

**IMPLEMENTATION OF A PERFORMANCE-BASED INSPECTION
REGIME FOR NUCLEAR SECURITY IN BRAZIL**

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Abstract

On October 15, 2021, the Brazilian Congress enacted Law No. 14.222 that created the Autoridade Nacional de Segurança Nuclear (ANSN). This national authority is responsible for authorizing, inspecting, and taking enforcement action, as needed, to ensure the licensee's physical protection systems achieve the requirements defined by ANSN Standards. [1][2] On April 29, 2021, the Comissão Nacional de Energia Nuclear (CNEN), the national authority responsible for nuclear security oversight prior to enacting Law No. 14.222, and the United States Department of Energy (USDOE) National Nuclear Security Administration (NNSA) signed two project action sheets to develop inspection manuals that focus on designing and implementing performance-based inspection methods and to develop training for ANSN inspectors on the use of the inspection manuals. Project action sheet No. 27 focuses on an initiative to develop a set of assessment guides to be used by ANSN nuclear security inspectors for conducting performance-based oversight. [3] Project action sheet No. 28 focuses on collaboration to develop and transition training curricula for conducting performance-based inspections. [4] Each project action sheet includes a defined set of tasks with assigned roles and responsibilities. This paper describes the objectives for each action sheet, the work performed to date as part of the joint effort to establish and implement a performance-based inspection regime in Brazil, and future engagement activities envisioned under each action sheet. The paper also describes the challenges and opportunities that ANSN has realized due to enactment of Law No.14.222 that transitioned nuclear security oversight responsibilities from CNEN to ANSN.

Purpose and Objective

This paper describes a collaborative effort between NNSA and ANSN to develop inspection manuals and to prepare training curricula to implement a performance-based inspection approach for ANSN nuclear security inspectors. It includes a brief review of the Law 14.222 that created ANSN, a summary of the transition of nuclear security responsibilities from CNEN to ANSN, an overview of the current nuclear security inspection approach implemented by ANSN, the need to implement a performance-based approach to nuclear security inspections, an overview of the current status and future plans associated with a collaborative effort between ANSN and NNSA to prepare and execute tasks identified in Project Action Sheets under the *Agreement between the Department of Energy of the United*

States and the National Nuclear Energy Commission of Brazil concerning Research and Development in Nuclear Material Control, Accountancy, Verification, Physical Protection, and Advanced Containment and Surveillance Technologies for International Safeguards Application (hereby referred to as the Agreement).

Overview of the Law that Created the Brazilian Autoridade Nacional de Segurança Nuclear

Law 14,222, of October 15, 2021, establishes the creation of the new National Nuclear Safety, Security and Safeguards Authority (ANSN), based on the separation of the Directorate of Nuclear Safety, Security and Safeguards (DRS) from the National Nuclear Energy Commission (CNEN). This law determines the purpose for the newly developed authority, defines the origin of its resources and defines its competencies and obligations to the citizens of Brazil. [2]

The competencies and requirements assigned to ANSN by the law include, the establishment of specific regulations for nuclear safety, nuclear security and radioprotection, the evaluation and inspection of the safety of nuclear and radioactive materials and their associated facilities, and the issuance of licenses and authorizations for these facilities, as well as the collection of fees and fines to include the application of legal sanctions, in cases of serious infringement.

In addition, ANSN will be responsible for giving orientations and guidance for actions of municipal, state, and federal public entities regarding nuclear safety, nuclear security and radioprotection of nuclear activities and facilities and informing the population about these activities and facilities, as necessary.

ANSN will also be responsible for giving specialized opinion on request, on bills, treaties, or various other types of commitments, including international commitments made under treaties, conventions, or agreements, and collaborating with international organizations, in addition to acting in nuclear safety, nuclear security and radioprotection of major events. Therefore, ANSN plays a major role in the State's responsibility to establish, implement and maintain an appropriate physical protection regime applicable to nuclear material and nuclear facilities under its jurisdiction as described in Article 2.A.1 of the Amendment to the Convention on the Physical Protection of Nuclear Material (A/CPNM) [INFCIRC/274/Rev.1/Mod.1 (corrected)]. [5]

Summary of Transition from CNEN to ANSN and Roles and Responsibilities of ANSN Nuclear Security Department

The National Nuclear Energy Commission (CNEN) is a federal autarchy created for the development of the Brazilian national nuclear energy policy. [6] It is divided into three directorates, among which the Directorate of Nuclear Safety, Security and Safeguards (DRS), establishes rules and regulations and is responsible for licensing and supervising nuclear and radioactive facilities and activities related to these installations in Brazil, and the Directorate of Research and Development (DPD), which is responsible for research and development activities within the nuclear area, including the application of postgraduate courses. The Directorate for Institutional Management (DGI) is responsible for logistical and administrative support. The formation process of this organizational structure developed throughout the existence of CNEN due to the evolution of the Brazilian national energy policy during its existence.

The permanence of all these activities under the same institution, over the years, led to questions and criticisms and the separation of regulatory activities from those of research and promotion of nuclear energy in different institutions, came to be seen with increasing attention,

due to possible conflicts of interest and the need to streamline the process of managing these various activities.

In addition, in terms of international commitments, Brazil is a signatory to the Amended Convention on the Physical Protection of Nuclear Material (CPPNM) that was ratified by Brazil on March 18, 2022 [7], of which Fundamental Principle D establishes that the State designates an independent competent national authority for the nuclear area. Fundamental Principle D states:

“The State should establish or designate a competent authority which is responsible for the implementation of the legislative and regulatory framework, and is provided with adequate authority, competence and financial and human resources to fulfill its assigned responsibilities. The State should take steps to ensure an effective independence between the functions of the State's competent authority and those of any other body in charge of the promotion or utilization of nuclear energy. [5]”

In this way, the idea of a regulatory authority for the nuclear area emerged and developed. However, the process is slow and remains to be completed. Several discussions were held on how this new authority would be created and structured, how it would be inserted within the Brazilian Nuclear Program (PNB) and how it would relate to the other institutions that are part of the Program. In the end, it was decided to separate DRS, the regulatory arm of CNEN, taking advantage of the existing structure, mainly due to its simplicity and lower economic impact.

Decree 11.142, of July 21, 2022, provides the structure of the new ANSN, which will have, among other bodies, two Directorates. [8] One of them, the Directorate of Radioactive Installations and Control, will be responsible for planning, coordinating, regulating, and supervising ANSN's actions and activities related to physical protection.

As the transition process has not yet concluded, a more detailed structure, with a better definition of roles and responsibilities and the creation and distribution of internal organizational units, has not yet been formally established. The details for the creation of the various organizational units and their specific roles and responsibilities as it relates to Brazil's nuclear security regime are under discussion.

Overview of the Current Inspections Approach Utilized by CNEN/ANSN for Nuclear Security Inspections

Physical protection inspections in Brazil currently follow a mixed, prescriptive, and performance-based pattern, following the provisions of current physical protection regulations. Prior to November 2019, physical protection inspections in nuclear and radioactive facilities were carried out in accordance with the old CNEN NE 2.01 standards, which were very prescriptive but also very comprehensive. [9]

A revision of this old normative instrument was then carried out, which resulted in three new, more specifically focused regulations, one of them focused on nuclear materials and facilities, the CNEN NN 2.01 which, in several articles, addresses the issue of the evaluation of the physical protection system design of a facility. [10] This new normative instrument was adopted precisely to modernize and make the inspection methodology more accurate.

CNEN NN 2.01, although still retaining a certain prescriptive nature in establishing its requirements, also refers, throughout its text, to the subject of performance evaluation. Its Article 16, for example, talks about carrying out periodic exercises and tests so that the operator can carry out a self-assessment in terms of personnel and equipment performance. [10] Article 27 specifically talks about security force assessments. [10] Article 34 requires the operator to estimate the times to certify an alarm and the response times of both the security force and the external response force in their physical protection plans. [10] Article 35 establishes that tests, simulations, and measurements may be requested, or carried out voluntarily by the operator as

a demonstration, during an inspection, to assess the operability and effectiveness of the detection, alarm, and certification systems, or even the delay and response times. [10] However, more guidance is needed to ensure performance-based inspections are performed in a consistent manner to accurately assess if the physical protection system design meets requirements defined as part of the licensing and authorization process. A discussion was held between nuclear security subject matter experts at ANSN and NNSA to determine if a collaborative effort could be initiated to develop performance-based inspection guidance that would be published in ANSN manuals to standardize the approach for performing and assessing the results of performance-based inspections for licensee physical protection systems. Both ANSN and NNSA agreed to tasks described under Project Action Sheet 27 titled *Development of Assessment Guides for Performance-Based Nuclear Security Inspections* and Project Action Sheet 28 titled *Joint Workshop on Performance-Based Inspection Methods for Nuclear and Radiological Security*.

Overview of Project Action Sheet 27 Objectives and Current Status

On April 29, 2021, by exchange of letters, the Director of the Brazilian Comissão Nacional de Energia Nuclear and the Director of the United States National Nuclear Security Administration, Office of International Nuclear Security signed Project Action Sheet 27. [3] The Project Action Sheet notes that CNEN¹ and NNSA “intend to carry out a cooperative effort on development and implementation of physical protection methodologies, training, and performance testing concepts. This effort includes an initiative to develop a set of assessment guides to be used by CNEN nuclear security inspectors for conducting performance-based oversight.” [3] This Project Action Sheet includes four defined tasks. Task 1 includes conducting an initial scoping meeting to identify the nuclear security subject matter that should be addressed by the assessment guides. Task 2 includes a discussion to develop the table of contents and outline for each assessment guide intended for development under the Project Action Sheet. Task 3 provides for collaboration to draft the individual assessment guides. Task 4 includes a final review and publication of the assessment guides within the framework of CNEN/ANSN publication approval process. [3]

The collaborative effort under Project Action Sheet is ongoing but has been impacted primarily due to 1) the global COVID-19 pandemic which restricted the ability to meet in person, and 2) finalizing the organizational structure of ANSN and the roles and responsibilities assigned to the various units created as part of the transition of roles and responsibilities from CNEN to ANSN. However, multiple video teleconferences were held between ANSN and NNSA subject matter experts and it was decided that the first assessment guide to be drafted would focus on conducting performance-based inspections of physical protection system detection and assessment sub-systems. The initial discussion for developing the detection and assessment guide focused on sharing experiences related to conducting performance-based inspections in both countries. Nuclear security experts from NNSA shared the structure and content of assessment guides used by NNSA as part of their assessment activities. A copy of the NNSA *Physical Security Systems Assessment Guide* published in December 2016 was provided to ANSN as a reference. This Assessment Guide includes information on conducting performance-based assessments of physical protection systems at NNSA facilities in the United States.

Additional virtual meetings were held to develop the table of contents and outline for the ANSN Detection and Assessment Guide. Nuclear security experts at ANSN used the outline

¹ Note that the reference to CNEN in the Project Action Sheets is consistent with the reference to ANSN when the new roles and responsibilities for the ANSN Directorate of Radioactive Installations and Control are defined within the new organizational hierarchy.

and table of contents developed under Task 2 to prepare an initial draft of the ANSN Detection and Assessment Guide for use by inspectors in the field. Additional virtual meetings were held to review the draft Assessment Guide to align it with the performance objectives defined in the CNEN NN 2.01 standard. A final draft of the ANSN Detection and Assessment Guide has been prepared and is currently under a final review by both sides. This Assessment Guide will be used to develop the training curricula outlined under Project Action Sheet 28.

Overview of Project Action Sheet 28 Objectives and Current Status

Project Action Sheet 28 was signed by both sides on the same date as Project Action Sheet 27 by exchange of letters. This Project Action Sheet focuses on a collaborative effort to develop training curricula that is intended to support a national workshop that utilizes the assessment guides developed under Project Action Sheet 27. [4] This Project Action Sheet includes six tasks.

The first task involves conducting an in-person planning meeting to develop and finalize the workshop agenda, prepare a project management schedule, assign roles and responsibilities for developing workshop lesson plans and exercises, determine how the workshop may be conducted either via long-distance learning, in person or a blend of these approaches, and discuss logistical preparations for executing the joint workshop. The second task includes a collaborative effort to jointly develop lectures, participant guides, facilitator guides and all necessary supporting documentation needed to effectively conduct the Joint Workshop on Performance- Based Inspection Methods for Nuclear and Radiological Security. The third task involves a collaborative effort to conduct a virtual version of the Workshop to assess the applicability and quality of the workshop based on participant feedback. The results from task three will be used to improve the curricula developed under task two. Task four includes a collaborative effort to conduct an in-person version of the Workshop that includes any recommended changes based on participant feedback from task three. Task five includes a collaborative effort to conduct a formal evaluation of the in-person Workshop performed under task four. The feedback received from the participants will be used to further improve the applicability and effectiveness of the training curricula. This approach is consistent with the Systematic Approach to Training that includes analysis, design, development, implementation, and evaluation for a professional work environment. The sixth task involves a collaborative effort to transition all training curricula to ANSN for use in their internal formalized training program. [4]

As for the status of Project Action Sheet 28, some initial discussions have occurred that focused on a proposed agenda and course outline for conducting performance-based inspection for nuclear and radiological security. However, further progress has been delayed because completing the initial Assessment Guides under Project Action Sheet 27 is a priority at this time. Both sides intend to re-engage on the Workshop curriculum development, finalize the agenda, and schedule the Workshop at an agreed upon time in 2024. Additional Workshops may be coordinated and conducted by ANSN for their national inspectors in the future as an activity outside of the current scope of this Project Action Sheet.

Summary

The collaborative work performed under Project Action Sheet 27 and Project Action Sheet 28 under the Agreement demonstrates the commitment that both sides have in strengthening the international nuclear security regime. This collaborative effort also demonstrates the interest that ANSN and NNSA have in related to conducting joint projects for the research, development, testing, and evaluation of nuclear material control, accountancy, verification, physical protection and advanced containment and surveillance technologies,

techniques, or procedures. The Assessment Guides developed under Project Action Sheet 27 will be used to support the training and qualification program developed by ANSN for their nuclear and radiological inspection program. Both sides intend to further their collaboration on nuclear security best practices at the national and facility level to promote effective implementation of recommendations contained in the International Atomic Energy Agency (IAEA) Nuclear Security Series publications. The collaborative effort to share nuclear security best practices is consistent with Essential Element 6: International Cooperation and Assistance as described in the IAEA Nuclear Security Series No. 20 publication titled *Nuclear Security Fundamentals: Objective and Essential Elements of a State's Nuclear Security Regime*. Essential Element 6.d notes that “Cooperating and exchanging experiences and information, including on the establishment, implementation, maintenance and sustainability of *nuclear security systems*” is an important function of an effective nuclear security regime. [11]

It is further noted that the collaborative effort under Project Action Sheet 27 and Project Action Sheet 28 also support Essential Element 12: Sustaining a Nuclear Security Regime. This essential element notes that maintaining a trained and qualified staff is essential to sustaining an effective nuclear security regime in the State. [11] Therefore, the collaborative work performed under these Project Action Sheets promotes a continuation of the excellent relationship between ANSN and NNSA for implementing nuclear security best practices.

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