

## IMPACT OF COVID-19 RESTRICTIONS ON IMPLEMENTATION OF RANDOM AND UNANNOUNCED SAFEGUARDS ACTIVITIES

J. Whitlock<sup>1</sup>, T. Renis<sup>2</sup>, G. Dyck<sup>1</sup>, V.Z. de Villiers<sup>1</sup>, H. Barroso Junior<sup>1</sup>, C. Norman<sup>1</sup>

<sup>1</sup> IAEA Department of Safeguards

<sup>2</sup> IAEA Department of Safeguards (retired)

### ABSTRACT

The COVID-19 pandemic resulted in the shutdown of air traffic, closure of borders, and the introduction of quarantine measures in an attempt to stop the spread of the virus. This created new challenges for the International Atomic Energy Agency (IAEA) in carrying out its verification duties all over the world. Random unannounced inspection regimes and short notice inspection regimes were particularly affected since the unpredictability of access could not be maintained. The IAEA Department of Safeguards collected and analysed data relating to the impact of COVID-related restrictions on IAEA safeguards activities, with a focus on random unannounced and short notice activities. A departmental framework was established to assess the impact of all cases identified and make recommendations for implementing mitigating activities in a consistent manner. This also supported the effectiveness assessment of mitigating activities on a case-by-case basis. The paper elaborates the scope of the project, the framework used to assess cases in a consistent manner, and the mitigating activities that were recommended in the context of implementing safeguards at the State level. It also describes some lessons learned in the process.

### 1. INTRODUCTION

The impact of the COVID-19 pandemic has been far-reaching, beginning in the first quarter of 2020. Governments around the world adopted strict health and safety related measures for the containment of the coronavirus, such as social and physical distancing measures, restricting inbound and outbound surface and/or air travel, limiting free movement of people, and closing borders. These measures had a significant impact on the International Atomic Energy Agency's (IAEA's) implementation of safeguards, in particular the conduct of a number of its planned in-field verification activities, requiring measures to be taken to overcome the challenges.

In close collaboration with the relevant State safeguards authorities, the IAEA identified and implemented the measures necessary to continue operating in the new and evolving environment, while subsequently implementing those activities that had to be postponed in the second quarter of 2020, based on their priority. This resulted in a significant increase of in-field activities in the second half of the year, which allowed the IAEA to complete most of its verification activities by the end of the year.

For some facilities, however, COVID-19 restrictions, including extended quarantine requirements for IAEA safeguards inspectors, affected the effectiveness of routine inspections involving the

timely conduct of random, short notice or unannounced inspections at facilities. Such inspections rely on factors such as randomness, unpredictability, and timely access, thereby strengthening their deterrent effect. In 2020, such inspections could not be fully implemented throughout the year in 28 States, impacting the attainment of some safeguards technical objectives, particularly at 16 operating facilities handling nuclear material in bulk form. The period when this occurred varied from a few days in some States, up to a few months in other States.

The IAEA Department of Safeguards foresaw this issue and took steps early in 2020 to address the challenge. An internal Working Group, with representatives from the Division of Operations, as well as the Divisions of Concepts and Planning (SGCP), and Information Management (SGIM), was formed to ensure consistency in the identification, analysis, and mitigation of verification activities impacted by COVID-19.

A departmental framework was established to assess the impact of all cases identified and make recommendations for implementing mitigating activities in a consistent manner. This also supported the effectiveness assessment of mitigating activities on a case-by-case basis, including the identification of potential anomalies for cases where the random verification regimes were effectively suspended during the affected periods.

The following sections elaborate the scope of this activity, the framework used to assess cases in a consistent manner, and the mitigating activities that were recommended in the context of implementing safeguards at the State level. It also describes some lessons learned in the process.

## **2. IMPACT OF COVID-19 ON IAEA VERIFICATION ACTIVITIES**

The measures introduced by a significant number of States, and the correlating impact to safeguards, in response to COVID-19 can be summarized as follows:

- *Flight restrictions*: severe commercial flight restrictions on the vast majority of routes, resulting in cancellations of nearly all flights, meant that many States were much harder to reach (some not at all through commercial carriers);
- *Travel across State borders*: the introduction of strict immigration measures such as only allowing entry to citizens and residents of the State concerned meant that some States were harder to access for non-residents;
- *In-State restrictions*: the introduction of restrictions, including on the movement of people and availability of other services such as hotel accommodation and food outlets within the country's territory resulted in limited movement, accommodation and other services available for IAEA safeguards inspectors and technicians.
- *Access restrictions to IAEA offices and laboratories*: IAEA offices, in accordance with the COVID-19 mitigation policies of their host States, instituted work-from-home protocols in Vienna and Seibersdorf, in addition to the regional offices in Tokyo and Toronto, which presented challenges associated with access to IAEA facilities and secure information networks;
- *Access restrictions to State facilities and sites*: the closure or introduction of strict access restrictions at nuclear facilities or sites meant that some State facilities or locations outside

facilities (LOFs) were unavailable or harder to access for IAEA safeguards inspectors and technicians to conduct in-field activities.

- *Health and safety requirements*: the introduction of quarantine restrictions, requirement of appropriate personal protective equipment (PPE) which was in short supply worldwide, and medical testing requirements upon arrival in a State and before accessing nuclear facilities, varied between States and tended to change at short notice.

Substantial adjustments of some processes and workflows at IAEA Headquarters in Vienna, and at its regional offices, were required to enable staff of the Department of Safeguards to effectively work remotely, while ensuring that the IAEA's information security measures continued to be applied to all safeguards information. As a result of these adjustments, the IAEA was able to continue to carry out safeguards activities at its Headquarters and regional offices, and deliver results that were close to pre-pandemic levels, albeit with some delays.

The most significant impact was on the IAEA's ability to conduct a number of its planned in-field verification activities. This required the IAEA to take a number of measures to overcome or mitigate this impact. These measures included:

- Prioritizing time-critical, in-field verification activities (with subsequent periodic reassessment);
- Strengthening the collaboration with the States concerned to arrange the necessary access to States, facilities and other locations for the IAEA's safeguards inspectors during the pandemic;
- Enhancing the protection of the health and safety of the staff on duty travel, including extended use of polymerase chain reaction (PCR) tests and personal protective equipment (PPE);
- Using chartered flights or other means of alternative travel to reach nuclear facilities and other safeguarded locations in States;
- Establishing a departmental framework and review process to assess the implementation issues due to the pandemic related measures, and recommend mitigating activities in a consistent manner.

The last of these measures listed above is the topic further elaborated in this paper, particularly as it relates to random and unannounced safeguards activities.

### **3. FRAMEWORK FOR ASSESSMENT OF RANDOM AND UNANNOUNCED SAFEGUARDS ACTIVITIES**

The IAEA Department of Safeguards created a framework, as summarized below, to assess the impact of COVID-19 restrictions on random and unannounced verification activities, on a case-by-case basis, and to make recommendations for implementing mitigating activities in a consistent manner.

### **3.1 Assessing the effectiveness**

The framework summarized the conditions necessary for effective implementation of random and unannounced inspection regimes, as follows:

- It is not possible for the operator or State to conceal or remove observable(s) within the notification period;
- It is not possible for the operator or State to predict the timing; and
- Conditions in the State/facility allow for successful implementation of agreed arrangements, e.g. provision of accurate information to support the inspections, retention times for nuclear material as specified, availability and timeliness of access, and ability to implement planned activities.

The framework further stated that when these conditions cannot be met, the consequences should be evaluated and mitigating activities planned.

In many States all of the above conditions were compromised to some degree by factors related to the COVID-19 restrictions on State and facility access, summarized in Section 2. Of particular relevance to the maintenance of the necessary conditions for effective implementation of random and unannounced inspection regimes listed above, these factors include:

- State closure of borders;
- State-mandated quarantine periods (14 days typically) for inspectors;
- Delays in renewal of expired entry visas for inspectors;
- Requirements for airport access by inspectors negotiated with the State;
- State requirement for escort of inspectors during all travel within the State.

During the time period where one or more of these factors led to a State's awareness of the IAEA's inability to conduct random or unannounced verification activities, it could be assumed that these random and unannounced inspection regimes were effectively suspended.

### **3.2 Purpose of random and unannounced inspections**

The framework clarified that when assessing the impact of the above conditions, it is important to consider the purpose(s) of the inspection, the type of facility and type and quantity of nuclear material concerned, and the impact on the relevant acquisition path (i.e., the specific safeguards technical objective being addressed).

In general, random and unannounced inspection activities are implemented by the IAEA for the following purposes:

- Quantity component for the detection of diversion of declared nuclear material (for protracted diversion), including verification of both flows and inventory;
- Timeliness component for the detection of diversion of declared nuclear material (for abrupt diversion);

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- Coverage of ‘borrowing scenarios’ within a State;
- Detection of tampering with containment and surveillance (C/S) measures (e.g., in conjunction with Remote Data Transmission (RDT) to IAEA Headquarters);
- Maintenance of continuity of knowledge; for example, unannounced inspections covering spent fuel transfers (as an alternative to C/S);
- Detection of facility misuse (undeclared production or processing), including undeclared design changes;
- Detection of undeclared nuclear material and activities for the State as a whole; e.g., Complimentary Access.

The types of in-field safeguards activities potentially affected by COVID-19 restrictions include:

- Limited frequency unannounced access (LFUA) activities at enrichment plants;
- Short notice random inspections (SNRI) at fuel fabrication plants, conversion plants, storage installations, on-load reactors;
- Unannounced inspections (UI) at research reactors, light water reactors (LWRs), storage installations, and HEU/Pu storage facilities;
- Random inspections and random interim inspections (RI/RII) at nuclear research facilities, research reactors, LWRs/HWRs, spent fuel storage facility (SFSF), spent fuel (SF) dry/wet storages, and reprocessing plants;
- Complementary access activities (CA).

### **3.3 Identifying mitigating measures**

The framework established that when the conditions listed in Section 3.1 could not be met, the impact needed to be assessed in light of the purpose of the inspection (as summarized in Section 3.2). Consideration should be made of the potential scenarios that would undermine the effectiveness of the inspection, and what could be done to address these. In many cases, if unannounced or short notice activities could not be effectively conducted, probabilities of detection of some scenarios, for the time affected, may be very low or zero. If unpredictability and/or timely access cannot be achieved, it may be necessary to apply other measures and/or change to a different inspection regime to meet the technical objectives.

In some cases, the framework noted that a technical objective (TO) may still be met, but partially with lower ‘coverage’. For example, if short-notice random inspections (SNRIs) could not be implemented at fuel fabrication facilities in order to cover 100% of nuclear material flow and borrowing scenarios, returning to a regime of scheduled inspections at the fuel fabrication facilities may cover some lower percentage of the nuclear material flow. ‘Borrowing’ inspections at other facilities may also be required.

The framework noted that in some cases when TOs cannot be met according to the IAEA’s original implementation plan, alternative measures might be available elsewhere in the State’s acquisition path, through the adjustment of priorities and planned level of activities. In these cases,

the analyses should be fully documented and the Annual Implementation Plan (AIP) for the State updated with a clear rationale provided.

In summary, the framework recommended that mitigating measures to cover a given TO might fall under one or more of the following three options:

- delayed implementation of the original activity to cover the TO;
- implementation of an alternate activity to address the TO; and/or
- implementation of an extra activity or adjusted coverage (priorities) elsewhere in the relevant acquisition path.

### **3.4 Documentation and review**

The framework established that assessments of impact and identification of mitigation measures, on a case-by-case basis, would be documented by the responsible State Evaluation Group (SEG) and reviewed by an internal Working Group. The Working Group, with representatives from the Division of Operations, as well as the Division of Concepts and Planning (SGCP), and the Division of Information Management (SGIM), ensured consistency across the Department of Safeguards in the response to impacted by COVID-19.

## **4. OUTCOMES AND LESSONS LEARNED**

The IAEA identified that random and unannounced inspection regimes could not be fully implemented throughout 2020 in 28 States due to COVID-19 restrictions. This impacted the attainment of some safeguards technical objectives, particularly at 16 operating facilities handling nuclear material in bulk form. The period when this occurred varied from a few days in some States, to up to a few months in other States. These occurrences were recorded as anomalies in the Departmental register of safeguards issues.

Many of these States had an additional protocol in force which provided the IAEA with additional verification tools and measures, including additional in-field verification activities and *ad hoc* analysis at Headquarters, to meet the safeguards objectives for these States. For other States, mitigating measures were implemented during subsequent inspections, design information verification activities, or other visits at the facilities involved. As a result, the IAEA conducted a high number of design information verification and complementary accesses in 2020 compared to previous years, as well as more frequent reviews of safeguards relevant information and safeguards data remotely transmitted to IAEA Headquarters from unattended systems installed in facilities.

General lessons learned from this process include:

- The framework represented a standardized approach to identifying and analysing the impacts that proved beneficial to those State Evaluation Groups (SEGs) performing the assessments, and supported consistency across the Department of Safeguards in its response. In particular, it was important to have a clear and consistent understanding, across the Department, of the role and determination of randomness in safeguards activities, and the impact of losing it for a given duration.

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- The Acquisition Path Analysis (APA) for a given State provided useful information for the assessment process, identifying the impacted technical objectives and suggesting alternate steps in a given acquisition path where priorities and activities might be focussed as a mitigating measure.
- In some specific cases it was useful, for the purposes of assessment, to separate the Material Balance Period (MBP) into different periods of coverage: zero detection probability for periods of no random access, and non-zero for periods when random access was restored. This focused the effort to identify mitigating measures on the different needs during each period: alternate activities (at IAEA Headquarters or elsewhere in the State acquisition path) during the period of no access, and increased or alternate in-field activities during the period of restored access.
- The value of proactively negotiating alternative in-field activities was demonstrated, in the context of implementation of mitigating measures during restored access, and also in light of the possibility for continued or returning restrictions as the pandemic continued.
- The value of surveillance measures and other unattended measurement systems (UMS), especially with remote data transmission (RDT) to IAEA Headquarters, was demonstrated.
- The value of clearly understanding the parameters associated with misuse scenarios covered by short notice inspections (e.g., persistence time, identification feasibility), and the associated detection probabilities, was demonstrated.
- Regardless of the level to which detection probability during an impacted period can be partially recovered, there is additional merit in performing extra activities or increasing the intensity of scheduled activities in order to regain confidence. This logic is particularly relevant for cases where timeliness was lost and inventory knowledge needed to be restored with a level as close as possible to the Physical Inventory Verification (PIV) level.

## **5. CONCLUSION**

The global COVID-19 measures presented a profound challenge to the IAEA in meeting its mandate to implement safeguards. Despite these difficulties, the IAEA's response, in close collaboration with relevant State safeguards authorities, enabled it to maintain a level of effectiveness of safeguards implementation consistent with previous years, and at the end of 2020 to meet its safeguards objectives and draw its safeguards conclusions.

For a number of States with facility safeguards approaches dependent upon random and unannounced in-field activities, the temporary restrictions on State access resulted in an inability to attain some technical objectives. A framework for identifying, assessing, and planning mitigating activities to address these technical objectives was created by the Department of Safeguards, along with a centralized Working Group for ensuring consistency and effectiveness. Specific follow-up actions were identified for a total of 28 States affected in this manner, allowing the IAEA meet its safeguards objectives for these States despite the unique and unexpected challenge this presented. Lessons were learned that will ensure that the IAEA is prepared for other challenges, whether through the continuing threat of COVID-19 at the time of writing, or other unforeseen events.