challenges in defining the boundaries of facility and LOF sites in accordance with Article 2.a.(iii), issues that were resolved in consultation with the IAEA and visits to the sites in question.

The States in Categories 1 and 2 identified other declaration requirements that had presented some challenges, including those in connection with tracking previously exempted

nuclear material in connection with Article 2.a.(vii) and preparing Article 2.a.(x) declarations on a State's general plans for the development of its nuclear programme.

With regard to more general issues, some of the States reflected concerns about the security/confidentiality of relevant information. One State had encountered conflicts in balancing safeguards obligations with security obligations, a matter resolvable in consultation with the IAEA. The development of the SDP, which provides a mechanism for the submission of declarations and other communications to the Department of Safeguards using two-factor authentication and end-to-end encryption, has addressed many of the concerns about the protection of the information submitted to the IAEA.[17]

The challenge most cited by the States in Category 3 was the collection of relevant information, especially in connection with initial declarations and their submission to the IAEA. They were confronted with the challenges posed by a lack of training and knowledge about safeguards and a lack of staff and experience. However, all States indicated that many of these challenges had been overcome through training and practice. According to one of the States in this category, the Protocol Reporter, which was developed by the IAEA and is currently on its third iteration, facilitated the declaration process as had the SDP, although requiring some training. As with a few States in the other categories as well, one of the Category 3 States also experienced difficulties with the current iteration of the Protocol Reporter software.

Complementary access

One State in Category 1 reported having experienced no problems in the implementation of CA, while another State indicated that it had experienced minor difficulties in obtaining access in a specific instance (i.e. access to a location from which nuclear material had long been removed and an unrelated commercial activity was under way).

Among the States in this category that indicated that they had experienced some difficulties in CA implementation, there was a range of responses by Category 1 States. In terms of general issues, the following were mentioned:

- Access to locations that had previously had no experience with safeguards-related matters;
- The negotiation of managed access, explaining the purpose of CAs to facility operators and providing to inspectors information considered "classified" under domestic law;
- Resources and logistics (including the need to have staff available at short notice and the need for personnel other than safeguards experts), especially in the case of access to remote locations and where radiological protection arrangements might be necessary;
- Turnover in personnel at the national level and at the various locations subject to CA in the field.

A few specific issues were also reported by the respondents in this category, including a CA being triggered on a non-working day for the relevant ministry and a CA extending beyond the official working hours. In another instance, a Category 1 State referred to how the issue of access to buildings on an R&D site that were not related to the nuclear fuel

[17] See https://www.iaea.org/sites/default/files/sg-sdp.pdf for more information about the Safeguards Declarations Portal.

cycle was addressed. Although the buildings had been included in the State's declaration under its previous AP and the IAEA had had access to them, upon that State's accession to INFCIRC/193/Add. 8, the site definition was revised whereby the State's declarations were limited to those places where nuclear material/activities related to the nuclear fuel cycle were located. Before that action was taken, however, the IAEA was invited to re-enter the buildings which were intended to be removed from the State's declaration to confirm their status as not related to the nuclear fuel cycle.

The majority of the States in Category 2 responded that they had experienced no challenges in the conduct of CAs, with one State noting that CA was enforced as a condition for granting the relevant permits. However, concerns were expressed about information security, and the need for the development and implementation of security measures in connection with nuclear facilities and nuclear material.

In Category 3, one State responded that it had identified no challenges in connection with CAs. Another indicated that it had experienced minor challenges internal to the State with regard to facilitating access management and relevant administrative processes, including lack of knowledge of AP obligations by the relevant security agencies. The remaining State in this category cited poor transportation connections and the lack of basic equipment at the CA location.

A number of States in all Categories offered comments/suggestions for minimizing difficulties and facilitating access under the AP, including modification of relevant legislation to ensure that the State could secure the access provided for under the AP, and the identification of specific staff at relevant facilities and facility sites responsible for CAs to ensure smooth implementation. One State with a larger nuclear fuel cycle counselled that "smooth implementation of CAs, in particular, two hours' advance notice CA, needs the domestic mechanism of information flow" and direct communication by the SRA with facility operators "to help them understand what the IAEA and safeguards are".

"Following national workshops … and continued cooperation with the relevant entities, these entities now better understand the international obligations of the State and the significance for ease of access. Therefore smoother arrangements have been made, including pre-clearance procedures in some places and the whole access management system has been further developed to avoid unnecessary burdens."

The Category 2 State that indicated that it had had no difficulties in implementing CAs stated that "complementary accesses have not represented significant challenges since the country promotes and practices a transparency policy, directed and coordinated by the SRA." One of the Category 3 States reported that "following national workshops, [memoranda of understanding] and continued cooperation with the relevant entities, these entities now better understand the international obligations of the State and the significance for

ease of access. Therefore, smoother arrangements have been made, including pre-clearance procedures in some places and the whole access management system has been further developed to avoid unnecessary hurdles."

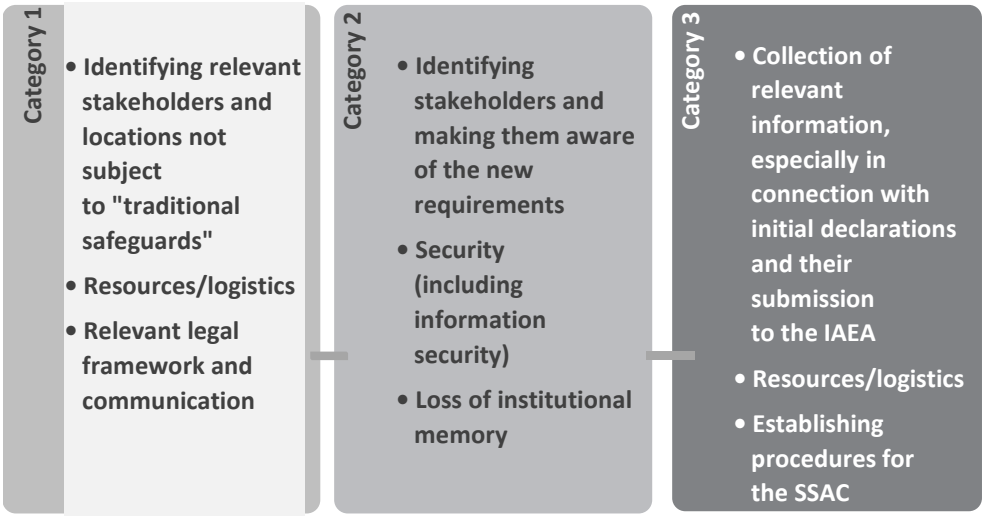
Other challenges

Eight of the twelve Category 1 States shared additional challenges related to the legal framework and communications. One State noted that it had not had a law in place for implementing the AP when it entered into force, but that this had been addressed by conducting a field trial in order to monitor the preparation of the first declaration. A number of States noted that difficulties had also arisen due to the absence of clear definitions of the roles and responsibilities in implementing the AP and/or because there were no specific regulations in place related to nuclear material used for non-nuclear purposes. Another Category 1 State referred to the challenge of establishing the status of no longer operational installations that were still listed with a zero nuclear material inventory.

Establishing secure lines of communication between the SRA and the IAEA and, where relevant, EURATOM was identified by a Category 1 State as another challenge, which had eventually been resolved in consultation with the relevant entities. It was also noted that communication issues were also alleviated by having an SRA representative present on site with updated information at each CA. Reference was also made to the loss of information about nuclear related activities owing to the mobility of personnel responsible for safeguards, especially as regards research and academic institutions and users of small quantities of nuclear material, a concern echoed in the responses of a number of States in Category 2.

An additional challenge cited by States in Category 2 related to the coordination and exchange of information between the various institutions of the State, educational institutions and the private sector.

Top challenges in AP implementation (by category)



A problem unique to States in Category 3 was the establishment of procedures for the SSAC, not surprisingly given that none of these States had operational nuclear facilities or activities that had been subject to safeguards procedures under the CSA. This was addressed through IAEA training and support, national workshops and engaging the relevant stakeholders.

2.6. Impact of the AP, the broader conclusion and integrated safeguards on frequency or intensity of IAEA access

The average number of years between the AP's entry into force and the drawing of the broader conclusion for the participating States altogether was 3.5 years. The average time for drawing the broader conclusion was 4.5 years for the eleven States in Category 1 for which the broader conclusion has been drawn and 2.2 years for the five States in Category 2.[18] As of the end of 2017, the IAEA had been implementing IS in 15 States with an average of 11.2 years of experience in each of the relevant Category 1 States and 13.6 years in the Category 2 States.

[18] The broader conclusion has not yet been drawn for one of the States in Category 1 or for any of the three States in Category 3.

4.5 years

Average length of time between AP entry into force and drawing of the broader conclusion

Category 1 States

Three quarters of the States with larger nuclear programmes responded that, overall, they had experienced a decrease in the IAEA's missions to the State since the AP's entry into force. Of these, several reported an initial increase in access attributable to CAs in the years immediately following its entry into force, but subsequent decreases over time, and further reductions after the implementation of IS (one State reported a reduction by 30% and another by 40%). Some of the decreases were identified as having been with regard to particular types of facilities (e.g. reactors, fuel fabrication plants, storage facilities); another State attributed the decrease to a reduction in the nuclear activities and direct use material in the State. Three of the States that reported reductions under IS reported a subsequent increase in IAEA access due to issues unrelated to the AP but rather as a function of changes in the State's nuclear programme (e.g. new nuclear facilities, repatriation of nuclear material, damaged fuel elements).

Only one States in this category reported that it had experienced no significant change with the AP's entry into force, adding that "there is no real impact of CAs on the SRA; if there is nothing to hide, CA is not very burdensome".

All States in Category 2 reported a decrease in the frequency of routine access in the State following the introduction of IS, with one reporting a decrease by some 30% to almost 70%. One remarked that initially more inspectors were required for more days but that now fewer inspectors were required for fewer days.

Integrated safeguards were not being applied in the Category 3 States as no broader conclusion had yet been drawn for them. One State (with a modified SQP) reported having had one ad hoc inspection, and no CAs, over the nine years since the simultaneous entry into force of its CSA and AP. On the other hand, a State with an SQP based on the old model experienced an increase in access due to the conduct of CAs (under the old SQP, the IAEA had no right to request access, so all access requested would have been under the AP). The remaining State indicated that it had not experienced a change in the frequency of access following the entry into force of the AP.

For its part, EURATOM reported that, since the entry into force of the NNWS AP, the total number of IAEA missions in the European Union had decreased but it did not offer specific statistics.

2.2 years

Average length of time between AP entry into force and drawing of the broader conclusion

Category 2 States

As of 2016, the IAEA had completed its review of the SLAs based on integrated safeguards. According to the responses of the participating States in which IS approaches had been being implemented (States in Category 1 and 2), the impact of that review had, on the whole, resulted in some minor decreases in IAEA inspections in a few States. Most decreases were reported for States with larger nuclear fuel cycles (Category 1 States). Only two States (both in Category 1) reported an increase in frequency following the review of the SLA, attributing the increase to an increase in random interim inspections or SNRIs.

As indicated in the previous section of this report, 18 States and EURATOM responded to questions about the average annual frequency of requests for CAs. In Category 1 States, the number ranged from less than one a year to four a year, with most reporting on average one to two a year. One State with a very large fuel cycle reported having received, on average, 10 to 20 requests for access annually; however, some of these requests for access were likely not attributable to AP issues. The States in Category 2, with some nuclear activities, reported an average frequency ranging from less than one a year to between two and four a year. The States in Category 3 reported an average of one a year with one State not having received any requests for CA.

Of particular interest was the reporting by several States in Category 1 and one in Category 2 of a significant drop in the number of CAs to zero during the period 2011–2015, with one State attributing this to a temporary shift in the policy of the Department of Safeguards.

The data provided with regard to the reasons for CA requests do not enable a detailed breakdown by category of fuel cycles. However, it appears that, regardless of the scope or scale of the State's nuclear activities, the reasons for invoking CA were predominantly to provide assurance of the absence of undeclared nuclear material and activities, rather than to resolve a question or inconsistency, and very rarely to verify the decommissioned status of a facility or a LOF.

The questionnaire also addressed the frequency of requests for clarification received by States from the IAEA. The majority of Category 1 States reported a yearly average ranging from "less than one" a year to "three to five" a year, with one reporting an average annual frequency of ten to twenty a year. Of the Category 2 and 3 States, the most cited averages were from "less than one" to "one to three" a year.

In terms of the effort expended in responding to IAEA requests for clarification, EURATOM and all but one participating State responded. Follow-up consultations with many of these States indicated that it was difficult to provide good estimates, as the length of time was associated with the nature of the question. Notwithstanding, the States did attempt to provide answers.

Of the Category 1 States, the estimate of staff time dedicated to responding to such requests ranged from negligible to seven person days per question. The yearly averages ranged from a couple of hours or days of staff time a year to one to three months a year. One State in Category 1 responded that such requests for clarification were usually addressed during trilateral information exchanges with the IAEA and EURATOM.

The estimates provided by the States in Category 2 ranged from one week to one month a year of staff time (with two States reporting that it had received no requests in the last four years). The Category 3 responses suggested a very quick turnaround time of a half hour to an hour, and a maximum of one week to one month a year. For its part, EURATOM indicated that it spent between one and three months of staff time on average each year responding to IAEA inquiries.

2.7. Academic and research institutions

The questionnaire included two questions intended to elicit information about what steps States had taken to ensure that academic institutions/researchers working on nuclear topics were aware of AP reporting requirements and whether, as a corollary to that question, the new obligation had resulted in any benefits for the State.

In terms of the steps taken, all three categories of States and EURATOM responded that they had engaged in active outreach with relevant institutions and conducted searches of a variety of sources of information, including publications, patents, and databases on research grants and PhD research topics, as described above. One State in Category 1 responded that it had involved government agencies, which had roles related to nuclear power use and R&D, in preparing AP declarations with regard to academic institutions/researchers.

"Those who are performing research in the field of the nuclear fuel cycle are obligated to report annually this research to the Authority, according to national legislation. Each year we send out a reminder to actors who have reported research to the Authority previously or have come to the attention of the Authority during the year. For facilities where we perform inspections and reviews of their management systems we periodically check their instructions regarding R&D reporting."

In terms of whether this obligation had resulted in any benefits, several States in Category 1 reported having discovered relevant R&D activities previously unknown to them, usually in academic institutions, but occasionally at smaller supplier firms, and information on international multilateral R&D projects not involving nuclear material. An additional State reported that, while it had been aware of the R&D activities, it had acquired in greater detail about them as a result of AP implementation. One Category 2 State reported that it had been made aware of some four or five small scale research activities over recent years through open source literature searches carried out in the course of implementing its AP.

2.8. Benefits

All but two of the 20 participating States offered examples of the benefits derived from the implementation of their respective APs, including all States in Category 3 and all but one each in Categories 1 and 2.

Among the Category 1 States, with the largest nuclear fuel cycles, the benefits included the following:

- Better cooperation among State entities and between the States and other stakeholders, and increased knowledge about safeguards and their importance;
- More effective import/export controls
- Better overall oversight, awareness and improved controls of nuclear-related activities and exempted material, including those for past nuclear activities;
- A better understanding of nuclear-related R&D being carried out in academic institutions; and
- Stronger relationships between government offices, allowing them to leverage each other's strengths and to follow up with each other's licensees.

The Category 2 States responded similarly in terms of the types of benefits that were derived from AP implementation, including improved oversight, and increased awareness and control of nuclear related activities.

"We consider that it is both a time and human resources consuming task that must be done every year, but we do believe that the AP is necessary to confirm no indication of the diversion of declared nuclear material from peaceful activities and no indication of undeclared nuclear material or activities for the State as a whole."

All Category 3 States identified specific benefits as a consequence of AP implementation including those cited by the Category 1 States. They also referred to economic benefits, strengthened national safeguards systems, strengthened cooperation with the IAEA, increased security and greater confidence of the international community in the peaceful nature of the State's use of nuclear material. A collateral benefit cited by one of these States was better tracking of the locations of radioisotopes in industrial gamma cameras. One of the participants in this category added the following:

> "[Implementation of the AP] significantly strengthened the [State's] safeguards system, where it allowed for a broader scope of control and state regulation. Additionally, it strengthened the cooperation with the federal customs authority and customs administrations … and cooperation with involved ministries and all chambers of commerce licensing any trade activities in the State. … "In addition, it increased the motivation] to further develop national awareness with regard to State obligations under [the] CSA and AP, and generally nuclear non-proliferation, on a national level."

2.9. Lessons learned

The lesson most often cited by States, regardless of the category, was that working with the IAEA in a transparent, proactive and cooperative manner, with continuous follow-up and voluntary offers, facilitated the implementation of the AP and offered the maximum benefit to the State concerned. One Category 1 State echoed that view, stating that "at the international level, the AP information can be crucial to give compete credible assurances. [The State] therefore believes that countries with a CSA, an AP and a broader conclusion should [have] reduced in-field verification activities. In this way, the Agency would gain additional resources that could be used for other areas of safeguards verification. The safeguards system should be more focused and adaptable to cover high risk areas, allowing for greater differentiation between States but avoiding discrimination."

The nature of the lessons learned seemed not to depend on the size of the nuclear fuel cycle

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In terms of lessons learned, the Category 1 States identified the following:

- The AP is necessary to confirm that there were no indications of the diversion of declared nuclear material from peaceful activities and no indication of undeclared nuclear material or activities for the State as a whole.
- It enhanced the credibility of the IAEA's safeguards system and the confidence of the international community.
- Implementation of the AP strengthened cooperation in the nuclear field.

- AP implementation increased awareness of the good cooperation in partnership with EURATOM and the IAEA and offered opportunities for better coordination among EU NNWSs.

One State noted that "a strong State regulator will manage AP issues the best". In that regard, States in this category offered some specific recommendations on the implementation of APs:

- A dialogue should be initiated with the IAEA on AP requirements at an early stage and the IAEA (and where relevant EURATOM) continuously consulted on issues such as sites and the content of declarations.
- The SRA should participate in all IAEA inspections, visits and CAs.
- States and operators should engage with the IAEA and EURATOM: their inspectors need to know them in theory and in practice.
- Precise and specific requirements with regard to the obligations of the SRA and entities subject to reporting and access requirements under the AP should be established in implementing regulations.
- An environment conducive to trust should be created by engaging competent staff.
- Processes for the collection and submission of the necessary information to the IAEA should be optimized.

The nature of the lessons learned seemed not to depend on the size of the nuclear fuel cycle, as responses from the Category 2 States echoed the lessons identified by the Category 1 States. However, they offered additional observations and advice:

- Don't take a narrow, legalistic approach to reporting but rather be transparent and consultative with the IAEA. For example, where the SRA discovers some R&D for which "reportability" is unclear or marginal, it is best to seek advice from the IAEA. That way, even if the SRA decides not to report it under the AP, the discussion about the R&D is still on the record with the IAEA.
- Article 4.d. "question or inconsistency" letters from the IAEA are not uncommon and should not be viewed as an accusation by the IAEA. It is best to work in a transparent and cooperative manner with the IAEA when responding to the issues raised.
- Prepare for CAs: have an internal checklist of what to do and what questions could come up. Advise your operators on what to expect.
- Conclude an AP as a necessary contribution to an effective global IAEA safeguards system and to global peace and security.

An additional concrete recommendation by States in both Category 2 and 3 was to invest in outreach to the stakeholders and in SRA capacity building through, for example, implementation trials (a recommendation echoed by EURATOM).

Although the States in Category 3 had no operational nuclear activities, each shared lessons learned in their implementation of APs:

- Many countries already have export control procedures, so it is easy for them to start implementing the AP. Those that do not have those controls but pursue certain activities related to the nuclear fuel cycle will only benefit from complying with AP provisions such as export control.
- The convening of a sub-regional workshop in collaboration with the IAEA and another State (in this case Japan), to promote the AP greatly shaped the States' appreciation of the AP as a benefit in the framework of global nuclear cooperation.
- An AP is indispensable for a transparent nuclear programme; it allows for broader control at the national level and should be the norm for every State pursuing a peaceful nuclear programme.

And final comments from EURATOM on lessons learned:

- Invest in information, awareness, training of the parties involved to prepare an implementing field that covers a wider set of stakeholders and activities than "traditional" safeguards.
- Continuous follow-up and consultation with the IAEA is important, particularly at the beginning of the process.
- Make use of voluntary offers/visits to the IAEA in connection with the preparation of AP declarations and CA pilot and test exercises.

Chapter IV: Conclusions

Despite the broad range of responses provided by the project participants, some of which were specific to a particular State or EURATOM, a number of general conclusions can be drawn.

Implications for the SRA: Authority, resources, legislation

Implementation of the AP was not all plain sailing, as each of the participants, regardless of the scale of nuclear activities, identified the need for extra work on the part of the SRA, in particular in the early stages of implementing the AP. The majority of respondents reported little or no budgetary impact due to AP implementation. However, slightly more States reported the need for additional human resources by parties other than the SRA and, to a lesser extent, by the SRA; and the need for training or outreach activities for the SRA, facility operators and research institutions. For virtually all project participants, the only aspect that remained largely unaffected by the AP was the authority responsible for the implementation of safeguards (except as regards the sharing of obligations as between EURATOM and the NNWSs of the European Union).

Challenges

The participants also cited a number of number of challenges in connection with AP implementation. At the top of the list of challenges overall was the need to modify existing legislation and/or regulations, a task that fell mostly to the SRA, but in some cases, to other parts of the national government as well. The loss of institutional memory on the part of the SRA and operators also posed difficulties. The participants cited both general and specific challenges associated with the submission of AP declarations. Among the general challenges were identifying the relevant stakeholders, uncertainty about what was required to be declared and difficulties in using the related reporting software.

Of the specific challenges, the most commonly cited was in connection with the reporting of nuclear fuel cycle-related activities not involving nuclear material. In terms of the implementation of CAs, the participants pointed to access in connection with specific types of locations (in particular defining the boundaries for sites of facilities and LOFs), security concerns raised by operators, issues associated with resources and logistics and the importance of effective communication. A point stressed by many of the participants was the challenge of clearly delineating the roles and responsibilities of the various stakeholders in implementing the AP.

Impact of AP implementation

The most direct impact of AP implementation was on the frequency and number of IAEA safeguards missions overall. The majority of the participating States reported that, overall, they had experienced a decrease in the overall number of IAEA missions to the State since the AP's entry into force, in particular those States in which IS had been implemented. However, the frequency and intensity of IAEA access may fluctuate throughout the years, impacted as they may be by factors other than the AP.

As of the end of 2017, the IAEA had drawn the broader conclusion for 16 of the 20 participating States within an average of 4.5 years from the AP's entry into force. In 15 of those States, the IAEA was implementing IS at the end of 2017. The review carried out between 2011 and 2017 of the existing IS approaches resulted in some modification in 10 of the 15 participating States implementing IS, with most of those modifications described as small or minor, some of which entailed increases and others entailing increases.

In terms of CAs, the participants' responses indicated that the requests for CA were predominantly made in connection with places on a site and for the purpose of assuring the absence of undeclared nuclear material and activities, rather than in connection with a question or inconsistency. A significant majority of the requests were made with at least 24 hours, rather than the two-hour notice also provided for in the AP.

As regards IAEA questions or requests for clarification under the AP, the responses consistently indicated that, as for CAs, the frequency and number was significantly higher in the first year or two following the AP's entry into force with a gradual tapering off in subsequent years.

Academic and research institutions: new stakeholders

In light of the extensive debate during the negotiation of the Model Protocol on the importance of understanding what nuclear fuel cycle-related activities *not* involving nuclear material were being conducted in States, the participants were specifically asked to share their experiences with collecting the relevant information requested under Article 2.a.(i) and 2.b.(i) of the AP. Almost all of the participants described challenges associated with identifying who the new stakeholders were, as noted above, and offered suggestions as to how to go about that process. They also provided advice on how to raise awareness about the AP among researchers and academics with a view to ensuring compliance with the AP requirements.

While most of the participants responded that these reporting requirements had not led to the actual discovery of any hitherto unknown nuclear related R&D, they had resulted in an improvement in the States' awareness of where and by whom such activities were being carried out within their respective territories. They had also resulted in increased awareness on the part of experts and researchers about the importance of safeguards.

Benefits

According to the project participants, the benefits of AP implementation – both direct in terms of reduction of Agency access, and collateral – outweighed the challenges presented by its implementation.

In terms of the latter, the participants cited the contribution that AP implementation had made to better oversight of nuclear material and nuclear-related activities, to better export and import controls and to improved cooperation between State entities. A number of States also indicated that the implementation of the AP had resulted in the strengthening of the legal and regulatory framework for safety, security, safeguards and emergency preparedness, strengthened cooperation with the IAEA and increased the confidence of the international community in the exclusively peaceful nature of their respective nuclear programmes. For its part, EURATOM noted that the information acquired through the AP "allows a wider knowledge of the nuclear programmes and, as such, enables a strategic planning of safeguards activities".

Lessons learned

In terms of lessons learned, the most often cited by States, regardless of the scope or scale of nuclear activities, was that working with the IAEA in a transparent, proactive and cooperative manner offered the maximum benefit to the State concerned. As noted by one State, "a strong State regulator will manage AP issues the best", recommending that the SRA participate in all IAEA inspections, visits and CAs. EURATOM spoke of the importance of investing in increased awareness and training of the parties involve, as well as continuous follow-up and consultation with the IAEA, particularly at the beginning of the process.

A common theme in the responses of the participants, again regardless of the scope and scale of nuclear activities, was the indispensability of an AP for a transparent nuclear programme. According to several participants, implementation of the AP enhanced the credibility of the whole safeguards system, which led to increased confidence on the part of the international community in the peaceful nature of States' nuclear programmes and strengthened cooperation in the nuclear field.

As a final note, the survey results point to resources available to States that are contemplating the conclusion of an AP, not just through IAEA and EURATOM training courses and IAEA safeguards advisory missions, but through the support and assistance of other States as well as professional associations such as ESARDA and the INMM.

ABBREVIATIONS

AP	Additional Protocol
CA	Complementary access
CSA	Comprehensive safeguards agreement
DOE	US Department of Energy
ESARDA	European Safeguards Research and Development Association
EURATOM	European Atomic Energy Community
IS	Integrated safeguards
INFCIRC/153	*The Structure and Content of Agreements between the Agency and States Required in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons* (INFCIRC/153 (Corr.))
INMM	Institute of Nuclear Materials Management
ISSAS	IAEA SSAC Advisory Service
ISWG	Implementation of Safeguards Working Group of ESARDA
LOF	Any installation or location, which is not a nuclear facility, where nuclear material is customarily used in amounts of one effective kilogram or less
Model Protocol	*Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards* (INFCIRC/540 (Corr.))
NGO	Non-governmental organization
NNWS	Non-nuclear-weapon State
NWS	Nuclear-weapon State
R&D	Research and development
SDP	Safeguards Declarations Portal
SLA	State-level approach
SLC	State-level concept
SQP	Small quantities protocol
SSM	Swedish Radiation Safety Authority
SRA	State or regional authority responsible for the implementation of safeguards
SSAC	State system of accounting for and control of nuclear material
VCDNP	Vienna Center for Disarmament and Non-Proliferation

2018:23

The Swedish Radiation Safety Authority has a comprehensive responsibility to ensure that society is safe from the effects of radiation. The Authority works to achieve radiation safety in a number of areas: nuclear power, medical care as well as commercial products and services. The Authority also works to achieve protection from natural radiation and to increase the level of radiation safety internationally.

The Swedish Radiation Safety Authority works proactively and preventively to protect people and the environment from the harmful effects of radiation, now and in the future. The Authority issues regulations and supervises compliance, while also supporting research, providing training and information, and issuing advice. Often, activities involving radiation require licences issued by the Authority. The Swedish Radiation Safety Authority maintains emergency preparedness around the clock with the aim of limiting the aftermath of radiation accidents and the unintentional spreading of radioactive substances. The Authority participates in international co-operation in order to promote radiation safety and finances projects aiming to raise the level of radiation safety in certain Eastern European countries.

The Authority reports to the Ministry of the Environment and has around 300 employees with competencies in the fields of engineering, natural and behavioural sciences, law, economics and communications. We have received quality, environmental and working environment certification.

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