EPREV REPORT

IAEA | Emergency Preparedness Review EPREV

PEER APPRAISAL OF ARRANGEMENTS IN THE REPUBLIC OF CUBA FOR PREPAREDNESS AND RESPONSE FOR A NUCLEAR OR RADIOLOGICAL EMERGENCY

from 2018-11-19 to 2018-11-28
Havana, Cuba

International Atomic Energy Agency

FOREWORD

Within the United Nations system, the *International Atomic Energy Agency* (IAEA) has the statutory functions of establishing standards of safety for the protection of health against exposure to ionizing radiation, and of providing for the application of these standards. In addition, under the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency* the IAEA has a function, if requested, to assist Member States in preparing emergency arrangements for responding to nuclear accidents and radiological emergencies.

In response to a request from the Government of Cuba, the IAEA fielded an *Emergency Preparedness Review* (EPREV) mission to conduct, in accordance with Article III of the *IAEA Statute*, a peer review of Cuba's radiation emergency preparedness and response arrangements vis-à-vis the relevant IAEA safety standards.

The number of recommendations, suggestions and good practices is in no way a measure of the status of the emergency preparedness and response system. Comparisons of such numbers between EPREV reports from different countries should not be attempted.

CONTENTS

1. EXECUTIVE SUMMARY

This report provides the results of the *Emergency Preparedness Review* (EPREV) mission to the Republic of Cuba, held from 19 to 28 November 2018. The mission was undertaken by the *International Atomic Energy Agency* (IAEA) based on a request from the Government of the Republic of Cuba. EPREV missions are designed to provide a peer review of emergency preparedness and response (EPR) arrangements in a country based on the IAEA safety standards. The mission was focused on the emergency preparedness categories III and IV, as defined in the *IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency* [1]. The team for the EPREV mission consisted of international EPR experts from IAEA Member States as well as a team coordinator from the IAEA Secretariat.

This report includes recommendations and suggestions for improvements based on the IAEA safety standards as well as good practices that are considered as models for other Member States. In some cases, improvements in line with the detailed findings are already being undertaken. In other cases, the Government of the Republic of Cuba should adopt an action plan to implement the recommendations and suggestions.

The Government of the Republic of Cuba is to be commended for the very detailed, comprehensive and helpful self-assessment performed in preparation for the EPREV Service, for the excellent involvement of relevant organizations and their staff (particularly the direct participation of top ranking officials) and the full availability of documents, personnel and facilities.

The EPREV team noted some areas where improvements could be made. Particularly, to develop formal and detailed procedures for emergency response, establishing a protection strategy in line with the latest IAEA safety standards and further improving the framework for the protection of emergency workers and helpers. Some other recommendations and suggestions have been raised as well, regarding the emergency classification, emergency preparedness categories, waste management strategy in an emergency, termination of the emergency, resources for first responders and supporting organizations, quality management, transfer of authority and non-radiological consequences, together with other recommendations and suggestions.

The team also noted specific commendable practices. These good practices refer to aspects that go beyond the expectations set in the IAEA safety standards. Among these, the EPREV Team identified good practices such as: a systematic analysis of accidents and emergencies through the *System of Analysis, Dissemination and Learning from Incidents and Radiological Events* (ADASIR); a systematic approach for developing integrated and coordinated nuclear or radiological emergency plans before the operation of a facility starts; and, the integrated provision of nuclear or radiological emergency preparedness and response training for Custom Officers through the *National Education Programme of the General Customs of the Republic* (AGR) in close cooperation with the *National Centre for Nuclear Safety* (CNSN) and the *Ministry of Interior* (MININT).

This report serves as the final record of the EPREV mission. The IAEA will continue to work with the Republic of Cuba to improve its EPR arrangements for nuclear and radiological emergencies. It is expected that the Republic of Cuba will develop an Action Plan to implement

the recommendations and suggestions in the report, and will invite the IAEA for an EPREV Follow-Up Mission to review its implementation.

The main mission of the EPREV Service for the Republic of Cuba was implemented by the *Incident and Emergency Centre* (IEC) of the IAEA within the scope of the Technical Cooperation Project *CUB9019 Strengthening the National Infrastructure for Radiation Safety and Security*.

2. INTRODUCTION

2.1. Objective and Scope

The Government of the Republic of Cuba (Host Country) requested an IAEA *Emergency Preparedness Review* (EPREV) Service on 08 February 2017. The IAEA responded positively to the request.

The EPREV Service for the Republic of Cuba focuses on the emergency preparedness and response (EPR) arrangements and capabilities for nuclear or radiological emergencies in emergency preparedness categories (EPC) III and IV, as defined in the *IAEA Safety Standards Series No. GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency* (GSR Part 7). It reviews these arrangements and capabilities against the requirements of GSR Part 7.

The key objectives of the EPREV Service are to:

- Provide the Republic of Cuba with an objective assessment of the arrangements and capabilities to respond to nuclear or radiological emergencies regardless of the cause with respect to IAEA safety standards and guidelines.
- Assessing the condition in which the Republic of Cuba resides with regard to international standards for nuclear and radiological EPR.
- Assisting the Republic of Cuba in providing a basis upon which to develop a longer term programme to enhance its ability to respond to nuclear and radiological emergencies.
- Provide recommendations, suggestions and good practices to the Republic of Cuba regarding EPR to nuclear and radiological emergencies, to be used in an action plan, as described below.

2.2. Preparatory Meeting

At the request of the Government of Cuba, Preparatory Meeting for the EPREV Service was hosted by the *National Centre for Nuclear Safety* (CNSN) of the *Office for Environmental Regulation and Nuclear Safety* (ORASEN) from 17 to 19 July 2018 in Havana, Cuba.

The meeting was carried out by the appointed IAEA Team Leader Mr Antonio Ortiz Olmo, the IAEA Coordinator Mr Phillip Vilar Welter, the Host State Coordinator Ms Alba Guillén Campos, the main Host State Contact Points Mr Yamil López Forteza and Raul Rubén Costa Gravalosa and representatives for the involved Host State institutions.

The preparatory meeting resulted in the agreement of preliminary *Terms of Reference*, which included the scope of the EPREV Service, the proposed EPREV Review Team composition, the official Host State counterparts and the logistics of the Main Mission.

2.3. Advanced reference materials

As agreed during the preparatory meeting, the counterparts of the Republic of Cuba provided the IAEA with thei self-assessemnt as well as the *Advance Reference Materials* by making use of the IAEA *Emergency Preparedness and Response Information Management System* (EPRIMS) in due time before the main mission. In preparation for the mission, the IAEA review

team members conducted a review of the *Advance Reference Materials* and provided their initial review comments to the IAEA Team Leader and Coordinator prior to the commencement of the main mission.

2.3. Main Mission

The main EPREV mission took place between 19 to 28 November 2018 in Havana, Cuba. It was intended to facilitate the improvement of the EPR arrangements in the Republic of Cuba and in other Member States, based on the knowledge gained and experiences shared between the Cuban and the IAEA EPREV team and through the evaluation of the effectiveness of the Cuban arrangements, capabilities and good practices. Additionaly, the mission provided the participating Cuban staff a good opportunity to discuss their practices with reviewers who have experience with different practices in the same field and contributes to the harmonization of emergency prepradeness and response approaches among IAEA Member States.

2.4 Reference for the Review

IAEA Safety Standards Series Nos GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency [1], *GSG-2, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency* [2], *GS-G-2.1, Arrangements for Preparedness for a Nuclear or Radiological Emergency* [3] and *GSG-11, Arrangements for the termination of a Nuclear or Radiological Emergency* [4]. A detailed description of the EPREV Service is provided in the *IAEA Services Series 36, Emergency Preparedness Review (EPREV) Guidelines* [5].

The terms used in this report are consistent with those found in the IAEA safety standards referred in the above paragraph.

3. DETAILED FINDINGS

3.1 GENERAL REQUIREMENTS

Requirement 1: The Emergency management system

The all-hazards management system of the Republic of Cuba is defined in its legislation through the *Law 75 of National Defence*. The system is managed by the *National Civil Defence General Staff* (EMNDC), which is defined as the national authority for organizing, directing, coordinating, executing and controlling the implementation of the country policy for the reduction of any type of disasters.

The *National Disaster Reduction Plan* (PNRD) defines the national authorities that participate in the emergency management system. The specific *National Plan for Radiological Emergencies* (PNER) is an annex of the PNRD and includes the hazard characterization, the involved response organizations and the preparedness arrangements for the response to an emergency.

The national structure for response to nuclear or radiological emergencies is in accordance with the results of the hazard assessment included in the *Technical Basis for Planning for Radiological Emergencies* (BTP). This document is the basis to apply a graded approach in the response as reflected in the PNRD for radiological emergencies.

The emergency management system is in line with the relevant IAEA safety standards.

Requirement 2: Roles and responsibilities in emergency preparedness and response

The *Directive No 1/2010* defines and assigns responsibilities to the State bodies in the emergency response system. The roles and responsibilities for nuclear or radiological EPR of the organizations are further specified in the annex PNER of the PNRD.

The *Ministry of Science, Technology and Environment* (CITMA) is responsible to provide technical support for the response to different hazards, including nuclear or radiological hazards. The allocation of roles and responsibilities of CITMA under a nuclear or radiological emergency are defined in *CITMA's Radiological Emergency Response Plan* (CITMA-PER). Other Ministries have responsibilities in nuclear or radiological emergencies related with their area of competence. In addition, under the *Decree-law No 186*, the *Ministry of Interior* (MININT) is the entity responsible for matters related with security events. The *Revolutionary Armed Forces* (FAR) may, under very special occasions, give assistance to the response to a nuclear or radiological emergency, mainly on the detection, identification, decontamination and medical support.

The EMNDC is the National Warning Point and the CNSN is the Competent Authority Domestic and Abroad for the *Convention on Early Notification of a Nuclear Accident* and the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency* [6].

The CITMA-PER clearly allocates responsibilities and roles for response to several specific groups like, for instance, dose assessment, environmental monitoring, etc.

The *Decree-law No 207/2000* assigns the *National Center for Nuclear Safety* (CNSN) as the executive regulatory body for nuclear and radiological matters. The coordination of the CITMA response is the responsibility of a *Managerial Operational Group* chaired by the head of the CNSN.

The *Decree-law No 207/2000* states that the operating organization is the responsible for the coordination of an emergency on-site. The operating organization must have implemented a Radiological Emergency Plan (PER) for the facility or activity, approved by the CNSN. The CNSN is also responsible for the inspection of the PER.

A consistent mechanism for the coordination of the response to all types of emergencies is in place, including a nuclear or radiological emergency. This coordination mechanism is centred on a management group created under the EMNDC head and comprising liaison officers from all relevant institutions.

The EMNDC establishes permanent working relationships with central government administration bodies. In addition, the EMNDC, the CNSN and the MININT, work together with the *General Customs of the Republic* (AGR), the *Ministry of Transport* and *Civil Aviation Institute* (IACC) for border control.

The coordination of the emergency response is achieved at national, provincial and municipal level by the existence of a national head and provincial and municipal heads of *Civil Defence*. The level of coordination depends on the affected area, the complexity of the emergency and the severity of the hazard or the risk posed by the facility. Criteria exist to assign the coordination of the emergency to the different levels of the *Civil Defence* (i.e. municipal,

provincial or national). Lower echelons of *Civil Defence* may request assistance of higher echelons.

Nevertheless, related to the preparedness stage, there is no permanent working group of the relevant organizations with the clear mission and ability to meet periodically to propose developments for nuclear or radiological EPR, to coordinate and ensure consistency between the emergency arrangements, to ensure consistency among the PERs of the different organizations and to ensure appropriate and coordinated programmes of training and exercises are in place and implemented, among others. The working group created specifically for the preparation of the EPREV Mission is a good example of such a body.

Suggestion 1
Observation: There is no permanent working group of the relevant organizations in place during the preparedness stage, in consistency with the emergency management system.
Basis for the suggestion: GSR Part 7 paragraph 4.10 states: "*The government shall establish a national coordinating mechanism to be functional at the preparedness stage, consistent with its emergency management system…* ".
Suggestion: The Government should consider establishing a formally designated permanent working group of the relevant organizations at the preparedness stage, in consistency with the emergency management system.

The State legislation framework establishes general provisions for the civil liability (Law No. 59 Civil Code) for activities that generate risk which includes the repair of material damage and compensation for damages, as well as, compensation to workers in case of accident (Law No. 116. Labour Code). Nevertheless, no specific provisions exist for compensation of the victims for damage due to a nuclear or radiological emergency.

Suggestion 2
Observation: The legal framework for the compensation of victims does not include specific provisions for compensation of the victims for damage due to a nuclear or radiological emergency.
Basis for the suggestion: GSR Part 7 paragraph 4.6 states that: "*The government shall ensure that arrangements are in place for effectively governing the provision of prompt and adequate compensation of victims for damage due to a nuclear or radiological emergency*. "
Suggestion: The Government should consider putting in place specific provisions for compensation of the victims for damage due to a nuclear or radiological emergency.

Requirement 3: Responsibilities of international organizations in emergency preparedness and response

Requirement 3 of GSR Part 7 is not relevant in the context of an EPREV, as it refers to the EPR responsibilities of international organizations and not to those of Member States.

Requirement 4: Hazard assessment

The Republic of Cuba has an overall and very detailed hazard assessment, which takes into consideration nuclear or radiological emergencies combined with conventional emergencies that may occur in the region (e.g. earthquake, tsunami, severe weather, tropical cyclones, etc.) and affect the national territory and its jurisdictional waters, as well as very low probability events. The national structure for response to radiological emergencies is in accordance with the results of the hazard assessments, which are detailed in the BTP.

The overall all-hazards assessment is developed and updated periodically. The most recent hazard assessment was completed in May 2018, updating previous hazard assessments.

The hazard assessment identifies the emergency preparedness categories III, IV and V, as defined in the former *IAEA Safety Standards Series No. GS-R-2* (superseded in 2015 by GSR Part 7).

The hazard assessment for radiological emergencies of the facility or activity is made by the operating organization and is reviewed by the CNSN during the license process, and then included by the CNSN in the overall all-hazard assessment.

Recommendation 1
Observation: The emergency preparedness categories currently used in the Republic of Cuba are in line with the *IAEA Safety Standards Series No. GS-R-2*, which was superseded in 2015 by the *IAEA Safety Standards Series No. GSR Part 7*.
Basis for the recommendation: GSR Part 7 in paragraph 4.19 states that: "*For the purposes of these safety requirements, assessed hazards are grouped in accordance with the emergency preparedness categories shown in Table 1. The five emergency preparedness categories (hereinafter referred to as 'categories') in Table 1 establish the basis for a graded approach to the application of these requirements and for developing generically justified and optimized arrangements for preparedness and response for a nuclear or radiological emergency."*
Recommendation: The Government should review the current emergency preparedness categories to bring them in line with the emergency preparedness categories defined in the *IAEA Safety Standards Series No. GSR Part 7* which establishes a basis for a graded approach in EPR.

Requirement 5: Protection strategy for a nuclear or radiological emergency

The *Basic Norms on Radiological Safety* (NBSR) establish that the decision to adopt an immediate response action shall be justified and optimized based on the circumstances existing at the time of occurrence and on the expectation of a release of radioactive materials into the environment, with established criteria. A protection strategy has not been fully developed, justified and optimized at the preparedness stage, as indicated in Requirement 5 (4.27 to 4.31) of GSR Part 7.

The BTP contains general and operational criteria for use in the preparedness and response for radiological emergencies, consistent with those from the *IAEA Safety Standards Series Nos GSR Part 7* and *GSG-2*, but does not include reference levels as indicated in GSR Part 7.

Recommendation 2
Observation: A protection strategy has not been fully developed, justified and optimized at the preparedness stage for taking protective actions and other response actions effectively in a nuclear or radiological emergency and thus, many of the requirements related to a protection strategy as described in GSR Part 7 have been observed as not being addressed sufficiently (e.g. the requirements on early protective actions, reference levels, justification and optimization and mitigation of non-radiological consequences, among others).
Basis for the recommendation: GSR Part 7 requirement 5 states that the *"The government shall ensure that protection strategies are developed, justified and optimized at the preparedness stage for taking protective actions and other response actions effectively in a nuclear or radiological emergency".*
Recommendation: The Government should ensure that protection strategies are revised, justified and optimized at the preparedness stage for taking protective actions and other response actions effectively in a nuclear or radiological emergency, and revise and complete the EPR arrangements in line with the protection strategy as described in GSR Part 7.

3.2. FUNCTIONAL REQUIREMENTS

Requirement 6: Managing operations in an emergency response

Current legislation defines the responsibility of the operating organizations for ensuring the preparation, organization, verification and execution of on-site response, through the emergency plan, stating both on-site and off-site responsibilities of intervening organizations. Furthermore, regulations define specific requirements for coordination and cooperation between organizations of the response, which need to be carried out in the preparedness stage; for the response measures; and for the transition between different levels of the *Civil Defence System* (i.e. municipal, provincial or national).

These arrangements are formalized into the PER, developed with the participation of all intervening or interested organizations (for instance, first responders, medical services, local authorities, regulatory authority). The on-site emergency response operations are carried out and managed without affecting the continuous performance of operational safety and security functions, particularly considering the characteristics of EPC III.

On the other hand, off-site activities, if required, are considered in the PER and executed as required during the emergency. Corresponding *Defence Councils* (at either national, provincial or municipal levels, depending on the circumstances) assumes command and control responsibilities.

According to the PER, both on-site safety and security sub-systems are arranged to work during an emergency, coordinated and integrated. Security systems are supervised by the *Directorate of Security and Physical Protection*, from the *Ministry of Interior*, acting as a regulatory authority, which provides additional assurance.

Finally, Cuba is a State Party to the *Convention on Early Notification of a Nuclear Accident* and thus, through the corresponding processes, information is continuously maintained in cases of notification of nuclear or radiological emergencies.

The arrangements addressed at developing a PER consider a comprehensive systematic approach, carried out before starting the operation of a facility, with the participation of the organizations in the areas of (a) fire-fighting, (b) security and physical protection and (c) nuclear or radiological EPR, which, thanks to increased preparedness efforts, results in an improved PER, characterized by a high level of integration and coordination. One example related to the *Fire Department* of the MININT as expert area in fires. The response of the *Fire Department* during an emergency, as a first responder, will be based on coordinated and detailed procedures and designs established prior to operation of the facility. The *Fire Department* will revise these arrangements regularly in its role, by mandatory supervision.

Good practice 1
Observation: The arrangements addressed at developing a Radiological Emergency Plan (PER) consider a comprehensive systematic approach, carried out before starting the operation of a facility, involving an integrated review with several organizations in expert areas through independent mandatory certification, which must be integrated by the regulator for the issuance of the license. Operating organizations are supervised independently by these expert organizations and jointly with the radiological regulatory authority, resulting in an improved PER, characterized by a high level of integration and coordination.

Good practice 1
Basis for the good practice: GSR Part 7 in requirement 6 states that: "*The government shall ensure that arrangements are in place for operations in response to a nuclear or radiological emergency to be appropriately managed."*
Good practice: Having in place a systematic approach for developing integrated and coordinated nuclear or radiological emergency plan before the operation of a facility starts, with high level of participation of all involved organizations during the preparedness stage, through a set of independent certification processes integrated by the regulatory authority/ies for the issuance of the operating authorization, resulting in an improved emergency plan, characterized by a high level of integration and coordination, which is maintained by further supervision.

Requirement 7: Identifying and notifying a nuclear or radiological emergency and activating an emergency response

The country has several notification points in case of emergency, although there is no priority in that distribution. The relevant notification point is determined on whether the emergency takes place at a fixed facility, a mobile facility or at an unforeseen location. These arrangements are indicated in the corresponding PER, which specify general response actions, according to some operational intervention levels, including all possible and low-probability events, based on Table 8 of the *IAEA Safety Standards Series No. GS-R-2* (superseded by GSR Part 7 in 2015). The visits and interviews showed that notification is made to almost all the intervening organizations that entail the emergency system, being a normal practice.

In case of a potential emergency the operating organizations establish communication with all the entities and organizations listed in the plans. It is estimated that reliable means are in place and if necessary *Armed Forces* can provide some logistic support. The emergency system is activated and used frequently due to natural emergencies (e.g. hurricanes).

Radiological emergencies are classified in the Republic of Cuba as alert, incident, emergency, major emergency and general emergency, following a classification system that is inconsistent with the one given in GSR Part 7 for EPC III and IV which establishes the following emergency classes: other nuclear or radiological emergencies, alert and facility emergency. General emergencies and site area emergencies (as defined in GSR Part 7) should, by definition, not be possible in EPC III and IV (as defined in GSR Part 7). In addition, the term 'general emergency' as used in the annex to the PNER is inconsistent with the definition of 'general emergency' used in GSR Part 7. Using this term in the international notification of a nuclear or radiological emergency may lead to misunderstandings.

The PERs describe in detail the response actions to be implemented, as well as the response organizations, in case off-site response actions are needed. Arrangements are in place for notifying the IAEA and exchanging information with the international community, under the *Convention on Early Notification of a Nuclear Accident*.

General managers, operating personnel and local officials are able to fulfil their identification, notification and response responsibilities based on the information provided in the plans.

Recommendation 3
Observation: Radiological emergencies are classified in the Republic of Cuba as alert, incident, emergency, major emergency and general emergency, following a classification system that is inconsistent with the one given in GSR Part 7 for EPC III and IV, which establishes the following emergency classes: other nuclear or radiological emergencies, alert and facility emergency. General emergencies and site area emergencies (as defined in GSR Part 7) should, by definition, not be possible in EPC III and IV (as defined in GSR Part 7).
Basis for the recommendation: GSR Part 7 paragraph 5.14 states that: "*The operating organization of a facility or activity in category I, II, III or IV shall make arrangements for promptly classifying […] types of nuclear or radiological emergency as follows: […]* *(c) Facility emergency at facilities in category I, II or III […].* *(d) Alert at facilities in category I, II or III […].* *(e) Other nuclear or radiological emergency for an emergency in category IV….*".
Recommendation: The Government should define the emergency classes in consistency with GSR Part 7.

Requirement 8: Taking mitigatory actions

The defined emergency scenarios for each facility are reflected in the PER and consider all aspects that could affect the radiological safety and all possible consequences. Measures are addressed at mitigating the emergency and its consequences and to bring the facility or activity to a safe and stable state. Off-site response is explicitly included, since response organizations must participate in the development of the plan. As a result, an integrated and coordinated PER is obtained.

According to current regulations, operating organizations and other organizations involved in the response are required to define the different resources (e.g. devices, instruments, supplies, equipment, communications systems, facilities and documentation; all this specifying a series of details) that need to be considered and prepared for response purposes. Besides, operating organizations and other organizations involved in the response are required to provide information, instruction and appropriate training to workers who may be potentially affected by response. Radiation protection of off-site technical assistance involved in on-site mitigatory actions is included in the procedures, but no detailed formal instructions from the operating organization are in place for the radiation protection of off-site emergency services that may access the facilities during the response phase of an emergency. Although some instructions are given in training events, a robust set of instructions need to be included in the PERs of the facilities and activities.

Suggestion 3
Observation: Although the radiation protection of off-site technical assistance involved in on-site mitigatory actions is included in the procedures, no detailed formal instructions from the operating organization are in place for the radiation protection of off-site emergency services that may access the facilities during the response to an emergency.
Basis for the suggestion: GSR Part 7 paragraph 5.27 states that: "*Off-site emergency services shall be afforded prompt access to the facility, and shall be informed of on-site conditions and provided with instructions and with means for protecting themselves as emergency workers*."
Suggestion: The regulatory authority should consider assuring that the operating organizations put in place detailed formal instructions for the radiation protection of off-site emergency services that may access the facilities during the response to an emergency.

Emergency services (fire-fighters, medical responders, explosive ordnance disposal specialists and others) have the required protective actions in their protocols and receive technical assistance from operating organizations before and during the emergency. Education and training activities are carried out between operational organizations and off-site services. On the other hand, the CNSN technically advises the bodies involved in the response to radiological emergencies and coordinates radiological aspects of the response.

Besides, the operating organization technically support the efforts of responding organizations during the emergency and provides technical information for their actions. In that context, as part of the preparation for emergencies, the operating organizations, at appropriate intervals, test the implementation of mitigatory actions together with the corresponding authorities.

Requirement 9: Taking urgent protective actions and other response actions

The classification of the emergency and the implementation of urgent protective actions by the operating organizations is based on initial assessments of the radiological conditions, mainly radiation levels and contamination through monitoring and early warning systems. This information is included by the operating organizations in the notification of an emergency to the CNSN.

The NBSR requires operating organizations to inform authorities about the development of the situation, the actions taken to protect emergency workers and members of the public, as well as the exposures that have already occurred and are expected to occur.

The PERs of the operating organizations include provisions to warn all persons on the site, to take immediate and appropriate response actions and to ensure the availability of suitable, reliable and diverse means of communication with off-site officials.

The AGR is the responsible organization in the Republic of Cuba to carry out radiological controls at borders. Following an alarm from elevated radiation levels (i.e. ambient gamma dose rates above 99 μSv/h) the emergency procedure is to cordon off the area and notify CITMA. The AGR has a strong training program for all the staff with different levels of expertise related to their roles and functions. All training materials are available for consultation in the AGR intranet system.

In the two main facilities for scrap metal for export of the Republic of Cuba, the *Centre for Radiation Protection and Hygiene* (CPHR) maintains in-situ staff to radiologically control the scrap materials. In other scrap metal facilities, the CPHR has trained scrap metal workers to implement the controls. Dose rate values at which to initiate urgent protective actions and other response actions (e.g. cordon off the area) at the two main facilities are defined in the *Procedure for radiological surveillance of the scrap metal in different storage and transport scenarios*. However, the regulatory guide *Resolution 42/2011 – CNSN* does not establish operational criteria for initiating urgent protective actions and other response actions at other scrap metal facilities.

Suggestion 4
Observation: There are no operational criteria in place applicable to all scrap metal facilities for taking urgent protective actions and other response actions.
Basis for the suggestion: GSR Part 7 in paragraph 5.44 states that: "*Operating personnel for activities in category IV, first responders at locations where there is a significant likelihood of encountering a dangerous source that is not under control shall be provide with guidance and training on taking urgent protective actions and other response actions. This shall include guidance and training on the approximate radius of the inner cordoned off area in which urgent protective actions and other response actions would initially be taken and the adjustment of this area on the basis of observed or assessed conditions on the site.*"
Suggestion: The CNSN should consider stablishing operational criteria that are applicable to scrap metal facilities for taking urgent protective actions and other response actions.

There are limited tools or systems in place to ensure that all response organizations have updated and readily available information on the latest emergency conditions, assessments and response actions during the entire duration of a nuclear or radiological emergency, ensuring the compatibility of communication systems of all the response organizations.

Suggestion 5
Observation: There are limited tools or systems in place to ensure that all response organizations have updated and readily available information on the latest emergency conditions, assessments and response actions during the entire duration of a nuclear or radiological emergency.
Basis for the suggestion: GSR Part 7 in paragraph 5.36 states that: "*Arrangements shall be made such that information on emergency conditions, assessments and protective actions and other response actions that have been recommended and have been taken is promptly made available, as appropriate, to all relevant response organizations and to the IAEA throughout the emergency.*"
Suggestion: The Government should consider making arrangements so that information on emergency conditions, assessments and protective actions and other response actions that have been recommended and/or have been taken, is promptly made available, as appropriate, to all relevant response organizations during a nuclear or radiological emergency.

Requirement 10: Providing instructions, warnings and relevant information to the public for emergency preparedness and response

The Republic of Cuba has a strong system to provide instructions, warnings and relevant information to the public due to frequent natural emergencies like hurricanes.

The *Directive 1* designates the EMNDC as the organization responsible for providing the information to the public in case of disasters or other emergency situations. EMNDC receives technical advice from CITMA to prepare the information in the case of nuclear or radiological emergencies.

The PNRD specifies, that, additionally to planned communication channels to inform the public, like radio and TV, additional fixed and mobile systems can be deployed to enhance and reinforce the communications.

The EMNDC distributes the information to other ministries to increase its dissemination. For example, the *Foreign Affairs Ministry* is responsible to distribute the information to Cuban Diplomatic Missions in other countries and to provide appropriate information to the Diplomatic Corps and to oversee the provision of information to foreigners on the national territory; the *Tourism Ministry* distributes the information in different languages to hotels and resorts and the *Education Ministry* is responsible to inform foreign students in Cuba.

Requirement 11: Protecting emergency workers and helpers in an emergency

The legal framework of the Republic of Cuba does not have a formal definition for emergency worker or for helper. Nevertheless, the *Resolution No 18/2012* establishes the obligation to define the personnel to be present at the facility during an emergency. The CNSN establishes requirements for the dosimetric criteria of exposed workers responding to an emergency, measurements of emergency exposures, recording and reporting of results, and medical surveillance of exposed workers and the population.

The CNSN is responsible for establishing dosimetry requirements and regulation for the workers responding to an emergency. The CPHR is the only institution in the State that have the competence to perform dosimetry services. The CNSN is the entity responsible for the *National Dosimetric Data Base*, also used for emergencies.

Workers responding to an emergency at operating organizations and responders to nuclear and radiological emergencies have personal dosimetry arrangements. The CPHR, is part of the national response system and has a methodology for the delivery and reception of the dosimeters, evaluation of dose exposure and the capability to provide external and internal biological dosimetry. Nevertheless, a lack of dosimetric control and follow-up of workers responding to an emergency was observed for some operating organizations.

The dosimetry of the FAR personnel involved in a civilian response is established in coordination with the *Engineering Directorate* of the *Ministry of the Revolutionary Armed Forces* (MINFAR) and the CPHR. The dosimetry data have common database with the data for civilian workers responding to an emergency.

The *AGR Instruction 1/2015* also establishes, for the customs officers, the obligation to keep the information of the doses received during the response to an emergency.

The NBSR establishes the national guidance values for restricting the exposure workers involved in the response to a nuclear or radiological emergency.

There are no formal arrangements and procedures for the workers responding to an emergency to formally volunteer to perform tasks exceeding the dosimetric criteria and to be made aware of the risks involved. There is no form to track the consent and notification of the risk related to exceeding the dosimetric criteria.

The designation in advance of the on-site workers responding to an emergency is an obligation established under the PER for the facility or activity, as approved by the CNSN. This obligation has not been established for off-site responders.

During the implementation of protective actions following an emergency, persons not designated in advance as workers responding to an emergency will be integrated into operations. Nevertheless, there are no procedures in place to ensure that they receive ‘just in time’ training before the deployment for the implementation of protective actions.

The legal framework does not address the protection of helpers in an emergency. The NBSR establishes requirements for the protection of the personnel responding to an emergency without distinguishing between emergency workers and helpers.

Recommendation 4
Observation: The legal framework does not include a formal definition of emergency workers in a nuclear or radiological emergency, and procedures are not established to designate off-site emergency workers in advance and are not established to provide non-designated emergency workers with 'just in time' training, immediately before deployment, on how to perform duties under emergency conditions.
Basis for the recommendation: Requirement 11 of GSR Part 7 states that: *"The government shall ensure that arrangements are in place to protect emergency workers and to protect helpers in a nuclear or radiological emergency."* GSR Part 7 paragraphs 5.49 and 5.52 state that: "*Arrangements shall be made to ensure that emergency workers are, to the extent practicable, designated in advance and are fit for the intended duty. These arrangements shall include health surveillance for emergency workers for the purpose of assessing their initial fitness and continuing fitness for their intended duties.*" "*The operating organization and response organizations shall ensure that arrangements are in place for the protection of emergency workers and protection of helpers in an emergency for the range of anticipated hazardous conditions in which they might have to perform response functions. These arrangements, as a minimum, shall include: […] (b) Providing emergency workers not designated in advance and helpers in an emergency immediately before the conduct of their specified duties with instructions on how to perform the duties under emergency conditions ('just in time' training); …*"
Recommendation: The Government should ensure that the legal framework includes a formal definition and provisions for emergency workers in a nuclear or radiological emergency.

Recommendation 5
Observation: No formal procedures are in place to formally register the consent of personnel responding to an emergency to volunteer for response operations potentially exceeding established dosimetric criteria.
Basis for the recommendation: Requirement 11 of GSR Part 7 paragraphs 5.57 states that: "*The operating organization and response organizations shall ensure that emergency workers who undertake emergency response actions in which doses received might exceed an effective dose of 50 mSv do so voluntarily…"*
Recommendation: The Government should ensure that procedures are in place to formally register the consent of emergency workers to volunteer for response operations potentially exceeding established guidance values for restricting exposure of emergency workers (as provided in Appendix I of GSR Part 7).

Recommendation 6
Observation: The legal framework does not include a formal definition of helpers in a nuclear or radiological emergency and procedures are not established to protect them.
Basis for the recommendation: GSR Part 7 requirement 11 of GSR Part 7 states: "*The government shall ensure that arrangements are in place to protect emergency workers and to protect helpers in a nuclear or radiological emergency.*"
Recommendation: The Government should ensure that the legal framework includes a formal definition of helpers in a nuclear or radiological emergency and arrangements are established for their protection in such an emergency.

Requirement 12: Managing the medical response in a nuclear or radiological emergency

The *Ministry of Public Health* (MINSAP) is the responsible authority for performing medical response actions in an emergency, including a nuclear or radiological emergency. The medical response is organised in coordination with the EMNDC and with the participation of the other authorities, State agencies and the educational and service institutions.

The municipal, province and national levels have dedicated facilities that enable general attention to the concerned population during emergencies, including medical attention. In case of radiological emergencies their medical staff is able to recognize symptoms of severe radiation exposure and inform the reference hospital *Hermanos Ameijeiras* (located in Havana) where dose assessment and medical treatment of exposed and contaminated individuals can be provided.

Arrangements are in place for the provision of appropriate medical screening, triage and medical treatment for those people who could be affected in a nuclear or radiological emergency and for the provision of appropriate medical attention. The instruction *IR.CNSN.ER.03* for the protection and registration of the public in radiological emergencies is in place and includes arrangements to register all individuals from the public involved in a radiological emergency, but does not include instructions for medical follow-up to detect radiation induced health effects (e.g. operational criteria, such as OILs for monitoring the skin or the thyroid). Such arrangements are only in place for occupationally exposed individuals.

The CPHR has laboratories and resources to provide reliable analysis on biological samples, internal contamination monitoring, cytogenetic biodosimetry and whole-body counting.

Suggestion 6
Observation: Arrangements are in place for the provision of appropriate medical screening, triage and medical treatment for those people who could be affected in a nuclear or radiological emergency and for the provision of appropriate medical attention. The instruction *IR.CNSN.ER.03* for the protection and registration of the public in radiological emergencies is in place and includes arrangements to register all individuals from the public involved in a radiological emergency, but does not include instructions for medical follow-up to detect radiation induced health effects (e.g. such as OILs for monitoring the skin or the thyroid). Such arrangements are only in place for occupationally exposed individuals.
Basis for the suggestion: GSR Part 7 paragraph 5.68 states that: "*Arrangements shall be made for the identification of individuals who are in those population groups that are at risk of sustaining increases in the incidence of cancers as a result of radiation exposure in a nuclear or radiological emergency. Arrangements shall be made to take longer term medical actions to detect radiation induced health effects among such population groups in time to allow for their effective treatment. These arrangements shall include the use of pre-established operational criteria in accordance with the protection strategy (see para. 4.28(4)).*"
Suggestion: The Government should consider establishing instructions (including criteria for individual monitoring) for medical follow-up to detect radiation induced health effects following a nuclear or radiological emergency, in time to allow for their effective treatment.

Requirement 13: Communicating with the public throughout a nuclear or radiological emergency

The Republic of Cuba has in a place a comprehensive general strategy for communicating with the public during any type of emergency, with specific arrangements for a nuclear or radiological emergency. This strategy has been often tested in real emergencies, mainly during extreme meteorological events (e.g. hurricanes).

The *Resolution 18/2012* from the CNSN states the requisites for public communications for nuclear or radiological emergencies.

The EPREV Team was informed that the population has high confidence in the EMNDC, which makes communication with the public very efficient. The EMNDC is supported by CITMA in this activity.

CITMA's Disaster Reduction Plan includes extensive planning on communication with the public during an emergency. A yearly workshop with the media is organized by CITMA, and another is organized by the EMNDC, to familiarize journalists with nuclear and radiological emergencies. The media is also invited to participate in table top exercises.

The communication with the public by the EMNDC is formally done by a structured *Information Note* to the public stating the current situation and the response actions to be followed. These *Information Notes* need the approval of the President of the National Council of the Republic before being shared with the public.

The EMNDC, with the support of CITMA, has developed a strategy to deal with rumours.

Other public institutions, such as CITMA, AGR or MINSAP, may issue their own press releases concerning a nuclear or radiological emergency in coordination with the EMNDC.

The arrangements for communicating with the public are not only focused on procedures for issuing press releases and for providing factual information, but also on ensuring that the public puts the health hazards into perspective and to address public concern regarding possible health effects, by addressing nuclear or radiological emergencies in all levels of the public education system.

Operating organizations are obligated to have in place means for emergency communication with workers, visitors of the facility and the immediate neighbouring population. There is an obligation to include these arrangements in the emergency plans of the facilities.

Requirement 14: Taking early protective actions and other response actions

The CNSN has developed emergency response procedures and instructions regarding the protection and registration of the public in radiological emergencies, monitoring and decontamination of individuals, vehicles and equipment within the cordoned-off area in a radiological emergency.

The *Instruction IR.CNSN.ER.04* from CNSN about decontamination of members of the public in a radiological emergency includes the process to carry out this activity. However, arrangements have not been made to test methods of decontamination before their general use and to assess their effectiveness in terms of dose reduction.

Suggestion 7
Observation: Arrangements have not been made to test methods of decontamination before their general use and to assess their effectiveness in terms of dose reduction.
Basis for suggestion: GSR Part 7 paragraph 5.80, states: "*Arrangements shall be made to test methods of decontamination before their general use and to assess their effectiveness in terms of dose reduction.*"
Suggestion: The CNSN should consider reviewing the *Instruction IR.CNSN.ER.04* to include references to test methods of decontamination before their general use and to assess their effectiveness in terms of dose reduction.

Additionally, the *CNSN Resolution 18/2012* establishes arrangements to carry out retrospective assessment of exposure to start medical treatment after the emergency. The *CITMA Resolution 9/97* about environmental radiological surveillance, has provisions to conduct monitoring and assessment of contamination in the case of a transnational emergency.

Requirement 15: Managing radioactive waste in a nuclear or radiological emergency

Elements on the safe management of radioactive waste are covered in several regulations. For example, the *Decree-Law No.207/2000 on the Use of Nuclear Energy* (Art. 38 - 44) establishes the requirements for the management of radioactive waste. Additionally, the *Special Provisions (Second)* establishes that the CITMA, based on a proposal of the CNSN and in coordination with other competent authorities, can seize radioactive waste. The regulatory framework does not include specific requirements for the management of human and animal remains contaminated in a radiological emergency.

The EPREV Team was informed that a draft of a new strategy for radioactive waste management is under development, including the radioactive waste generated in an emergency.

Recommendation 7
Observation: There is no formal national strategy document in place for the safe management of radioactive waste, including radioactive waste or contaminated human or animal remains generated in a nuclear or radiological emergency.
Basis for the recommendation: GSR Part 7 paragraph 5.84 states: *"The national policy and strategy for radioactive waste management [19] shall apply for radioactive waste generated in a nuclear or radiological emergency, with account taken of paras 5.85 to 5.88."*
Recommendation: The Government should establish a national strategy for the safe management of radioactive waste, including radioactive waste or contaminated human or animal remains generated in a nuclear or radiological emergency.

Requirement 16: Mitigating non-radiological consequences of a nuclear or radiological emergency and of an emergency response

The Republic of Cuba has arrangements in place for providing counselling and psychological support to people affected by an emergency, which applies for mitigating the non-radiological consequences of a nuclear or radiological emergency. The arrangements include information on any associated health hazards and clear instructions on any actions to be taken in a nuclear or radiological emergency. However, arrangements to consider and mitigate the non-radiological consequences (e.g. through effective public communication), beyond psychological consequences, have not been developed.

Suggestion 8
Observation: Arrangements to consider and mitigate the non-radiological consequences, beyond psychological consequences, have not been developed.
Basis for the suggestion: GSR Part 7 requirement 16 states that: "*The government shall ensure that arrangements are in place for mitigation of non-radiological consequences of a nuclear or radiological emergency and of an emergency response.*"
Suggestion: The Government should consider putting in place arrangements for the mitigation of not only psychological consequences but also other non-radiological consequences.

Requirement 17: Requesting, providing and receiving international assistance for emergency preparedness and response

The Republic of Cuba is a State Party to the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*. The Contact Point for requesting/receiving assistance is the CNSN. In the event of a radiological emergency, Cuba will request assistance to the IAEA in accordance with this convention.

Additionally, EMNDC is a member of the *International Civil Protection Organization* and has implemented general plans for receiving international assistance in case of a disaster, through the civil defence assistance mechanism. The same plans are applicable for receiving assistance in the framework of the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*. Nevertheless, there are no specific arrangements in place to benefit from, and to contribute to the provision of, international assistance for preparedness and response for a nuclear or radiological emergency.

Suggestion 9
Observation: The Republic of Cuba is a State Party to the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency*. A general plan for receiving international assistance in case of a disaster, through the civil defence assistance mechanism, is in place. Nevertheless, there are no specific arrangements in place to benefit from, and to contribute to the provision of, international assistance for preparedness and response for a nuclear or radiological emergency.
Basis for the suggestion: GSR Part 7 Requirement 17 states: "*The government shall ensure that adequate arrangements are in place to benefit from, and to contribute to the provision of, international assistance for preparedness and response for a nuclear or radiological emergency.*"
Suggestion: The Government should consider putting in place specific procedures to benefit from, and to contribute to the provision of, international assistance for preparedness and response for a nuclear or radiological emergency.

Requirement 18: Terminating a nuclear or radiological emergency

The regulatory framework (CNSN's *Resolution No.18/2012* and the NBSR) contains some of the arrangements for terminating nuclear or radiological emergencies as described in GSR Part 7. The regulatory framework establishes for the operating organizations a very general provision on the termination of each of the protective actions implemented during the emergency and requirements for assessments and radiological monitoring following the termination of the emergency. For example, the operating organization's PER establishes criteria to declare the termination of the emergency and the beginning of the recovery phase. It also includes the person responsible for declaring the termination of the emergency and the mechanisms for notification of the staff, responding organizations and the regulatory authority. In case that response actions are implemented off-site, the *Civil Defence* is responsible for terminating the emergency (NBSR Art. 205). However, the regulatory framework does not include all requirements established in GSR Part 7, such as for example the roles and functions of organizations and the arrangements for consultation of interested parties.

Suggestion 10
Observation: The regulatory framework does not include all the relevant arrangements indicated in GSR Part 7 for the termination of an emergency.
Basis for the suggestion: GSR Part 7 para 5.100 states that: "*The government shall ensure that, as part of its emergency preparedness, arrangements are in place for the termination of a nuclear or radiological emergency. The arrangements shall take into account that the termination of an emergency might be at different times in different geographical areas. The planning process shall include as appropriate: (a) The roles and functions of organizations; […] (h) Arrangements for consultation of interested parties*."
Suggestion: The Government should consider ensuring that all the relevant arrangements are in place for the termination of radiological emergencies.

Requirement 19: Analysing the nuclear or radiological emergency and the emergency response

A consistent method for reporting, documenting and preserving the information from a radiological emergency is stated in the *Procedure for the investigation and follow-up of radiological events*.

The operating organization and the response organizations are required, as stated in the NBSR, to provide information on the implemented response actions to the CNSN in a nuclear or radiological emergency. The dosimetric data related to the personnel engaged or affected by the emergency is stored until the age of 75 years or for 30 years after the event.

The analysis of the emergency has to be performed immediately after the end of the emergency and reported to the CNSN no later than 30 days after the event, in a defined report template.

The CNSN conducts analysis of accidents and emergencies through the *System of Analysis, Dissemination and Learning from Incidents and Radiological Events* (ADASIR), developed nationally, as part of its program for fostering and developing safety culture. The objective of ADASIR is to promote the dissemination of lessons learned from actual national and international events. The analysis is carried out by experts from the CNSN and other national institutions, including the operating organizations, as well as the TSOs with expertise in the topic covered. The lessons learned give feedback to the regulators for the improvement of the regulatory service.

Good Practice 2
Observation: The CNSN conducts an analysis of nuclear and radiological accidents and emergencies through the *System of Analysis, Dissemination and Learning from Incidents and Radiological Events* (ADASIR), developed nationally, as part of its program for fostering and developing safety culture. The objective of ADASIR is to promote the dissemination of lessons learned from actual national and international events. The analysis is carried out by experts from the CNSN and other national institutions, including the operating organizations, as well as the TSOs with expertise in the topic covered. The lessons learned give feedback to the regulators for the improvement of the regulatory service.
Basis for the good practice: GSR Part 7 paragraph 5.102 states: "*Arrangements shall be made to document, protect and preserve, in an emergency response, to the extent practicable, data and information important for an analysis of the nuclear or radiological emergency and the emergency response. Arrangements shall be made to undertake a timely and comprehensive analysis of the nuclear or radiological emergency and the emergency response with the involvement of interested parties.*"
Good practice: Establishing a comprehensive system for methodically analysing actual national and international events, identifying lessons learned and disseminating them to all relevant organizations.

3.3. REQUIREMENTS FOR INFRASTRUCTURE

Requirement 20: Authorities for emergency preparedness and response

The legal framework, consubstantiated by other documents like the PNRD, establishes defined roles and responsibilities for the organizations involved in the preparedness and response to nuclear or radiological emergencies. These roles and responsibilities are established for the national, provincial and municipal levels.

The CITMA, MINSAP, MININT and other Ministries, as well as the EMNDC, have the responsibility to develop plans for nuclear or radiological emergencies in accordance with the responsibilities assigned to them by the PNRD. These plans are implemented at the organizations involved in the preparedness and response for a nuclear or radiological emergency of these Ministries.

The authority to take decisions is clearly allocated to organizations both for on-site and off-site emergencies. On-site emergency arrangements for granting the necessary authority to notify the relevant organizations and taking prompt actions on the site are in place. The role and authority of the Incident Commander is also defined by the *Decree Law No. 170/97*.

The legal framework and the PNRD establish mechanisms and systems for coordination and communication among all relevant organizations during response. The regulatory framework presents some formal arrangements for the coordination between MININT and EMNDC in case of emergencies requiring a coordination between the safety and security response.

The *Directive No. 1/2010* differentiates phases for emergencies in general. The specific differentiation for nuclear and radiological emergencies is provided in the PNER. This specific differentiation differs from the one provided in the IAEA safety standards.

Suggestion 11
Observation: The Directive No. 1/2010 differentiates phases for emergencies in general. The specific differentiation for nuclear and radiological emergencies is provided in the PNER. This specific differentiation differs from the one provided in the IAEA safety standards.
Basis for the suggestion: The *IAEA Safety Standards Series No. GSG-11* in Section 2 describes the "*Phases of a nuclear or radiological emergency.*"
Suggestion: The Government should consider revising the emergency phases as suggested in the *IAEA Safety Standards Series No. GSG-11*.

Although the delegation and/or transfer of authority takes place in conventional emergencies, formal arrangements for the delegation and/or transfer of authority in a nuclear or radiological emergency are not specified in the relevant emergency plans, together with arrangements for notifying all appropriate parties of the transfer.

Recommendation 8
Observation: Although the delegation and/or transfer of authority takes place in conventional emergencies, formal arrangements for the delegation and/or transfer of authority in a nuclear or radiological emergency are not specified in the relevant emergency plans, together with arrangements for notifying all appropriate parties of the transfer.

Recommendation 8
Basis for the recommendation: GSR Part 7 paragraph 6.6 states that: "*The arrangements for delegation and/or transfer of authority shall be specified in the relevant emergency plans, together with arrangements for notifying all appropriate parties of the transfer*."
Recommendation: The Government should ensure arrangements are specified for the delegation and/or transfer of authority in the relevant nuclear or radiological emergency plans, together with arrangements for notifying all appropriate parties of the transfer of authority.

Requirement 21: Organization and staffing for emergency preparedness and response

In general terms, the organization for preparedness and response for a nuclear or radiological emergency is specified and staffed.

For example, the *CNSN Resolution 18/2012* establishes a single emergency response management organization for the operating organization with the objective of a quick integration, coordination and extension of the response. According to the resolution, an organizational chart stating the components of the emergency response management organization needs to be included in the PER with a brief description of the responsibilities, necessary personnel and the interaction between the components. This Resolution also specifies the obligation to define the staff of the facility from the beginning until the termination of the radiological emergency.

Furthermore, in the case of an emergency at an unforeseen location, the CITMA has approximately 30 staff members with the training and capabilities to evaluate radiological conditions of the emergency. In the case of a large radiological emergency there are provisions in place to obtain support from other institutions, including the FAR, to participate in the emergency response.

Requirement 22: Coordination of emergency preparedness and response

The coordination between all the off-site response organizations in the case of a nuclear or radiological emergency is described in the PNRD. The EMNDC and the CITMA are the organizations that most frequently receive notifications from operating organizations. However, there are no protocols or procedures in place for exchanging technical information between EMNDC and CITMA for the time between the notification of an emergency and the activation of the off-site response.

Suggestion 12
Observation: There are no protocols or procedures in place for exchanging technical information between EMNDC and CITMA for the time between the notification of an emergency and the activation of the off-site response.
Basis for the suggestion: GSR Part 7 paragraph 6.12 states that: *"Arrangements shall be developed, as appropriate, for the coordination of emergency preparedness and response and of protocols for operational interfaces between operating organizations and authorities at the local, regional and national levels: […]. Arrangements shall be put in place to ensure effective working relationships among these organizations, both at the preparedness stage and in an emergency".*
Suggestion: EMNDC and CITMA should consider establishing protocols or procedures for exchanging technical information between them for the time between the notification of an emergency and the activation of the off-site response.

The CPHR is a key technical support organization in the case of a nuclear or radiological emergency covering: environmental monitoring, radionuclide identification, external and internal dosimetry and biological dosimetry. There are no consistent procedures in place (including forms) to share the information related to these activities with the *CITMA Evaluation Group* in a normalized and predefined manner, that would help reducing the likelihood of misunderstandings or misinterpretations between response organizations.

Recommendation 9
Observation: There are no consistent procedures in place (including forms) at the CPHR to share the information with the *CITMA Evaluation Group* in a normalized and predefined manner.
Basis for the recommendation: GSR Part 7 paragraph 6.12 states that: *"When several different organizations of the State or of other States are expected to have or to develop tools, procedures or criteria for use in the response to an emergency, arrangements for coordination shall be put in place to improve the consistency of the assessments of the situation, including assessments of contamination, doses and radiation induced health effects and any other relevant assessments made in a nuclear or radiological emergency, so as not to give rise to confusion. ".*
Recommendation: The CPHR should ensure consistent procedures are in place (including forms) to share the information with the *CITMA Evaluation Group* in a normalized and predefined manner, in order to reduce the likelihood of misunderstandings or misinterpretations between response organizations.

Requirement 23: Plans and procedures for emergency response

As discussed in previous requirements of this report, in the Republic of Cuba, each organization is required to develop and submit the PRD, which describes the whole hazard range that can affect its corresponding facilities and activities. One annex of the PRD is the PER, dedicated particularly to radiological emergencies. A PER needs to be approved by the nuclear regulatory authority, as well as coordinated with the *Fire Department*, the medical services and the MININT´s headquarter at municipal level. Besides, it needs the go-ahead of the *Civil Defence* municipal authority. As explained in requirement 6 (managing operations in an emergency response), regulations define specific requirements for coordination and cooperation between organizations of the response, which need to be carried out in the preparedness stage, for the response measures. Coordination is formalized through *Cooperation Agreements* among response organizations. Both National PRD and National PER have been developed under this rationale.

PERs, at all levels, include the organization responsible for the development and maintenance of the arrangements, and the responsibilities of operating organizations and response organizations. Corresponding plans describe the coordination realized between these arrangements and those for response to a conventional emergency and to a nuclear security event.

Although all relevant organizations have detailed plans in place according to their functions and responsibilities, detailed procedures for emergency response have not been formally established in many cases, as addressed in previous requirements of this report (e.g. requirement no. 8, 9, 11, 12 and 22). The EPREV Team observed this issue in almost all organizations. Generally, this may include but is not be limited to, notification and identification of an emergency and activation of a response, implementation of protective actions, mitigatory actions, provision of information and other functions.

Recommendation 10
Observation: Although all relevant organizations have detailed plans in place according to their functions and responsibilities, detailed procedures for emergency response have not been formally established in many cases.
Basis for the recommendation: GSR Part 7 requirement 23 states that: "*The government shall ensure that plans and procedures necessary for effective response to a nuclear or radiological emergency are established.*"
Recommendation: The Government should ensure that all procedures that are necessary for effective response to a nuclear or radiological emergency are established.

Requirement 24: Logistical support and facilities for emergency response

PERs list the basic tools, equipment, instruments, supplies and other elements needed for response related to the facilities, transport or activities, as applicable. Documents containing the necessary information for notification and implementation are available. Coordination in logistical support is addressed by the participation of intervening organizations in the development of plans. *Cooperation Agreements* among these organizations are signed, as part of a common and compulsory practice within the Cuban emergency system, for the whole range of hazards and emergencies. There is a high degree of coordination, but these agreements would need to contain more specific information on the specific arrangements agreed by the organizations.

Emergency response facilities or locations are designated to support emergency response in all postulated hazard conditions.

Capabilities for sample analysis and measurements of internal contamination for the purposes of emergency response and of health screening are in place. Response organizations have their own logistical support and communication capabilities. If necessary, additional means can be supplied, as requested, including support from the FAR.

The resources for first responders and supporting organizations, needed to enable the emergency response functions to be performed effectively in a nuclear or radiological emergency, such as environmental monitoring and sampling, individual monitoring, personal dosimetry, detection and identification of radioactive materials, are limited.

Suggestion 13
Observation: The resources for first responders and supporting organizations, needed to enable the emergency response functions to be performed effectively in a nuclear or radiological emergency, such as environmental monitoring and sampling, individual monitoring, personal dosimetry, detection and identification of radioactive materials, are limited.
Basis for the suggestion: GSR Part 7 paragraph 6.22 states that: "*Adequate tools, instruments, supplies, equipment, communication systems, facilities and documentation… […] These support items shall be located or provided in a manner that allows their effective use under the emergency conditions postulated*."
Suggestion: The Government should consider evaluating the need for additional resources for first responders and supporting organizations and arranging for the provision of these resources, to enable the emergency response functions to be performed effectively in a nuclear or radiological emergency.

Requirement 25: Training, drills and exercises for emergency preparedness and response

The NBSR establishes the obligation and the frequency for the operating organizations to exercise their PER. The NBSR also establishes that the operating organizations are obligated to provide periodic training to all the workers responsible for implementing the plans and procedures during an emergency. This obligation is stated in the emergency response plans.

The *Resolution 18/2012* establishes the obligation for the operating organizations to define a programme for training and exercising the response to nuclear or radiological emergencies. That programme needs to include partial and full tests of the plans. The EMNDC and CITMA are responsible for the enforcement of these programmes.

Although trainings and exercises are frequent, not all levels of personnel to be involved in an emergency response participate regularly in the exercises.

Suggestion 14
Observation: Although training and exercises are frequent, not all levels of personnel planned to be involved in an emergency response participate regularly in the exercises.
Basis for the suggestion: GSR Part 7 requirement 25 states that: "*The government shall ensure that personnel relevant for emergency response shall take part in regular training, drills and exercises to ensure that they are able to perform their assigned response functions effectively in a nuclear or radiological emergency*".
Suggestion: The Government should consider ensuring that all personnel foreseen to be involved in the emergency response, including from first responders to decision-makers, are regularly involved in trainings and exercises.

The *National Education Programme of the AGR* provides education, training and practical exercises for all new customs officers in radiation protection, detection of nuclear or radioactive materials at borders and the EPR for relevant nuclear and radiological emergencies. This education and training process is provided based on the proactive coordination and cooperation of the AGR, CNSN and MININT, ensuring consistency of the emergency arrangements between the three organizations and the ability of the customs officials to perform their assigned response functions effectively in a nuclear or radiological emergency. More than 2000 customs officials have been trained and certified since 2014.

Good practice 3
Observation: The *National Education Programme of the AGR* provides education, training and practical exercises for all new customs officers in radiation protection, detection of nuclear or radioactive materials at borders and the preparedness and response for relevant nuclear and radiological emergencies. This education and training process is provided based on the proactive coordination and cooperation of the AGR, CNSN and MININT, ensuring consistency of the emergency arrangements between the three organizations and the ability of the customs officials to perform their assigned response functions effectively in a nuclear or radiological emergency. More than 2000 customs officials have been trained and certified since 2014.
Basis for the good practice: GSR Part 7 requirement 25 states that: "*The government shall ensure that personnel relevant for emergency response shall take part in regular training, drills and exercises to ensure that they are able to perform their assigned response functions effectively in a nuclear or radiological emergency."*

Good practice 3
Good practice: Including practical education and training programmes for nuclear and radiological emergency preparedness and response in the general curriculum for organizations involved in the response, implemented in close coordination and cooperation with the regulatory authority/ies.

Requirement 26: Quality management programme for emergency preparedness and response

Some general requirements and elements of the quality management programme are included in the NBSR. The CPHR services that integrate the emergency response organization of CITMA and CENTIS have quality management systems implemented. The PERs are part of the operating organization quality management system. Arrangements for inventories, resupply, tests and calibrations are available. However, there is no specific requirement in the legislation for implementing a quality management programme for nuclear or radiological EPR activities.

Recommendation 11
Observation: There is no specific requirement in the legislation for implementing a quality management programme for nuclear or radiological emergency preparedness and response activities.
Basis for the suggestion: GSR Part 7 requirement 26 on the quality management programme states that: "*The government shall ensure that a programme is established within an integrated management system to ensure the availability and reliability of all supplies, equipment, communication systems and facilities, plans, procedures and other arrangements necessary for effective response in a nuclear or radiological emergency.*"
Recommendation: The Government should ensure that a quality management programme for nuclear or radiological emergency preparedness and response activities is implemented.

APPENDIX I: AGENDA OF THE MAIN MISSION

The main mission of the EPREV Service was held from 19 to 28 November 2018, in Havana, Cuba

Day	Time	Activity		
Sunday 18	am pm	Internal meeting of the IAEA EPREV Team: Briefing, refresher training, review of mission plan, review of preliminary observations and assignment of priorities		
Monday 19	am*	Location: ORASEN - CNSN	Opening remarks and introductions by the Host Country Coordinator and the IAEA Team Coordinator *(presentations, agenda review, and administrative arrangements)*	
			Presentation by the IAEA Team Leader of the EPREV objectives and process	
			Presentation by the EMNDC of the overall national framework for EPR of the Host Country	
			Introduction by each counterpart of specific EPR arrangements (Organizations of the Central Administration of the State (OACE), organs, entities and institutions)	
			Presentation by the ORASEN - CNSN of the Host Country self-assessment	
	pm		Interview: ORASEN – CNSN	
		Daily review meeting of the IAEA EPREV Team		
Tuesday 20	am	Location: EMNDC Visit: Command Post Interview: Civil Defence Staff on the Civil Defence System (Emergency Management System) in the Republic of Cuba.		Location: Command Post of the Fire Department Visit: Command Post of the Fire Department Interview: Fire Department, National Police and Department of Security and Physical Protection of the Ministry of the Interior (MININT)
	pm	Location: ORASEN - CNSN Interview: EMNDC-AENTA (Public Communications)		Location: ORASEN – CNSN Interview: CNSN
		Daily review meeting of the IAEA EPREV Team		
Wednesday 21	am	Location: Customs Headquarters Interview: General Customs of the Republic *(Management Centre AGR)*		Location: CEADEN Visit: Irradiation Laboratory (EPC III)
		Location: International Airport Jose Marti Visit: CAS, Customs "International Cargo"		
	pm	Location: ORASEN – CNSN Interview: ENIA (EPC IV)		Location: Hospital “Hermanos Ameijeiras” Interview: Medical Response (including cooperation with CPHR) – SIUM Visit: TSO
		Daily review meeting IAEA EPREV Team		

Day	Time	Activity	
Thursday 22	am	Location: CENTIS Visit: Isotopes Centre (EPC III) Visit: Transport of radioactive material (EPC IV)	Location: CPHR at Pedro Pi Visit: CPHR (Laboratories: External dosimetry, biological dosimetry; internal dosimetry; environmental radiological surveillance) Interview: TSO
	pm	Location: CPHR at Managua Visit: CPHR (Radioactive Waste Interim Storage) (EPC III)	
		Daily review meeting of the IAEA EPREV Team	
Friday 23	am	Location: ORASEN - CNSN Discussion: ORASEN – CNSN, MININT, CPHR	
	pm	Discussion: EMNDC, Ministry of Education	
		Weekly review meeting of the IAEA EPREV Team	
Saturday 24	am	Report writing by the IAEA EPREV Team	
	pm		
Sunday 25	am	Report writing by the IAEA EPREV Team	
	pm	Preliminary draft report submitted by the IAEA EPREV Coordinator to the National EPREV Coordinator by 16:00.	
Monday 26	am	Executive summary provided by the IAEA EPREV Team Leader to the Host Country.	
		Host Country reviews report.	
	pm	Written comments provided by the National Team Coordinator by 16:00 to the IAEA EPREV Team Coordinator.	
		The IAEA EPREV Team reviews the comments.	
Tuesday 27	am	Meeting to clarify issues, as appropriate, between the National and the IAEA EPREV Team.	
	pm	Report finalization	
Wednesday 28	am*	Closing remarks from the National Coordinator, IAEA Coordinator and Team Leaders	
		Media session	
		Formal closing of the main EPREV mission	

*All national organizations relevant for nuclear and radiological EPR were present during this time period.

APPENDIX II: COMPOSITION OF THE IAEA TEAM FOR THE MAIN MISSION

No.	Name and LAST NAME	Position (EPREV)	Organization, Country
1.	Antonio ORTIZ OLMO	Team Leader	CSN, Spain
2.	Phillip VILAR WELTER	Team Coordinator	IAEA
3.	Marina NIZAMSKA	Reviewer	IAEA
4.	João OLIVEIRA MARTINS	Reviewer	APA, Portugal
5.	Jaime SALAS KURTE	Reviewer	Chile

APPENDIX III: LIST OF CUBAN ATTENDEES

No.	Name	Position	Organization
1.	Alba Guillén Campos	Director	*National Centre for Nuclear Safety*
2.	Pablo Jerez Veguería	Head of Department of Regulations and Technical Development	
3.	Rosbell Bosch Robaina	Head of Department of Regulatory Control	
4.	Yamil López Forteza	Senior Specialist of Regulation, Control and Safety	
5.	Cruz Duménigo González		
6.	Ramón Hernández Álvarez		
7.	Andrés de La Fuente Puch		
8.	Yolanda Pérez Reyes		
9.	Jorge L. Paredes Gilismán		
10.	Ivonne Alonso González		
11.	Juan Ramón Fuentes Fuente		
12.	Omar Cruz Zubiaur		
13.	Ilieva Ilizástigui Arissó		
14.	Pedro Ibrahim Díaz Guerra		
15.	Maydelis Rosa Rodríguez		
16.	Conrado Alfonso Pallarés		
17.	Juan B. Sosa Marín		
18.	Rubén Ferro Fernández		
19.	Grelia W. Rodríguez Álvarez	Specialist	*Directorate of Foreign Relations. Ministry of Science, Technology and Environment*
20.	Yipsian Rodríguez Soto	Methodologist	*Ministry of Education*

21.	José E. Betancourt Lavastida	Director of Civil Defence	*Ministry of Public Health*
22.	Ernesto Ascuy Carrillo	Senior Official of Enforcement	*General Customs of the Republic*
23.	Argelio Zaldivar	Head of Department of Analysis	
24.	Francisco Hernández	Head of the Control Alarm Center	
25.	Raúl Batista	Senior Specialist of IT	
26.	Anisley Mrtínez	Secretary of the Directorate of Enforcement	
27.	Carlo Ayala Balmaseda	Senior Inspector	
28.	Heliberto Goytosolo	Shift Supervisor	*Office of the General Customs of the Republic at the International Airport Jose Marti*
29.	Isnavi Chacón Caminero	Deputy Director	
30.	Dalia Hernández	1st Officer of Enforcement	
31.	Geannis García	1st Officer of Enforcement	
32.	Alberto Cruz	Head of Enforcement	
33.	Bienvenido Rivera Cuello	Radiation Protection Officer	
34.	Viridia Cartier Pedroso	Head of Department of Temporary Storage	
35.	Asiel Chacón Goaben	Shift Supervisor of the Department of Temporary Storage	
36.	Juan C. Hernández	Head	
37.	Nuvia Herrera Martínez	Operator of Control Alarm Station	
38.	Bianca Hernández García	Radiation Protection Officer	*National Enterprise of Applied Research. Ministry of Construction*
39.	Raúl de Jesús López Montoya	Radiation Protection Officer. Unit of Santiago de Cuba	
40.	Nadia Arredondo Piré	Counsellor	*Department of Political Affairs. Multilateral Affairs and International Law Division. Ministry of Foreign Affairs*
41.	Daniel Llizo González	Head of the Division of Defense and Security	*Ministry of Foreign Affairs*

42.	Adalberto Barzaga Laffite	Specialist	*Ministry of Labor and Social Security*
43.	Santiago Cuenca Vargas	Specialist	*Ministry of Domestic Commerce*
44.	Fernando López Esteban	Specialist	*Ministry of Finances and Prices*
45.	Miladis Miranda	Specialist	*Enterprise CAUDAL*
46.	Roxana de la Mora Machado	Specialist	*Ministry of Public Health*
47.	Daniel López Aldama	President	*Nuclear Energy and Advanced Technology Agency*
48.	Marta Contreras Izquierdo	Director of Human Capital	
49.	Eleonaivys Parsons Lafargue	Specialist in Communications	
50.	Liutenant Colonel Narciso Navarro Guillén	Specialist	*Directorate of Security and Physical Protection. Ministry of Interior*
51.	Mirna Ivette Alejo Maceo	Specialist	*Ministry of Construction*
52.	Juan Cárdenas Herrera	Director of Research	*Center for Radiation Protection and Hygiene*
53.	Gladys M. López Bejerano	Director General	
54.	Eduardo Capote Ferrera	Specialist of Radiation Protection	
55.	My. Vladimir González	Specialist of Civil Defense	*Revolutionary National Police. Ministry of Interior*
56.	Diango S Martínez Alonso	Rescue Service	*Cuban Red Cross Society*
57.	Mercedes Hernández Villa	Specialist	*Ministry of Food Industry*
58.	Fernando Enrique Ayra	Specialist	*Department of Radiation Protection Center of Isotopes*
59.	General of División Ramón Pardo Guerra	Chief	*National Civil Defense Chief of Staff*
60.	Colonel. Luis A. Macareño Veliz	2nd Chief	
61.	Lieutenant Colonel. Gloria Gely Martinez	Head of Disaster Risk Reduction Department	
62.	Lieutenant Colonel. Williams Cedeño Centeno	Specialist	

63.	Marbelis Rodríguez Azahares	Head of International Cooperation Department	*National Civil Defense Chief of Staff*
64.	Milena Pérez Acosta	Specialist of the International Cooperation Department	
65.	Raúl Costa Gravalosa	Head of Section of Natural and Technological Disaster Risk Reduction	
66.	Lieutenant Colonel Antonio Valdés Chiong	Chief of Coordination and Support	*Corp of Firefighters of the Republic of Cuba*
67.	Colonel Daniel Chávez Fujichiro	2nd Chief	
68.	My. Roberto Carlos Ramírez	Chief of Political Section	
69.	My. Germán Valido Roura	2nd Chief of Fire Extinction Department	
70.	Colonel Luis Carlos Guzmán Matos	Chief	
71.	My. Carlos Rodríguez Angulo	2nd Chief National Command Post	
72.	Juan Ulises Castillo Sanz	Director	*National Base of Medical Emergencies. Ministry of Public Health*
73.	Fernando Grondona Torres	Specialist	
74.	Luis Sánchez Zamora	Head of Radiotherapy Service	*Hospital "Hermanos Ameijeiras"*
75.	Alfredo Herrera González	Deputy Director	
76.	Yoandris García Casadevall	Specialist Internal Medicine	
77.	Aliette García García	Specialist in Haematology	
78.	Calixto Hernández Cruz	Head of Service of Haematology	
79.	Rafael Rodríguez Garcell	Head of Burns Service	
80.	Beatriz Dumpierres Otero	Psychologist	
81.	Alejandro González Linares	Radiation Protection Officer	
82.	Reyner Menéndez Pérez	Head of Nuclear Medicine Service	
83.	Miguel Hernán Esteves del Toro	Director General	
84.	Manuel Lescay	2nd Head of the Intensive Care Unit	
85.	Adrián Jorge Guzmán González	Specialist	*Medical Assistance Division. Ministry of Public Health*

86.	Andy L. Romero	Head of the Secondary Standard Calibration Laboratory	*Centre for Radiation Protection and Hygiene*
87.	Daniel Medina	Head of the External Dosimetry Laboratory	
88.	Yoan Yera	Head of the Internal Dosimetry Laboratory	
89.	Orlando Domínguez	Head of the National Network for Environmental Surveillance	
90.	Mercedes Salgado	Head of the Radioactive Waste Management Service	
91.	José L. Peralta	Head of Environmental Service	
92.	Isis María Fernández	Head of the Laboratory for Environmental Surveillance	
93.	Enma Odelys Ramos Viltre	Specialist of the National Network for Environmental Surveillance	
94.	Jorge E. González	Head of the Radiobiology Laboratory	
95.	Niurka González	Head of the Radiation Protection and Human Capital Section	
96.	Omar F. García	Director of Administration and Human Capital	
97.	Niury Martínez Ricardo	Technician of the Laboratory for Environmental Surveillance	
98.	Marizury Valdez	Head of the IT Service. Manager of the National Dosimetry Bank	
99.	Nancy Acosta	Technician of the Internal Dosimetry Laboratory	
100.	Tania Medina	Biodosimetry Service	
101.	Rafael Castillo Gómez	Specialist of the of the Radioactive Waste Management Service	
102.	Zayda Amador Balbona	Radiation Safety Specialist	*Isotopes Centre*
103.	René Leyva Montaña	Director General	
104.	Miguel A. Soria Guevara	Radiation Protection Officer	

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ABBREVIATIONS

ADASIR	System of Analysis, Dissemination and Learning from Incidents and Radiological Events
AENTA	Nuclear Energy and Advanced Technology Agency
AGR	General Customs of the Republic
BTP	Technical Basis for Planning for Radiological Emergencies
CEADEN	Centre for Nuclear Development and Applied Technologies
CENTIS	Isotopes Centre
CITMA	Ministry of Science, Technology and Environment
CITMA-PER	CITMA's Radiological Emergency Response Plan
CNSN	National Centre for Nuclear Safety
CPHR	Centre for Radiation Protection and Hygiene
EMNDC	National Civil Defence General Staff
ENIA	National Applied Research Company
EPR	Emergency Preparedness and Response
EPREV	Emergency Preparedness Review
EPRIMS	Emergency Preparedness and Response Information Management System
IAEA	International Atomic Energy Agency
MINFAR	Ministry of the Revolutionary Armed Forces
MININT	Ministry of the Interior
MINSAP	Ministry of Public Health
NBSR	Basic Norms on Radiological Safety
PNRD	National Disaster Reduction Plan
ORASEN	Office for Environmental Regulation and Nuclear Safety
PER	Radiological Emergency Response Plan
PNER	National Plan for Radiological Emergencies
TSO	Technical Support Organization