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INTEGRATED REGULATORY REVIEW SERVICE (IRRS) FOLLOW-UP MISSION

TO

INDONESIA

Jakarta, Indonesia

25 November to 4 December 2019

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY

IAEA
Integrated Regulatory Review Service
IRRS

BADAN PENGAWAS TENAGA NUKLIR
BAPETEN

Integrated
Regulatory
Review Service

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REPORT OF THE INTEGRATED REGULATORY REVIEW SERVICE (IRRS) MISSION TO INDONESIA

Mission dates:	*25 November to 4 December 2019*
Regulatory body visited:	*BAPETEN*
Location:	*Badan Pengawas Tenaga Nuklir (BAPETEN) Jakarta, Indonesia*
Regulated facilities and activities in the mission scope:	*All regulated nuclear installation and radiation facilities and activities.*
Organized by:	*International Atomic Energy Agency*

IRRS REVIEW TEAM	
LARSSON Carl-Magnus	Team leader (Australia)
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The number of recommendations, suggestions and good practices is in no way a measure of the status of the regulatory body. Comparisons of such numbers between IRRS reports from different countries should not be attempted.

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EXECUTIVE SUMMARY

At the request of the Government of Indonesia, an international team of senior safety experts met with representatives of Indonesia from 25 November to 4 December 2019 to conduct an Integrated Regulatory Review Service (IRRS) follow-up mission. The purpose of the IRRS follow-up mission was to review Indonesia's progress against the recommendations and suggestions identified in the initial IRRS mission, which had been carried out from 2 to 14 August 2015. The mission took place at the BAPETEN (Nuclear Energy Regulatory Agency of Indonesia) Headquarters in Jakarta. BAPETEN is the national regulatory authority in Indonesia and is responsible for all aspects of regulation related to radiation safety, nuclear safety and security. The scope of the IRRS follow-up mission was the same as for the 2015 IRRS mission.

The IRRS team carried out a review of the progress made on each recommendation and suggestion that was documented in the 2015 IRRS mission report. These recommendations and suggestions cover the following areas: responsibilities and functions of the Government; the global nuclear safety regime; responsibilities and functions of the regulatory body; the management system of the regulatory body; the activities of the regulatory body, including authorization, review and assessment, inspection, enforcement and the development and content of regulations and guides; emergency preparedness and response; occupational exposure control, patient protection and the regulatory infrastructure being developed to support the introduction of a nuclear power programme. To assess progress, the IRRS team conducted a series of interviews and discussions with BAPETEN staff and staff of the Ministry of Health (MoH), and reviewed the advance reference material provided by BAPETEN.

The IRRS team took note of the current status of the nuclear programme in Indonesia, including the possibility of major projects in the near future, and used that information as a premise for the review.

Overall, the IRRS review team concluded that Indonesia, through the Government and BAPETEN, has been responsive to the recommendations and suggestions made in 2015, and continues to place focus on the implementation of a framework that provides for effective protection of public health and safety, and of the environment. The IRRS team concluded that 18 out of 24 recommendations, and 32 out of 38 suggestions made by the 2015 IRRS mission had been effectively addressed and, therefore, could be considered closed or closed on the basis of progress made and confidence in effective completion. This is a significant achievement in a period of four years. The IRRS team has consolidated some of the earlier recommendations by issuing 3 new recommendations so that the issues covered under those earlier recommendations can be addressed in a more coherent manner. The IRRS team also identified one new good practice.

The IRRS team highlighted the following initiatives that had been taken since 2015:

- Approval of a national policy and strategy for safety by the Government of Indonesia;
- Development of a comprehensive legislative framework that includes a draft amendment to the existing nuclear law (Law No. 10 of 1997) on radiation and nuclear safety and security, which is awaiting final approval in the Parliament.

The IRRS team also noted ongoing progress in the following areas:

- Updating of a number of radiation and nuclear safety regulations and internal procedures;
- Improvement of the management system of BAPETEN, including establishment of a mission and a vision for the organization;
- Establishment of arrangements to improve staffing level and competencies;

- Introduction of a graded approach to the regulatory oversight of facilities and activities;
- Strengthening of core regulatory functions by developing a variety of new processes and procedures;
- Development of mechanisms for communication with the public;
- Improvement of emergency preparedness and response by formulating the regulatory requirements in this area and making practical arrangements.

BAPETEN has shown commitment to continuous improvement of its regulatory practices and is fully engaged in the global nuclear safety regime, being part of relevant international conventions.

Additionally, BAPETEN is further expanding its scope and programme, as well as building competency, to address the regulation of a future nuclear power programme, while maintaining its focus on safety of the current facilities and activities.

On the other hand, the IRRS team identified some areas still needing improvement that the IRRS team believes would enhance the legal and regulatory framework for safety in Indonesia.

Therefore, Indonesia needs to take further actions to:

- Complete the update of its legislative framework and align it with the IAEA safety standards;
- Strengthen the legal and regulatory framework regarding waste management, decommissioning and remediation, including funding arrangements, and develop a policy and strategy in this area, which also accounts for a future nuclear programme;
- Further align the regulatory framework for control of medical and occupational exposure with the IAEA safety standards; and
- Develop a government strategy to enable all organizations involved in ensuring safety of a future nuclear power programme to attract and retain qualified personnel.

The development of BAPETEN over the next few years will be an on-going challenge. As in the case of many other regulatory bodies around the world, BAPETEN has to maintain and further develop its human and financial resources. Maintaining and expanding staff competence and knowledge will be a continuous challenge as the number of radiation facilities is growing and applications for research reactor licence renewals are expected in the near future. Large scale and innovative nuclear technologies such as a 10 MWt High Temperature Gas-Cooled Reactor (HTGR) or Small Modular Reactors (SMR), would create a new challenge not only for BAPETEN, but for the entire nuclear regulatory framework in Indonesia. Therefore, the Government of Indonesia may consider assigning a coordinating function for nuclear safety infrastructure to an existing or new organization.

The IRRS team concluded that the BAPETEN's management and staff clearly recognize the importance of their mission towards the safety and protection of the Indonesian public.

Throughout the mission, the IRRS team received full cooperation from all parties involved. In particular, the BAPETEN staff was very open in the discussions and provided excellent assistance.

The specific findings of the follow-up mission are summarized in Appendices IV and V.

An IAEA press release was issued following the mission.

I. INTRODUCTION

At the request of the Government of Indonesia, an international team of senior safety experts met representatives of BAPETEN from 25 November to 4 December 2019 to conduct an Integrated Regulatory Review Service (IRRS) follow-up mission. The purpose of the follow-up mission was to review the implementation of the recommendations and suggestions given to the Government of Indonesia and BAPETEN during the IRRS Mission in August 2015. The Follow-Up Mission was formally requested by the Government of Indonesia in May 2018. A preparatory meeting was conducted on 13 and 14 February 2019 at the BAPETEN's Headquarters in Jakarta to discuss the purpose, objectives and detailed preparations of the review in connection with regulated facilities and activities in Indonesia and their related safety aspects.

The IRRS review team consisted of nine experts from nine IAEA Member States, three IAEA staff members. The IRRS review team carried out the review in the areas covered by the initial mission in August 2015.

The follow-up self-assessment report and supporting documentation were provided to the IRRS review team as advance reference material (ARM) for the mission. During the mission, the IRRS review team performed a systematic review of all topics by reviewing the ARM and additional information, and by conducting interviews with the management and staff of BAPETEN and staff of Ministry of Health.

All through the mission the IRRS team received excellent support and cooperation from BAPETEN.

II. OBJECTIVE AND SCOPE

The purpose of this IRRS follow-up mission was to conduct a review of the implementation of the recommendations and suggestions given to the Government of Indonesia during the IRRS Mission in August 2015 and to exchange information and experience in the areas covered by the IRRS. The IRRS review scope included all facilities and activities regulated by BAPETEN. The review was carried out by comparison of existing arrangements against the IAEA safety standards.

It is expected that the IRRS follow-up mission will facilitate regulatory improvements in Indonesia and other Member States from the knowledge gained and experiences shared between BAPETEN and IRRS reviewers and through the evaluation of the effectiveness of the Indonesia`s regulatory framework for nuclear and radiation safety.

III. BASIS FOR THE REVIEW

A) PREPARATORY WORK AND IAEA REVIEW TEAM

At the request of the Government of Indonesia, a preparatory meeting for the Integrated Regulatory Review Service (IRRS) follow-up mission was conducted at BAPETEN's Headquarters in Jakarta, Indonesia, on 13 and 14 February 2019. The preparatory meeting was carried out by the appointed Team Leader Mr Carl-Magnus Larsson, Deputy Team Leader Mr Petr Krs, IAEA Coordinator Mr Ibrahim Shaddad and the BAPETEN representatives.

The IRRS mission preparatory team had discussions regarding regulatory programmes and policy issues with the senior management and staff of BAPETEN represented by Ms Dahlia Cakrawati Sinaga, Director of Regulations Development for Nuclear Installation and Materials at BAPETEN. The discussions resulted in agreement that the regulatory functions covering the following facilities and activities were to be reviewed by the IRRS follow-up mission:

- Research reactors;
- Fuel cycle facilities;
- Waste management facilities;
- Radiation sources facilities and activities;
- Decommissioning;
- Transport of radioactive materials;
- Control of medical exposure;
- Occupational radiation protection;
- Public and environmental exposure control;
- Waste management (policy and strategy, predisposal and disposal);
- Preparations for the regulation of nuclear power plants;
- Selected policy issues.

Presentations were made on the national context, the current status of BAPETEN and the progress made by BAPETEN since the initial mission of August 2015.

IAEA staff presented the IRRS principles, process and methodology of conducting an IRRS follow-up mission. This was followed by a discussion on the tentative work plan for the implementation of the follow-up mission in Jakarta from 25 November to 4 December 2019.

The proposed IRRS review team composition (senior regulators from Member States to be involved in the review) was discussed and the size of the IRRS review team was tentatively confirmed. Logistics including meeting and work space, counterpart identification, lodging and transport arrangements were also addressed.

The BAPETEN Liaison Officer for the Preparatory Meeting and the IRRS follow-up mission was Ms Dahlia Cakrawati Sinaga.

BAPETEN provided the IAEA (and the review team) with the advance reference material and additional materials for the review in August 2019. In preparation for the mission, the IRRS review team members conducted a review of the advance reference material and provided their initial review comments to the IRRS Review Team Coordinator and Team Leader prior to the follow-up mission.

B) REFERENCES FOR THE REVIEW

The relevant IAEA safety standards and the Codes of Conduct on the Safety and Security of Radioactive Sources and Safety of Research Reactors were used as review criteria. The complete list of IAEA publications used as references for this mission is provided in Appendix VII.

C) CONDUCT OF THE REVIEW

An initial IRRS review team meeting was conducted on Sunday, 24 November 2019, in Jakarta by the IRRS Team Leader and the IRRS IAEA Team Coordinator to discuss the general overview, the focus areas and specific issues of the mission, to clarify the basis for the review and the background and objectives of the IRRS mission and to agree on the methodology for the review and the evaluation among all reviewers. They also presented the agenda for the mission.

The Liaison Officer, Ms Dahlia Cakrawati Sinaga, was present at the initial IRRS review team meeting, in accordance with the IRRS guidelines, and presented logistical arrangements for the mission.

The reviewers also reported their first impressions on the implementation of the findings based on the advance reference material. General approaches for the drafting of the mission conclusions were agreed.

The IRRS entrance meeting was held on Monday 25 November 2019, with the participation of senior management and staff of BAPETEN. Opening remarks were made by the Mr Yus Rusdian Akhmad, Deputy Chairman of Nuclear Safety Assessment, and the Team Leader, Mr Carl-Magnus Larsson, gave a presentation on the expectations of the IRRS follow-up mission. Ms Dahlia Cakrawati Sinaga, from BAPETEN gave an overview of activities and response to the 2015 mission findings.

During the mission, a review was conducted for all the mission scope areas with the objective of reviewing the Government and BAPETEN's response to the recommendations and suggestions identified during the initial mission. The review was conducted through meetings, interviews and discussions regarding the national practices and activities.

The IRRS review team performed its activities based on the mission programme given in Appendix II.

The IRRS Follow-Up Exit Meeting was held on Wednesday 4 December 2019 where the IRRS Team Leader Mr Carl-Magnus Larsson presented the results of the follow-up mission highlighting the main findings. This was followed by a statement by Mr Jazi Eko Istiyanto, Chairman of BAPETEN, in response to the Team Leader's presentation. Closing remarks were made by Mr Jovica Bosnjak on behalf of the Director of the Division of Radiation, Transport and Waste Safety, Department of Nuclear Safety and Security.

A press release was issued by the IAEA at the end of the mission.

1. RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT

1.1. NATIONAL POLICY AND STRATEGY FOR SAFETY

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: An explicit national safety policy and corresponding strategy that reflect the existing situation and development plans for use of nuclear energy and ionising radiation, and the long term commitment to safety of the Government, are not in place.	
(1)	**BASIS: GSR Part 1 Requirement 1, para. 2.3 states that "***The government shall establish a national policy and strategy for safety, the implementation of which shall be subject to a graded approach in accordance with national circumstances and with the radiation risks associated with facilities and activities, to achieve the fundamental safety objective and to apply the fundamental safety principles established in the Safety Fundamentals".*
(2)	**BASIS: GSR Part 1 Requirement 1, para. 2.3 states that** *"The national policy and strategy for safety shall express a long term commitment to safety. The national policy shall be promulgated as a statement of the government's intent. The strategy shall set out the mechanisms for implementing the national policy. In the national policy and strategy, account shall be taken of the following:* *…* *(c) The specification of the scope of the governmental, legal and regulatory framework for safety;* *(d) The need and provision for human and financial resources;* *(e) The provision and framework for research and development;* *(f) Adequate mechanisms for taking account of social and economic developments;* *(g) The promotion of leadership and management for safety, including safety culture.*
(3)	**BASIS: GSR Part 1 Requirement 1, para. 2.4 states that** *"The national policy and strategy for safety shall be implemented in accordance with a graded approach, depending on national circumstances, to ensure that the radiation risks associated with facilities and activities, including activities involving the use of radiation sources, receive appropriate attention by the government or by the regulatory body.*
R1	**Recommendation: The Government should develop and document a national policy and strategy for safety, supported by a national co-ordinated plan, to ensure the appropriate national infrastructure is implemented.**
Observation: Fundamental safety principles (as per SF-1) such as responsibility for safety, leadership and management for safety, and optimization of protection are not fully embedded in the framework for safety. A graded approach based on these principles is not explicitly defined in the Act or in implementing regulations and it is not applied consistently throughout the regulatory practices.	
(1)	**BASIS: GSR Part 1 Requirement 2, para. 2.5 states that** *"The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following:* *1) The safety principles for protecting people — individually and collectively — society and the environment from radiation risks, both at present and in the future;* *…*

Original mission RECOMMENDATIONS, SUGGESTIONS	
	(8) Provision for the review and assessment of facilities and activities, in accordance with a graded approach; *…* *(10) Provision for the inspection of facilities and activities, and for the enforcement of regulations, in accordance with a graded approach;*
R2	**Recommendation: The Government should ensure that the fundamental safety principles of the IAEA SF-1 are fully incorporated into the legal and regulatory framework for safety.**
S1	**Suggestion: The Government and BAPETEN should consider ensuring that all regulatory functions are implemented in a graded approach.**

Note: Recommendation 1 also covers issues raised in section 12.2.1.

Note: Suggestion 1 also covers issues raised in section 5.1.

Changes since the initial IRRS mission

Recommendation 1: In accordance with GSR Part 1 Requirement 1, the Government should establish a national policy for safety by means of different instruments, statutes and laws. Since the initial mission in 2015, a new Presidential Regulation No. 60 of 2019 on "National Policy and Strategy on Nuclear and Radiation Safety" has been promulgated and a draft amendment to Act No. 10 of 1997 on "Nuclear Energy" has been developed (the amendment is ready to be sent to Parliament for consideration). Together with corresponding legislation, the Presidential Regulation and the draft amendment to Act No. 10 of 1997 will constitute the national policy and strategy for safety in the sense provided for in GSR Part 1, Rev 1. The policy and strategy include roles, duties and commitments of parties related to the use of nuclear energy and ionizing radiation.

The policy and strategy defined in the above mentioned legislative documents refer to the fundamental safety objective and the fundamental safety principles established in IAEA SF-1, and to binding international legal instruments such as the Convention on Nuclear Safety. They also include specification of the scope of the governmental, legal and regulatory framework for safety, the provision of human and financial resources, the mechanisms for taking account of societal and economic developments, and promotion of leadership and management for safety, including safety culture.

The Indonesian nuclear programme is currently facing a number of challenges, such as the long term operation and subsequent licence renewals of existing research reactors, the application of modern nuclear technologies (medicine, science, etc.), the long term management of radioactive waste and spent fuel, and the provision of an appropriate number of qualified experts for all parties with responsibility for safety. Commencement of the project to build a new 10 MWt HTGR in Indonesia (referred to in the report from the original IRRS mission in 2015) is still pending. Plans for construction of a small modular test reactor (SMR) for electricity production have been put forward by the province of West Kalimantan. Application of such innovative and large-scale nuclear technology projects would create a new challenge for the nuclear regulatory framework in Indonesia. This will require provision of sufficient competent human resources and a legal framework updated to the latest IAEA safety standards (see recommendations 3 and 4 in section 1 and suggestion 3 in section 3).

The policy and strategy defined in Presidential Regulation No. 60 of 2019 was developed for a duration of 15 years and shall be updated every 5 years. It requires all involved organizations at the government and

provincial levels to use it as reference when preparing their strategic plans. Such strategic plans are crucial for proper implementation of the policy and strategy for safety in practice. Especially, if a large-scale nuclear technology project such as introduction of SMR technology, as mentioned above, is to be implemented in the near future.

Since Presidential Regulation No. 60 of 2019 was promulgated recently, this recommendation is considered closed even though the amendment to Act No. 10 of 1997 is still to be considered by the Parliament.

Status of the finding in the initial mission

Recommendation 1 is closed, as the new Presidential Regulation No. 60 of 2019 on "National Policy and Strategy on Nuclear and Radiation Safety" was promulgated.

Changes since the initial IRRS mission

Recommendation 2: The Fundamental Safety Principles of IAEA SF-1 were considered when drafting the amendment to Act No. 10 of 1997 and in the revision of the corresponding Government Regulations. A table cross-referencing the fundamental safety principles with the relevant paragraphs of the amendment to Act No. 10 of 1997 was presented by BAPETEN. The bill is to be submitted by the Government to the Parliament in the near future. Since the amendment is quite well advanced in the legislative process and in accordance with R1, this recommendation can be closed on the basis of progress and confidence in completion of planned legislative actions.

Status of the finding in the initial mission

Recommendation 2 is closed on the basis of progress made and confidence in effective completion, as the planned legislative action to amend Act No. 10 of 1997 on "Nuclear Energy" will be finalized.

Changes since the initial IRRS mission

Suggestion 1: BAPETEN has an internal policy to implement its regulatory functions in a graded approach (BCR No. 14 of 2014 on "BAPETEN Management System", Appendix 1B on "BAPETEN Regulatory Policy", section 7 "Risk management and graded approach").

This suggestion refers to the main functions of a regulatory body and in particular in its basis, the suggestion is specifically referring to inspections. In the inspection area, BCR No. 1 of 2017 on "Conducting Inspections in the Nuclear Energy Oversight" provides requirements for implementation of inspections, considering type of installation, risk level, inspector qualifications and inspection period. The regulation states: "BAPETEN's attention to the level and type of radiation exposure does not mean that all exposures, sources, and human actions, can or need to be simultaneously considered when establishing monitoring systems and regulations for their application. Conversely, the graded approach is expected to be in line with the impact of the source situation or certain exposure to supervisory control, and the level of exposure / risk associated with the source or situation".

At the time of the follow-up mission the graded approach is implemented to most of BAPETEN's regulatory activities. There are still some specific areas, such as authorization, where this concept needs to be implemented and revisions of relevant legislation completed, see section 5.1 of this Report.

Status of the finding in the initial mission

Suggestion S1 is closed on the basis of progress made and confidence in effective completion, as the incorporation of the graded approach concept is already well underway and will be finalized and implemented in BAPETEN's regulatory functions.

1.2. ESTABLISHMENT OF A FRAMEWORK FOR SAFETY

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The legal and regulatory framework for safety is not fully aligned with the latest IAEA requirements, such as GSR Part 3, Part 4, Part 5 and Part 7, or is still under development.	
(1)	**BASIS: GSR Part 1 Requirement 2, para. 2.5 states that** *"The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety".*
R3	**Recommendation: The Government and BAPETEN should ensure that the legal and regulatory framework is kept up to date and corresponds to the current IAEA standards.**

Note: Recommendation 3 also covers issues raised in sections 5.4, 5.7, 6.6, 9.4, 10.1, 11 and 12.2.

Changes since the initial IRRS mission

Recommendation 3: The process of amending Act No. 10 of 1997 commenced in 2016, in order to bring the act in alignment with the requirements of IAEA GSR Part 3, Part 4, Part 5 and Part 7. BAPETEN has developed "Program for Establishment of Laws and Regulations on Nuclear Energy in 2019", based on BAPETEN Regulation No. 8 of 2018 on "Procedures for Establishment of Laws and Regulations". This programme contains a list of 20 regulations that should be developed in 2019. In addition, BAPETEN has developed a document which contains a list of laws and regulations that will be developed in the period from 2020 to 2024, as part of BAPETEN's 2020-2024 Strategic Plan.

In parallel, BAPETEN initiated a revision of Government Regulations in order to adjust to the provisions of the above mentioned IAEA standards. This includes mainly GR No.33 of 2007 on "Safety of Ionizing Radiation and Security of Radioactive Sources", GR No.29 of 2008 on "Licensing of the Use of Ionizing Radiation Sources and Nuclear Materials", GR No.54 of 2012 on "Safety and Security of Nuclear Installation", GR No2 of 2014 on "Licensing of Nuclear Installations and Utilization of Nuclear Materials", and GR No.61 of 2013 on "Radioactive Waste Management".

An amendment of Act 10 of 1997 is expected to be presented to Parliament for consideration next year and is expected to be promulgated in 1 to 2 year timeframe. GR No. 29 of 2008 on "Licensing of Use of Ionizing Radiation Sources and Nuclear Materials" is in an advanced stage of revision (already with the Ministry of Justice, after consultations within Government), whereas all other planned revisions of Government Regulations are in earlier stages of the legislative process.

A decision was made to move some detailed provisions 'down' from Government Regulations to BAPETEN Regulations, and the revision of relevant BAPETEN Regulations could start in parallel. Such restructuring of the legislative documents should bring consistency and coherence into the legislative framework, which otherwise may become outdated in many parts and unfriendly to use in for the majority of users. However, this change makes the ongoing legislative process more complex and difficult to coordinate. In addition, due to standard timeframes in the legislative process and the complexity of planned changes, it is expected that the whole process of aligning the legislation and regulation to the IAEA safety standards will require time. Nevertheless, BAPETEN presented a number of draft revisions of Government or BAPETEN Regulations, some of them at well advanced stages of the process. The IRRS team encourages the Government and BAPETEN to complete the revision and restructuring of regulations to provide for an updated, concise and applicable legislative framework for safety that is aligned with the IAEA safety standards. Conclusions on status of this recommendation have been provided in several sections in this report.

Status of the finding in the initial mission

Recommendation 3 is open, as most of the revisions of the relevant legislation such as the amendment to Act No. 10 of 1997 on "Nuclear Energy" and the associated Government and BAPETEN Regulations are still under development.

1.3. ESTABLISHMENT OF A REGULATORY BODY AND ITS INDEPENDENCE

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The human resources of BAPETEN appear to be insufficient in several areas. In addition, lack of resources may adversely affect essential processes such as long-term competence building, basic and refreshment training and development of regulations and guides.	
(1)	***BASIS*: GSR Part 1 Requirement 3, states that** *"The government, through the legal system, shall establish and maintain a regulatory body, and shall confer on it the legal authority and provide it with the competence and the resources necessary to fulfil its statutory obligation for the regulatory control of facilities and activities.*
	BASIS: GSR Part 1, Req. 18 states that *"The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its responsibilities".*
R4	**Recommendation: The Government should provide BAPETEN with human and financial resources to ensure adequate discharge of its statutory regulatory obligations.**

Changes since the initial IRRS mission

Recommendation 4: Since the IRRS mission in 2015, BAPETEN has drafted a human resources plan that defines the number of staff necessary and the essential knowledge, skills and abilities for them to perform its regulatory functions. The plan was developed based on (among other guidance) the IAEA SARCoN (Systematic Assessment of Regulatory Competence Needs) methodology for competence mapping and is in compliance with relevant national legislation and government rules (Act No 5 of 2014 on "State Civil Apparatus" and GR No.11 of 2017 on "Management of Civil Servants"). (For additional details, see text concerning the resolution of S3 of section 3 of this report.)

In order to address the recommendation, BAPETEN should finalize its human resources plan and use it for justification for getting the resources necessary to perform its functions. Based on such justification, the Government should provide BAPETEN with necessary resources to fulfil its statutory obligation for regulatory control of facilities and activities, in particular if the current plans for implementation of major nuclear projects are brought to realization. This recommendation is considered open, since the human resource plan is still in draft version and its results have so far not resulted in appropriate increase of BAPETEN resources provided by the Government that would allow BAPETEN to face the challenges of an expanded nuclear programme.

Status of the finding in the initial mission

Recommendation 4 is open, as BAPETEN has not yet been provided with resources that were identified in its human resource plan as necessary to fulfil its statutory functions, in particular for an expanded nuclear programme.

1.4. RESPONSIBILITY FOR SAFETY AND COMPLIANCE WITH REGULATIONS

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The principle of prime responsibility for safety is not completely addressed in the legal framework for safety.	
(1)	**BASIS: GSR Requirement 5 states that** *"The government shall expressly assign the prime responsibility for safety to the person or organization responsible for a facility or an activity, and shall confer on the regulatory body the authority to require such persons or organizations to comply with stipulated regulatory requirements, as well as to demonstrate such compliance."*
(2)	**BASIS: GSR Requirement 6 states that** *"The government shall stipulate that compliance with regulations and requirements established or adopted by the regulatory body does not relieve the person or organization responsible for a facility or an activity of its prime responsibility for safety."*
R5	**Recommendation: The Government, through the legal framework, should ensure that prime responsibility of safety is assigned to the person or organization responsible for a facility or an activity.**

Changes since the initial IRRS mission

Recommendation 5: The draft amendment of Act No.10 of 1997 on "Nuclear Energy" will be presented to Parliament for consideration in 2020. When promulgated, this amendment will embed the principle of prime responsibility for safety in the law.

Status of the finding in the initial mission

Recommendation 5 is closed on the basis of progress made and confidence in effective completion, as the amendment to Act No.10 of 1997 on "Nuclear Energy" covers the principle of prime responsibility for safety.

1.5. COORDINATION OF AUTHORITIES WITH RESPONSIBILITIES FOR SAFETY WITHIN THE REGULATORY FRAMEWORK

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: In areas such as regulation of medical radiation applications and transport of radioactive materials there appears to be insufficient coordination between BAPETEN and other relevant government authorities.	
(1)	**BASIS: GSR Part 1 Requirement 7 states that** *"Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties".*

Original mission RECOMMENDATIONS, SUGGESTIONS	
R6	**Recommendation: The Government should ensure there is appropriate coordination and liaison between BAPETEN and other relevant authorities in the areas of medical application of radiation and transport of radioactive material.**

Note: Recommendation 6 also covers issues raised in sections 5.7, 7.5 and 11.1.

Changes since the initial IRRS mission

Recommendation 6: Presidential Regulation No. 60 of 2019 on National Policy and Strategy on Nuclear and Radiation Safety specifies the responsibilities of the relevant authorities related to regulation of medical exposure, including the responsibilities of the Ministry of Health (MoH) and BAPETEN. In addition, to strengthen cooperation and coordination at the national level, BAPETEN has signed an MoU with the MoH, which is of special importance considering the role of the MoH as a regulator and a major user of radiation technologies in medicine. BAPETEN has extended its cooperation with the MoH since the initial IRRS mission in 2015. The development of BCR No. 2 of 2018 on "Acceptance Test of X-Ray Machine" has been coordinated with the MoH. This situation was confirmed by the IAEA appraisal service ORPAS, which was invited to Indonesia in 2018. The ORPAS team identified improvements of existing policies and regulations together with further strengthening of cooperation between BAPETEN and MoH as areas where further work may be required to meet international guidance and best practices.

Overlaps of responsibility between BAPETEN and MoH, such as duplication of requirements for testing and calibration of radiation sources used in medicine, and of the recognition of medical physicists, have been identified and need to be adequately addressed in the ongoing revision of the regulations. See section 11.1.

Presidential Regulation No. 60 of 2019 on "National Policy and Strategy on Nuclear and Radiation Safety" also stipulates arrangements for coordination between transport authorities (the Ministry of Transport, the sea transport authorities, the air transport authorities and the Police). Cooperation arrangements between BAPETEN and the Ministry of Transport have been established through the process of licensing and developing regulatory documents.

The IRRS team was informed that the Ministry of Transport has initiated an activity to draft an MoU in order to formalize and further enhance the existing cooperation with BAPETEN, however this MoU has not yet been developed. See section 5.7.

Status of the finding in the initial mission

Recommendation 6 is closed on the basis of progress made and confidence in effective completion, as considerable progress in strengthening cooperation and coordination between BAPETEN and relevant Ministries has been made. (See sections 5.7, 7.5 and 11.1)

1.6 SYSTEM FOR PROTECTIVE ACTIONS TO REDUCE EXISTING OR UNREGULATED RADIATION RISKS

There were no findings in this area in the initial IRRS mission.

1.7. PROVISIONS FOR THE DECOMMISSIONING OF FACILITIES AND THE MANAGEMENT OF RADIOACTIVE WASTE AND OF SPENT FUEL

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: A specific document establishing a national policy and strategy for radioactive waste management and decommissioning is not in place.	
(1)	**BASIS: GSR Part 5 Requirement 2 states that** *"To ensure the effective management and control of radioactive waste, the government shall ensure that a national policyy and strategy for management are established.*
(2)	**BASIS: GSR Part 6 para.3.4 states that** *"The responsibilities of the government include: —Defining the national policy for decommissioning and for management of the resulting radioactive waste;* *—Defining the legal, technical and financial responsibilities of organizations to be involved in decommissioning"*
R7	**Recommendation: The Government should establish and promulgate a national policy and strategy for radioactive waste management and decommissioning.**
Observation: There are no provisions in the Act and corresponding Government regulations that take into account the long-term nature of radioactive waste and spent fuel management, decommissioning including decommissioning of nuclear installations before the end of its design life, and the establishment of appropriate financial provisions for such activities.	
(1)	***BASIS: GSR Part 1 R10 states that:*** "*The government shall make provision for the safe decommissioning of facilities, the safe management and disposal of radioactive waste arising from facilities and activities, and the safe management of spent fuel.*"
(2)	***BASIS: GSR Part 1 R10, para.2.3 states that:*** "*Appropriate financial provision shall be made for:* *(a) Decommissioning of facilities;* *(b) Management of radioactive waste, including its storage and disposal;* *(c) Management of disused radioactive sources and radiation generators;* *(d) Management of spent fuel.*
R8	**Recommendation: The Government should establish provisions, in the legal framework, governing long-term radioactive waste management, spent fuel management and decommissioning, including funding of such activities.**

Changes since the initial IRRS mission

Recommendation 7: The new Presidential Regulation No. 60 of 2019 on "National Policy and Strategy on Safety" was promulgated in September 2019. The annex to this document sets out the timeframe and process for the development of a policy and strategy for waste management. According to this Presidential Regulation, the policy and strategy for waste management, spent fuel management and decommissioning should be developed by 2025. Plans for long-term storage and disposal of radioactive waste are to be developed by 2035.

The development of policy and strategy for waste management, spent fuel management, decommissioning and remediation may include management of waste containing naturally occurring radioactive material

(NORM), due to the radioactive properties of the waste. The IRRS team encourages relevant authorities to consider the scope of the policies and strategies, as they are developed.

Status of the finding in the initial mission

Recommendation 7 is open, as a national policy and strategy radioactive waste management, spent fuel management, decommissioning and remediation have not been promulgated yet.

Changes since the initial IRRS mission

Recommendation 8: Safety objective is embedded as an overarching element in the national policy and strategy for safety promulgated in Presidential Regulation No. 60 of 2019. However, a corresponding policy and strategy on radioactive waste management and spent fuel has not been developed yet.

The amendment to Act No. 10 of 1997 on "Nuclear Energy" (as per 14 August 2019) is addressing long-term radioactive waste management (in Article 92), spent fuel management (in Article 83 to 91), decommissioning (in Article 38 to 42), and funding (in Article 44).

However, the amendment to the Act No. 10 of 1997 and existing regulations (particularly GR No. 61 of 2013, but also GR No. 29 of 2008 and GR No. 33 of 2007) do not contain all necessary provisions for the safe decommissioning of facilities, the safe management and disposal of radioactive waste arising from facilities and activities, and the safe management of spent fuel. In particular, financial provisions for remediation and existing exposure situations, such as mining, NORM activities and facilities, orphan sources and legacy waste and provisions for safe disposal of all types of waste are lacking.

Moreover, relevant requirements of IAEA safety standards, such as GSR Part 3, GSR Part 5 and GSR Part 6, are not considered in the legislation in a holistic and consistent manner.

Status of the finding in the initial mission

Recommendation 8 is open, as the provisions governing long-term radioactive waste management, spent fuel management and decommissioning, including funding of such activities are not yet fully embedded in the legislative framework.

1.8. COMPETENCE FOR SAFETY

There were no findings in this area in the initial IRRS missions.

1.9. PROVISION OF TECHNICAL SERVICES

Original mission RECOMMENDATIONS, SUGGESTIONS	
	Observation: The current practice is that all workers are monitored on a three month basis in all different practices.
(1)	**BASIS: RS-G-1.3 para. 3.16 states that** *"The frequency of dosimeter exchange should be established by the dosimetry service depending on the type of work being performed and the anticipated exposure associated with the work, and the characteristics of the dosimeters and the overall limit of detection of the dosimetry system. Exchange frequencies can range from daily, in*

Original mission RECOMMENDATIONS, SUGGESTIONS	
	special operations, to every six months, if the exposure is expected to be very low, but exchange periods of one to three months are typical."
S2	**Suggestion: BAPETEN should consider requiring the appropriate individual monitoring periods commensurate with the exposure condition.**

Changes since the initial IRRS mission

Suggestion 2: BAPETEN will require the period of individual monitoring to be linked to the risk and exposure conditions associated with the facility or activity. This requirement is addressed in the revision of BCR No. 4 of 2013 on "Radiation Protection and Safety in the Utilization of Nuclear Energy", which will be developed in 2020 based on BAPETEN's Strategic Plan for revising regulations.

Status of the finding in the initial mission

Suggestion 2 is closed on the basis of progress made and confidence in effective completion, as it is addressed in the revision of BCR No. 4 of 2013.

2. THE GLOBAL SAFETY REGIME

2.1. INTERNATIONAL OBLIGATIONS AND ARRANGEMENTS FOR INTERNATIONAL COOPERATION

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: In order to strengthen the nuclear safety infrastructure in Indonesia, the Government establishes and maintains extensive multilateral and bilateral international cooperation.	
(1)	**BASIS: GSR Part 1 Requirement 14 states that** *"The government shall fulfil its respective international obligations, participate in the relevant international arrangements, including international peer reviews, and promote international cooperation to enhance safety globally."*
GP1	**Good Practice: The Government and BAPETEN make extensive use of bilateral and multilateral international cooperation for training and competence building.**

2.2. SHARING OF OPERATING EXPERIENCE AND REGULATORY EXPERIENCE

There were no findings in this area in the initial IRRS missions.

3. RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY

3.1. ORGANIZATIONAL STRUCTURE OF THE REGULATORY BODY AND ALLOCATION OF RESOURCES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not appear to be authorised to independently take decisions on their organizational structure. BAPETEN's total funding is under government control; however, the distribution of resources within the BAPETEN is under its own control.	
Observation: The distribution of manpower, e.g. inspectors, between nuclear facilities, and radiation sources and facilities, appears to be disproportional which may be detrimental to regulation of radiation sources and facilities.	
Observation: BAPETEN issues a licence for each single source which inflicts heavy administrative burden on its staff.	
(1)	**BASIS: GSR Part 1 Requirement 18, para. 4.5 states that** *"The regulatory body has the responsibility for structuring its organization and managing its available resources so as to fulfil its statutory obligations effectively. The regulatory body shall allocate resources commensurate with the radiation risks associated with facilities and activities, in accordance with a graded approach. Thus, for the lowest associated radiation risks, it may be appropriate for the regulatory body to exempt a particular activity from some or all aspects of regulatory control; for the highest associated radiation risks, it may be appropriate for the regulatory body to carry out a detailed scrutiny in relation to any proposed facility or activity before it is authorized, and also subsequent to its authorization."*
R9	**Recommendation: The Government should authorise BAPETEN to develop and implement the organizational structure that would be best suited to allow it to carry out its obligatory functions effectively.**
S3	**Suggestion: BAPETEN should consider adjusting the allocation of resources, within the existing or revised organizational structure, to ensure proper regulation of nuclear facilities and radiation activities, using a risk-informed graded approach**
S4	**Suggestion: BAPETEN should consider establishing regional offices to allow it to discharge its regulatory responsibilities, in particular inspections, more effectively and in a timely manner.**
S5	**Suggestion: BAPETEN should consider revising its licensing structure to allow for a more reasonable and manageable number of licenses, thereby reducing the administrative burden for the organization as well as licence holders.**

Changes since the initial IRRS mission

Recommendation 9: This recommendation was initially issued to the Government because the team considered during the original mission, that BAPETEN did not have sufficient powers and flexibility to adjust its organizational structure to properly meet expectations associated with emerging issues and technologies, or address changing political and policy priorities. Structural changes can be proposed by BAPETEN to the Ministry of Administration and its Bureau of Reform, for approval. BAPETEN shall comply to Presidential Regulation No. 68 of 2019 on "Ministry Organization" in changing its organization.

The team considered this to be an unnecessary impediment to BAPETEN's ability to expediently address emerging issues and deal with major licence applications such as the siting, construction and operation of a nuclear power plant.

The team was, nevertheless, of the view that BAPETEN has the authority and responsibility to conduct evaluations of and the need for organizational changes periodically, anticipation of new and emerging challenges. BAPETEN should submit the assessment result, analysis and the reasons for organizational changes to the Ministry of Administrative and Bureaucracy Reform.

In 2018 BAPETEN conducted an assessment for the need for changes in its organizational structure at the level of the Executive Secretariat and in early 2019 these structural changes were approved and entered into force. BAPETEN has also begun an assessment of potential changes in the organizational structure at the Deputy Chairman level (Technical Function), but it has not been completed.

During the follow-up mission, the IRRS team was informed that no changes had been made to these arrangements. BAPETEN was, however, able to demonstrate that over the years a number of structural changes had been proposed and approved, presenting some examples predating the initial mission in 2015. BAPETEN has also developed a procedure for organizational change management in response to R12 from the original mission.

As such, this recommendation could be deemed closed on the basis of progress and confidence (see section 4.4). Nevertheless, the IRRS team concluded that current arrangements are not in alignment with GSR Part 1, and do not provide the flexibility required to effectively implement a graded approach, e.g., by engaging in pre-licensing and licensing review and assessment of safety and security of high-hazard facilities.

Status of the finding in the initial mission

Recommendation 9 is open, as BAPETEN does not have the authority to independently adjust the organizational structure to suit its needs.

Changes since the initial IRRS mission

Suggestion 3: The team observed in the original mission that the distribution of staff between the nuclear and radiation safety Directorates did not appear to reflect the high number of radiation facilities and source licences issued to licence holders across Indonesia and concluded that a more proportionate distribution of staff between the Directorates should be considered.

The distribution of staff has been adjusted. BAPETEN has also instituted a number of changes that will contribute to an optimized utilization of the available workforce. This includes involvement of inspectors from both Directorates in certain type of inspections. BAPETEN has also implemented B@LIS Online, a licence administration tool and database. This allows for multiple functions, including administration of licence applications, and supports a graded approach to regulatory oversight by a performance based ranking of licence holders into four categories, being: excellent (green); good (blue); operating with conditions (yellow); and, not allowed to operate (red). BAPETEN has also instituted 'participative inspections', essentially a self-assessment tool which can be utilized by licence holders that are categorised as 'green', based on their performance history.

BAPETEN has also developed a mechanism to recognize the contributions of licensees towards fulfilment of radiation safety objectives through issuing an award, the "BAPETEN Safety and Security Award" (or the BAPETEN Award). The licensees are evaluated to produce a Safety and Security Index (SSI), ranging from 0 to 100. Facilities with an SSI of over 95.5 receive the BAPETEN Award and the list of awardees is posted on BAPETEN's B@LIS web page, which can be accessed by the public.

The IRRS team recognizes the significant and positive aspects of the BAPETEN Award for promotion of the licensees' safety and security performance and notes its impact on the safety culture for the radiation facilities and activities. The IRRS team considers this should be recognized as a Good Practice.

Follow-up Mission RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: BAPETEN has developed an award system, the "BAPETEN Safety and Security Award", for outstanding safety and security performance. The list of the awardees is published annually on the BAPETEN website. This publicly accessible recognition promotes good performance as well as safety culture.	
(1)	**BASIS: GSR Part 3, para. 2.51** *"The principal parties shall promote and maintain safety culture by:* *(h) Providing means by which the organization continually seeks to develop and strengthen its safety culture.*
(2)	**BASIS: GS-G-1.3, para. 4.37** *"In order to inform the public of the safety of nuclear installations and of the effectiveness of the regulatory body, findings of inspections and regulatory decisions may be made publicly available. The extent to which such information is made publicly available will depend on the legal provisions in the State concerned.*
GPF1	**Good practice: BAPETEN implements an award system for outstanding performance of licensees for their compliance with the safety requirements. The annual publication of the list of winners on the website will have a positive impact on the promotion of safety culture.**

Status of the finding in the initial mission

Suggestion 3 is closed, as BAPETEN has strengthened its regulatory oversight of radiation sources and improved the efficiency and flexibility in utilization of its resources.

Changes since the initial IRRS mission

Suggestion 4: Indonesia is a large and populous country, with its population spread across numerous islands, large and small. BAPETEN is in its entirety located in Jakarta. During the original mission in 2015, the team suggested that BAPETEN should consider establishing regional offices, primarily to support the inspection program, although the risks associated with establishment of regional offices were recognized.

As stated above in relation to S3, BAPETEN has sought various means to strengthen its resource allocation, regulatory oversight and 'presence' among licence holders. These measures include the B@LIS Online system and participative inspections. The IRRS team concludes that BAPETEN makes significant efforts to improve its interactions with licence holders by other means than by establishing offices in closer proximity to licence holders. The IRRS team considers S4 can be closed, for reasons similar to those used to justify closure of S3 above.

Status of the finding in the initial mission

Suggestion 4 is closed, as BAPETEN has improved the efficiency and flexibility in the utilization of its resources.

Changes since the initial IRRS mission

Suggestion 5: The original mission suggested that BAPETEN should seek to reduce the number of licences for individual sources, where feasible and applying a graded approach. This could be achieved by covering a number of sources under a single licence issued for a facility or to a licence holder. The intent was to reduce the administrative burden for both BAPETEN and the licence holders, which would enable BAPETEN to increase its attention to areas of higher priority.

BAPETEN has drafted a revision of GR No. 29 of 2008 on "Licensing for the Use of Ionizing Radiation Sources and Nuclear Materials". The revision aims to simplify the licensing process and will eliminate the need for individual source licences by capturing several sources (except large sources such as irradiators and radiation therapy equipment, which are already considered facilities) under a single facility licence.

The revision of GR No. 29 of 2008 has gone through the consultation stage and been discussed with the Ministry of Justice. It is anticipated that the Ministry will sign off on the revision in 2020, after which it would be submitted for Presidential approval. It is likely that this process will take two years to complete, and subsequent implementation through a BAPETEN Chairman Decree, including its sign off, would take additional time. The proposed changes leave less of the details in the actual regulations, whereas necessary details for implementation are planned to be outlined in the Decree. The IRRS team supports this approach.

Status of the finding in the initial mission

Suggestion 5 is closed on the basis of progress made and confidence in effective completion, as the revised GR No. 29 of 2008 provides a more efficient licensing process for sources, and is at an advanced stage of the approval process.

3.2. EFFECTIVE INDEPENDENCE IN THE PERFORMANCE OF REGULATORY FUNCTIONS

There were no findings in this area in the initial IRRS missions.

3.3. STAFFING AND COMPETENCE OF THE REGULATORY BODY

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not appear to have developed a staffing plan, based on a thorough competence analysis that addresses its staffing needs to meet the potential expansion of the nuclear programme.	
(1)	**BASIS: GSR Part 1 Requirement 18, para. 4.11 states that** *"The regulatory body has to have appropriately qualified and competent staff. A human resources plan shall be developed that states the number of staff necessary and the essential knowledge, skills and abilities for them to perform all the necessary regulatory functions."*
S6	**Suggestion: BAPETEN should consider, as part of the human resource plan, making preliminary and generic analyses of future staffing needs that may be elicited by the introduction of large-scale technologies such as a nuclear power programme.**

Changes since the initial IRRS mission

Suggestion 6: The team was, during the original mission in 2015, informed of plans (although not yet approved by the President of the Republic of Indonesia) to generate about 5 GW electricity from nuclear power by the year 2025. At the time of the follow-up mission, late 2019, this seems to be a very ambitious target. However, the IRRS team was informed of plans to site one or more nuclear facilities in West Kalimantan at the request of the regional government, of 'prototype' nature and for electricity generation, building on the SMR or other advanced technology concepts. Time frames remain ambitious. Section 1.1 of this report provides additional detail.

Suggestion 6 was based on a lack of workforce planning at the time of the initial mission, enabling BAPETEN to address the ambitious plans for nuclear power. The staffing level of BAPETEN has changed only marginally since then. If the plans for introducing nuclear power go ahead, there will be a need for an increased and competent workforce that can effectively oversee the siting, construction and operation of the proposed nuclear power plant(s).

Based on the IAEA SARCoN Tool, IAEA support and in-house work, a realistic and satisfactory analysis has been carried out of the required number of staff, skills, competencies, qualification and training needs, including on-the-job training. The IRRS team considers that the draft Chairman Decree on "Policy on Human Resources Development and Plan 2015 – 2019" should be updated to reflect the new information, and finalised. The IRRS team also encourages BAPETEN to use the updated analysis and a revised workforce plan as basis for a request to the Indonesian Government to provide BAPETEN with sufficient resources for regulatory oversight of the nuclear programme. There is considerable urgency. A request of this nature would address R4 of section 1.3 of this report, which for the time being remains open.

Suggestion 6 is referred to in sections 4.3 and 12.2.9, where it was considered closed. The IRRS team considered the conclusions regarding the workforce plan outlined above to be equally applicable to sections 4.3 and 12.2.9.

Status of the finding in the initial mission

Suggestion 6 is closed, as satisfactory evidence was provided regarding workforce planning.

3.4. LIAISON WITH ADVISORY BODIES AND SUPPORT ORGANIZATIONS

There were no findings in this area in the initial IRRS missions.

3.5. LIAISON BETWEEN THE REGULATORY BODY AND AUTHORIZED PARTIES

There were no findings in this area in the initial IRRS missions.

3.6. STABILITY AND CONSISTENCY OF REGULATORY CONTROL

There were no findings in this area in the initial IRRS missions.

3.7. SAFETY RELATED RECORDS

There were no findings in this area in the initial IRRS missions.

3.8. COMMUNICATION AND CONSULTATION WITH INTERESTED PARTIES

There were no findings in this area in the initial IRRS missions.

4. MANAGEMENT SYSTEM OF THE REGULATORY BODY

4.1. IMPLEMENTATION AND DOCUMENTATION OF THE MANAGEMENT SYSTEM

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The BAPETEN Management System (BMS) partially captures the components that are essential to carrying out its safety-related functions. Procedures for promotion of a strong safety culture and a graded approach are not included in the BMS.	
(1)	**BASIS: GSR Part 1 Requirement 19, para. 4.14 states that** "*The regulatory body shall establish and implement a management system whose processes are open and transparent [9]. The management system of the regulatory body shall be continuously assessed and improved."*
(2)	**BASIS: GSR Part 1 Requirement 19, para. 4.15 states that** *"The management system of the regulatory body has three purposes:* *(1) The first purpose is to ensure that the responsibilities assigned to the regulatory body are properly discharged.* *(2) The second purpose is to maintain and improve the performance of the regulatory body by means of the planning, control and supervision of its safety related activities.* *(3) The third purpose is to foster and support a safety culture in the regulatory body through the development and reinforcement of leadership, as well as good attitudes and behaviour in relation to safety on the part of individuals and teams.*
(3)	**BASIS: GSR GS-R-3 Requirement 2.1 states that** "A *management system shall be established, implemented, assessed and continually improved. It shall be aligned with the goals of the organization and shall contribute to their achievement. The main aim of the management system shall be to achieve and enhance safety by:* *—Bringing together in a coherent manner all the requirements for managing the organization;* *—Describing the planned and systematic actions necessary to provide adequate confidence that all these requirements are satisfied;* *—Ensuring that health, environmental, security, quality and economic requirements are not considered separately from safety requirements,* *To help preclude their possible negative impact on safety."*
(4)	**BASIS: GSR GS-R-3 Requirement 2.5 states that** *"The management system shall be used to promote and support a strong safety culture by:* *—Ensuring a common understanding of the key aspects of safety culture within the organization;* *— …"*
(5)	**BASIS: GSR GS-R-3 Requirement 2.6 states that** *"2.6. The application of management system requirements shall be graded so as to deploy appropriate resources, on the basis of the consideration of:* *—The significance and complexity of each product or activity;* *—The hazards and the magnitude of the potential impact (risks) associated with the safety, health, environmental, security, quality and economic elements of each product or activity;* *—The possible consequences if a product fails or an activity is carried out incorrectly."*
R10	**Recommendation: BAPETEN should review its management system to ensure that the**

Original mission RECOMMENDATIONS, SUGGESTIONS	
	vision, mission, safety culture and the application of a graded approach reflect the Governmental assignment of tasks and that those are communicated to and understood by all layers of the organization.

Changes since the initial IRRS mission

Recommendation 10: BAPETEN has carried out a number of activities to further develop its management system, and to address safety culture. Activities include inviting experts from IAEA and other international organizations.

Since the original mission in 2015, the Management System Manual has been updated into BCR No. 14 of 2014 on "Management System of the Nuclear Energy Regulation Agency of Indonesia". BAPETEN has commenced updating the Manual (draft revision 2019.08.05) to include the findings from external experts and outcomes from internal audits.

During the interviews, the IRRS team was informed that the BAPETEN vision and mission have been updated and are included in the draft Strategic Plan for 2020-2024. Each mission comprises two statements and one objective. Further, each objective is supported by strategic goals. In addition, BAPETEN has developed indicators in order to monitor progress towards achieving the goals and objectives. The IRRS team encouraged BAPETEN to include a description of the connection between the vision, mission, strategic goals and indicators in the Management System Manual. This can be described at the level of structure and principles, noting that the strategic plan is part of the management system.

Safety culture is considered in section 3.4 of the Management System Manual, as well as in Presidential Regulation No. 60 of 2019 on "National Policy and Strategy on Nuclear and Radiation. Safety". Considerations of safety culture are, however, not further reflected in the management system or implemented in the organization. The strategy and safety culture evaluation guideline referred to in section 3.4 of the Manual is not developed. During interviews, the IRRS team was informed that the section Centre of Radiation Facilities and Radioactive Sources (RFRS) Regulatory Assessment within the Department of Nuclear Safety Assessment has been given the task to support the BAPETEN's activities in relation to safety culture, both internally and when conducting regulatory activities.

The application of a graded approach is handled in section 3.5 of the Management System Manual, and in section 7 of BAPETEN's Regulatory Policy (appendix 1B of the Management System Manual). The IRRS team was informed that BAPETEN uses a risk management framework described in BCR No. 11 of 2011 "Procedure of Management Risk Implementation". The IRRS team encourages BAPETEN to use this methodically and consistently throughout the organization. The IRRS team has noted that a graded approach is applied in regulatory activities.

New management system documents are communicated through the intranet and are in some cases subject to information activities and discussions with staff more broadly in the Auditorium. The IRRS team encouraged BAPETEN to inform staff on the development of the management system in a more systematic manner.

Status of the finding in the initial mission

Recommendation 10 is closed on the basis of progress made and confidence in effective completion, as the vision and mission are captured in the draft strategic plan. Approaches to safety culture appraisals still need to be further clarified in the management system and implemented in the organization.

4.2. MANAGEMENT RESPONSIBILITY

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Not all responsibilities of management are reflected in the BAPETEN Management System.	
(1)	**BASIS: GS-R-3 para. 3.2 States that** *"The senior management shall develop individual values, intuitional values and behavioural expectations for the organization to support the implementation of the management system and shall act as role models in the promulgation of these values and expectations.*
(2)	**BASIS: GS-R-3, para. 3.5 states that** *"Senior management shall ensure that it is clear when, how and by whom decisions are to be made within the management system".*
(3)	**BASIS: GS-R-3, para. 3.7 States that** *"Senior management shall develop the policies of the management system. The policies shall be appropriate to the activities of the organization".*
R11	**Recommendation: BAPETEN should include appropriate values, policies and decision making procedure in its management system and ensure they are communicated to all staff.**
Observation: The role of the individual charged with the responsibility for reporting on the performance of the BAPETEN Management System is not properly captured in the management system.	
(1)	**BASIS: GS-R-3, para. 3.13 states that** *"An individual reporting directly to senior management shall have specific responsibility and authority for:* *Reporting on the performance of the management system, including its influence on safety and safety culture, and any need for improvement;.*
S7	**Suggestion: BAPETEN should consider clarifying the responsibility of the individual reporting on the performance of the management system to senior management.**

Changes since the initial IRRS mission

Recommendation R11: As dealt in section 1.1, BAPETEN had initiated the drafting of a high-level policy and strategy for safety after the original mission in 2015, which have been included in the Presidential Regulation No. 60 of 2019 on "National Policy and Strategy for Nuclear and Radiation Safety", which serves as the overarching policy document governing BAPETEN's regulatory activities, as well as the activities of other relevant agencies and ministries.

BAPETEN has developed a number of policies and procedures and has included the values of the organization in the management system. Regarding procedures for decision making, a draft administrative procedure has been developed, outlining responsibilities and authorities for decision making in relation to rules, procedures, etc., related to the management system. Information on authorization and decision making regarding signing official report documents is provided in BCR No. 10 of 2015 on "Guidance for Making Official Documents". The BAPETEN Chairman Decree No. 160/K/11/2013 "Delegation of several authorities from BAPETEN Chairman to the Deputy Chairman and Directors" provides information on decision making regarding the licencing and inspection processes. Furthermore, for licencing, decision making is clarified in the B@LIS Online licence administration system. The IRRS team encourages BAPETEN to further develop the documentation regarding decision making so that it is clear when and how decisions are to be made, and who is authorized to make decisions, and to ensure that information is easy to access.

Status of the finding in the initial mission

Recommendation 11 is closed on the basis of progress made and confidence in effective completion, as the organizational values are incorporated and policies are developed, while work on procedures are still ongoing.

Changes since the initial IRRS mission

Suggestion 7: The Chairman of BAPETEN has appointed the Executive Secretary as representative of the management system. The responsibilities are stated and clarified in the Management System Manual, section 4.5.2.

However, the functions of the representative have not yet been fully implemented, for example regarding reporting on the implementation and development of the management system to senior management.

Status of the finding in the initial mission

Suggestion 7 is closed, as the responsibilities for the management system representative have been clarified and incorporated in the Management System Manual.

4.3. RESOURCE MANAGEMENT

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not appear to have developed a staffing plan, based on a thorough competence analysis that addresses its staffing needs.	
(1)	**BASIS: GS-R-3 para. 4.1 states that** *"Senior management shall determine the amount of resources necessary and shall provide the resources to carry out activities of the organization and establish, implement, assess and continually improve the management system".*
	See Suggestion 6 in Section 3.3.
Observation: There are no procedures in the BAPETEN Management System for assessing the safety of the working environment, although audits are performed.	
	BASIS: GS-R-3, para. 4.5 states that *"Senior management shall determine, provide, maintain and re-evaluate the infrastructure and the working environment necessary for work to be carried out in a safe manner and for requirements to be met."*
S8	**Suggestion: BAPETEN should consider establishing procedures for assessing the safety and appropriateness of the working environment.**

Changes since the initial IRRS mission

Suggestion 6 (section 4.3): Since the subject is already covered in section 3.3 of this report, the subject has not been discussed in this section.

Status of the finding in the initial mission

Suggestion 6 (in section 4.3) is closed. (See section 3.3)

Changes since the initial IRRS mission

Suggestion 8: Overarching responsibilities and activities for evaluation of the work environment are stated in section 5.6 of the Management System Manual. In order to ensure proper assessment of the work

environment, BAPETEN has developed BCR No. 4 of 2016 on "Occupational Safety and Health and Environmental Management System". This regulation describes planning, implementation, organizational structure and steering committee for health, safety and environmental management, and review and assessment by management. The regulation, states that the management system for work and environmental health and safety is a guidance to fulfil the requirements stated in the Management System Manual. The IRRS team encouraged BAPETEN, when updating the Management System Manual, to include a reference to BCR No. 4 of 2016 and outline its content at a general level.

Status of the finding in the initial mission

Suggestion 8 is closed, as BCR No. 4 of 2016 on "Occupational Safety and Health and Environmental Management System" includes a description of assessments of safety and appropriateness of the work environment.

4.4. PROCESS IMPLEMENTATION

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The BAPETEN Management System currently does not include a procedure for organizational changes.	
(1)	**BASIS: GS-R-3, para. 5.28 states that** *"Organizational changes shall be evaluated and classified according to their importance to safety and each change shall be justified."*
(2)	**BASIS: GS-R-3, para. 5.29 states that** *" The implementation of such changes shall be planned, controlled, communicated, monitored, tracked and recorded to ensure that safety is not compromised.*
R12	**Recommendation: BAPETEN should develop and include procedures for analysing the need for organizational changes taking into consideration safety aspects, and ensure that the procedures are implemented and communicated to all concerned.**

Changes since the initial IRRS mission

Recommendation 12: BAPETEN is not authorized to make any significant structural changes in the organization without approval from Government (see R9 in section 3.1, which is open). In order to ensure that safety aspects have been taken into consideration before submitting proposed organizational changes, BAPETEN has developed a draft procedure for organizational change management (Administrative Procedure No PA/BUO/10). The procedure relates to section 4.5.4 in the Management System Manual.

Status of the finding in the initial mission

Recommendation 12 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has developed a draft procedure for organizational change management.

4.5. MEASUREMENT, ASSESSMENT AND IMPROVEMENT

Original mission RECOMMENDATIONS, SUGGESTIONS
Observation: While procedures for self-assessments in order to evaluate performance are included in the BMS, they have not been fully implemented and safety culture aspects are not included.

Original mission RECOMMENDATIONS, SUGGESTIONS	
(1)	**BASIS: GS-R-3 para. 6.2 states that** *"The Senior management and management at all other levels in the organization shall carry out self-assessment to evaluate the performance of work and the improvement of the safety culture.*
S9	**Suggestion: BAPETEN should consider enhancing the implementation of self-assessments and to include safety culture aspects.**
Observation: While requirements on management system reviews are included in the BMS, such reviews have not been performed.	
	BASIS: GS-R-3 para. 6.7 states that *"A management system review shall be conducted at planned intervals to ensure the continuing suitability and effectiveness of the management system and its ability to enable the objectives set for the organization to be accomplished.*
R13	**Recommendation: BAPETEN should implement the management system review stated in the BMS manual.**

Changes since the initial IRRS mission

Suggestion 9: BAPETEN's Management System Manual includes a section on safety culture (3.4). The section ends with the following statement "Strategy to support and evaluate safety and security culture shall be described in detail in the Guideline of BAPETEN's safety and security culture development". During the interviews, the IRRS team was informed that this guideline has not yet been developed.

Status of the finding in the initial mission

Suggestion 9 is open, as safety culture is not yet included in BAPETEN's self-assessments.

Changes since the initial IRRS mission

Recommendation 13: BAPETEN has developed a draft quality procedure regarding management review (No. PM/09). The procedure describes in detail how the management review of the management system shall be conducted. During interviews, the IRRS team was informed that no management reviews had been conducted since the original mission in 2015. However, senior and middle management meet regularly to discuss and follow up on progress of ongoing tasks. These meetings, to some extent, address questions related to the management system.

Status of the finding in the initial mission

Recommendation 13 is open, as no management reviews have been conducted.

5. AUTHORIZATION

5.1. GENERIC ISSUES

Original mission RECOMMENDATIONS, SUGGESTIONS	
	Observation: A graded approach is not always fully implemented in the authorization process.
(1)	**BASIS: GSR Part 1 Requirement 1, para. 2.5 states that** *"The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following:* *1) The safety principles for protecting people — individually and collectively — society and the environment from radiation risks, both at present and in the future;* *(8) Provision for the review and assessment of facilities and activities, in accordance with a graded approach;* *…* *(10) Provision for the inspection of facilities and activities, and for the enforcement of regulations, in accordance with a graded approach;*
(R)	**See R 2 and S1 in section 1.1.**

Changes since the initial IRRS mission

Note: Recommendation 2 is not relevant to this observation.

Suggestion 1 (section 5.1): In the draft revision of GR No. 29 of 2008 on "Licensing of the Utilization of Ionizing Radiation Sources and Nuclear Material", the radiation facilities and activities are grouped into three groups, namely A, B and C corresponding to high, medium and low risk facilities. There are different requirements for licensing of radiation facilities and activities in accordance with their safety significance. The requirements stipulated in the regulation are different for different groups (stringent for groups A, moderated for group B and relaxed for group C). The IRRS Team noted that the implementation of a graded approach to the authorization process for radiation facilities and activities has improved compared to the situation during the original mission in 2015. However, there is only one type of authorization, "licence", which has been defined for all type of radiation facilities and activities.

Government Regulation (GR) No. 2 of 2014 on "Licensing of Nuclear Installations and Utilization of Nuclear Materials" specifies the authorization process, and relevant conditions and requirements for different types of nuclear installations under two categories, namely "nuclear reactors" and "non-reactor installations". However, the licensing stages and relevant requirements specified in GR No. 2 of 2014 are almost the same for all type of nuclear installations. Similarly, GR No. 54 of 2012, on "Safety and Security of Nuclear Installations" contains generic provisions applicable to all type of nuclear installations. These define conditions regarding different authorization stages, without taking into consideration grading according to risk for different types of nuclear installations. The authorization process and the associated prerequisites and conditions should be simpler for small size and low risk type of nuclear installations. Therefore, there is no improvement since 2015 regarding the application of a graded approach in the authorization process of nuclear installations.

Status of the finding in the initial mission

Suggestion 1 (in section 5.1) is closed on the basis of progress made and confidence in effective completion, as a graded approach has been introduced in general, although still not for nuclear installations (see S1 in section 1.1).

Original mission RECOMMENDATIONS, SUGGESTIONS	
	Observation: *The timeframes for authorizations are not flexible and do not take into account the complexity of the facilities and activities by applying a graded approach.*
(1)	**BASIS: GSR Part 1, Para 2.5 (3) states that** *"The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following:… (3) The type of authorization5 that is required for the operation of facilities and for the conduct of activities, in accordance with a graded approach;"*
(R)	**Recommendation: See R 2 and S1 in Section 1.1.**

Changes since the initial IRRS mission

Note: Recommendation 2 is not relevant to this observation.

Suggestion 1 (section 5.1): Government Regulation No. 29 of 2008 on "Licensing for the Use of Ionization Radiation Sources and Nuclear Materials", specifies time limits for each authorization process related to groups A, B and C, which correspond to high, medium and low risk facilities and activities. In accordance with this regulation, the Chairman of BAPETEN has to conduct an evaluation of the submissions within a maximum period of 20, 10 or 5 days for group A, B and C, respectively. The team noted that the time frames set out for authorization of radiation facilities and activities in different stages are in accordance with the graded approach.

The IRRS team also noted that GR No. 2 of 2014 specifies time frames for processing of authorization applications for different types of nuclear installations under two main categories, namely "nuclear reactors" and "non-reactor installations". Timeframes are the same for nuclear installations with different hazard levels in the same category. The team also noted that some specified time frames appear to be unrealistic. For example, maximum 12 months is given to BAPETEN to review the design document of an NPP. Other factors contributing to the risk such as maturity, complexity and history of the nuclear installation are not taken into consideration.

Additionally, the defined time limits and relevant provisions for each authorization stage do not appropriately exclude the time period to be spent by the applicant/licensee. Any request for additional information by BAPETEN during review and assessment can potentially significantly increase the time required for adequate assessment of the application.

Status of the finding in the initial mission

Suggestion 1 (in section 5.1) is closed on the basis of progress made and confidence in effective completion, as the application of a graded approach to the authorization time limits have been introduced only for radiation sources and facilities. (see S1 in section 1.1).

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: *There is insufficient public consultation before taking regulatory decisions or actions.*	
(1)	**BASIS: GSR Part 1 Requirement 36 states that** *"The regulatory body shall promote the establishment of appropriate means of informing and consulting interested parties and the public about the possible radiation risks associated with facilities and activities, and about the processes and decisions of the regulatory body."*
(2)	**BASIS: GSR Part 1 Para (4.66) states that** *"The regulatory body shall establish, either directly or through authorized parties, provision for effective mechanisms of communication, and it shall hold meetings to inform interested parties and the public and for informing the decision making process. This communication shall include constructive liaison such as:* *(a) Communication with interested parties and the public on regulatory judgements and decisions;* *……..* *(d) Communication on the requirements, judgements and decisions of the regulatory body, and on the bases for them, to the public;* *…….*
(3)	**BASIS: GSR Part 3 Requirement 2, para. 2.30 (f) states that** *"The regulatory body shall establish a regulatory system for protection and safety that includes [8]:* *…* *(f) Provision of information to, and consultation with, parties affected by its decisions and, as appropriate, the public and other interested parties."*
R14	**Recommendation: BAPETEN should strengthen its communication and consultation system regarding its authorization activities with interested parties.**

Changes since the initial IRRS mission

Recommendation 14: The involvement of the public and interested parties in the licensing process is stipulated in Act No. 30 of 2014 on "Government Administration". This Act requires the government institution to provide an opportunity for the public to be heard in a decision making process. The administrative requirements are stipulated in GR No.2 of 2014 and further elaborated in BCR No. 3 of 2018 on "Public Communications Strategy of Regulatory Body". In accordance with this BCR, BAPETEN puts efforts into provision of information to the public on the important safety aspects of its nuclear energy oversight.

BAPETEN has strengthened its communication and consultation mechanism regarding its authorization activities with interested parties, including public consultation during the review and assessment of licence applications for nuclear installations.

BAPETEN has also revised a procedure ("Procedure of Licensing for Nuclear Reactor Installation" PUK/DPIBN/02.2 of 2019) to include a mechanism for involvement of stakeholders (including the public) in the regulatory decision making process, and for sharing with the public, information pertaining to regulatory judgment and decisions. Furthermore, BAPETEN carried out a public hearing together with the local authorities before granting the site-permit for the Serpong site.

BAPETEN has also strengthened its communication and consultation process in authorization of radiation activities and radioactive materials with interested parties including public consultation during review and assessment.

In order to improve governance, the Indonesian government has implemented the One Single Submission (OSS) system for licensing. In the OSS licensing system, BAPETEN will communicate and consult with other ministries (for example with the Ministry of Health in order to issue health sector licence) before issuing permits. Similarly, for licensing of industrial radiography equipment, BAPETEN requires the applicant to obtain permission from the local administrative office, before applying for permission from BAPETEN.

Though regulatory decisions are documented, all of them are not being put in the public domain. Based on the information gathered above, however, the IRRS team has concluded that BAPETEN has improved its outreach to the public.

Status of the finding in the initial mission

Recommendation 14 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has strengthened its communication and consultation with interested parties, including the public.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: It appears that the number and competence of BAPETEN staff are insufficient to carry out authorizations in some areas such as transport and use of radiation in industry and medicine.	
(1)	**BASIS: GSR Part 1 Requirement 11 states that** *"The government shall make provision for building and maintaining the competence of all parties having responsibilities in relation to the safety of facilities and activities."* **BASIS: GSR Part 3 Requirement 2, para. 2.22 states that** *"The government shall ensure that arrangements are in place for the provision of the education and training services required for building and maintaining the competence of persons and organizations that have responsibilities relating to protection and safety."*
S	**Suggestion: See S3, section 3.1**

Changes since the initial IRRS mission

Suggestion 3 (section 5.1): BAPETEN has improved the availability and competence of staff for carrying out authorization in some areas such as transport and use of radiation in industry and medicine by:

- increasing the number of staff in the Directorate of Licensing of Radiation Facilities and Radioactive Materials by 17%;
- using B@LIS Online to facilitate the licensing process; and
- sending staff to attend training, workshops, etc in Indonesia or abroad.

Status of the finding in the initial mission

Suggestion 3 (in section 5.1) is closed, as BAPETEN has improved the efficiency and flexibility in its utilization of resources, which supports a risk informed and graded approach to regulation. (See S3 in section 3.1.)

5.2. AUTHORIZATION OF RESEARCH REACTORS

Original mission RECOMMENDATIONS, SUGGESTIONS
Observation: BAPETEN does not require the licensee to obtain an authorization for a research reactor

Original mission RECOMMENDATIONS, SUGGESTIONS	
entering into an extended shutdown.	
(1)	**BASIS: GSR Part 1 Requirement 24, para. 4.29 states that** *"Different types of authorizations shall be obtained for the different stages in the lifetime of a facility or the duration of an activity."* **BASIS: Code of Conduct on the Safety of Research Reactors, Section IV, para. 20.(b) states that** *"…Require the operating organization to prepare and maintain a safety analysis report and to obtain an authorization for siting, construction, commissioning, operation, modifications important to safety, extended shutdown, and decommissioning;"* **BASIS: Code of Conduct on the Safety of Research Reactors, Section VII.C, para. 33 states that** "*If unusual and compelling circumstances make it necessary for a research reactor to enter into or to continue in a state of extended shutdown, the operating organization should, as appropriate, prepare and implement a technical preservation programme to maintain the safety of the reactor and the reactor fuel, to be approved by the regulatory body."*
R15	**Recommendation: BAPETEN should develop a regulatory requirement so that operating organizations obtain an authorization for a research reactor for all stages of operation including entering into an extended shutdown condition.**

Changes since the initial IRRS mission

Recommendation 15: All research reactors under BAPETEN regulation are in operational state. As observed during the original mission, BAPETEN has elaborated the design and maintenance requirements related to extended shutdowns. Accordingly, Article 21 of BCR No. 8 of 2019 describes the extended shutdown conditions for research reactors. Article 22 of this BCR also stipulates the safety requirements to be considered during review and assessment in the case of extended shutdown.

Status of the finding in the initial mission

Recommendation 15 is closed, as BAPETEN has developed requirements for extended shutdown.

5.3. AUTHORIZATION OF FUEL CYCLE FACILITIES

There were no findings in this area in the initial IRRS missions.

5.4. AUTHORIZATION OF RADIOACTIVE WASTE MANAGEMENT FACILITIES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: There are no regulatory requirements for the operator to prepare a safety case and a supporting safety assessment for radioactive waste management.	
(1) **(2)**	**BASIS: GSR Part 5 Requirement 4, states that** *"…The operator shall carry out safety assessments and shall develop a safety case, and shall ensure that the necessary activities for siting, design, construction, commissioning, operation, shutdown and decommissioning are carried out in compliance with legal and regulatory requirements.*

Original mission RECOMMENDATIONS, SUGGESTIONS	
(3)	**BASIS: GSR Part 5 Requirement 13, states that "***The operator shall prepare a safety case and a supporting safety assessment. In the case of a step by step development, or in the event of modification of the facility or activity, the safety case and its supporting safety assessment shall be reviewed and updated as necessary".* **BASIS: GSR Part 5 Requirement 13, para. 5.3 states that** *"The safety case has to be prepared by the operator early in the development of a facility as a basis for the process of regulatory decision making and approval".*
Observation: BAPETEN does not require that waste packages and unpackaged waste that are accepted for processing, storage and/or disposal conform to criteria that are consistent with the safety case.	
	BASIS: **GSR Part 5 Requirement 12 states that** *"Waste packages and unpackaged waste that are accepted for processing, storage and/or disposal shall conform to criteria that are consistent with the safety case.".* **BASIS: SSR-5 Requirement 12 para. 4.25 states that** *"Adherence to the waste acceptance criteria is essential for the safe handling and storage of waste packages and unpackaged waste during normal operation, for safety during possible accident conditions and for the long term safety of the subsequent disposal of the waste".*
Observation: The safety case for a predisposal radioactive waste management facility does not include a description of how all the safety aspects of the site, the design, operation, shutdown and decommissioning of the facility and the managerial controls satisfy the regulatory requirements.	
	BASIS: **GSR Part 5 Requirement 14 states that** "*The safety case for a predisposal radioactive waste management facility shall include a description of how all the safety aspects of the site, the design, operation, shutdown and decommissioning of the facility, and the managerial controls satisfy the regulatory requirements. The safety case and its supporting safety assessment shall demonstrate the level of protection provided and shall provide assurance to the regulatory body that safety requirements will be met"*
Observation: Regulations do not require that the waste packages are designed and produced so that the radioactive material is appropriately contained during both normal operation and in accident conditions that could occur in the handling, storage, transport and disposal of waste.	
	BASIS: **GSR Part 5 Requirement 10 states that** "…*Waste packages shall be designed and produced so that the radioactive material is appropriately contained both during normal operation and in accident conditions that could occur in the handling, storage, transport and disposal of waste."*
Observation: The regulation does not require in the case of a step by step development, or in the event of the modification of the facility or activity, that the safety case and its supporting safety assessment shall be reviewed and updated as necessary.	
	BASIS: **GSR Part 5 Requirement 13 states that** *"The operator shall prepare a safety case and a supporting safety assessment. In the case of a step by step development, or in the event of modification of the facility or activity, the safety case and its supporting safety assessment shall be reviewed and updated as necessary"*

Original mission RECOMMENDATIONS, SUGGESTIONS	
R	**Recommendation: See R 3 section 1.2**

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Classification of the radioactive waste is not in line with the IAEA standards.	
(1)	**Basis: GSR 5 Para. 4.12 states that** *"Radioactive waste may be classified for different purposes, and different classification schemes may be used in the successive steps in waste management. The most common classification is that made from the perspective of its future disposal."*
(2)	**Basis: GSR 5 Para. 4.10 states that** *"Radioactive waste has to be characterized in terms of its physical, mechanical, chemical, radiological and biological properties."*
(3)	**Basis: GSG 1 Para. 2.2 states that** *" …. six classes of waste are derived and used as the basis for the classification scheme:* *Exempt waste (EW), Very short lived waste (VSLW), Very low level waste (VLLW), Low level waste (LLW), Intermediate level waste (ILW), High level waste (HLW).*
R	**Recommendation: See R3 in Section 1.2**.

Changes since the initial IRRS mission

Recommendation 3 (section 5.4): There are several regulatory requirements (GR No. 61, GR No. 29, BCR No. 8 of 2017, etc.) that address waste management, such as requirements for packages, requirements for modification and changes, and waste classification. Nevertheless, the IRRS team considered that additional efforts should be taken in the waste management area, where the following areas and issues should be considered in bringing the legislative framework in line with GSR Part 3:

- Currently, there are no provisions in the regulatory framework for safety cases and safety assessments for radioactive waste management facilities or activities that cover the suitability of the site; the design, construction and operation of the facility; the assessment of radiation risks; and assurance of the adequacy and quality of all safety related work associated with the facility or activity.
- The safety assessment is an integral part of the safety case. It is driven by a systematic assessment of radiation hazards and involves quantification of radiation dose and radiation risks that may arise from the facility or activity for comparison with dose and risk criteria set within the regulatory framework. It also provides an understanding of the behaviour of the facility or activity under normal conditions and anticipated operational occurrences and in the event of accidents since the design stage.
- The safety case and supporting safety assessment for a radioactive waste management facility or activity provides the basis for safety demonstration and for licensing. Both the safety case and the safety assessment will evolve with the development of the facility or activity, and will assist and guide decisions on siting, location, design and operations. The safety case for a waste management facility or activity will also be the main basis on which a dialogue with interested parties will be established, and on which confidence in the safety of the facility or activity can be developed.

- The safety case should be used to assist the establishment of licence conditions and other controls and requirements on the facility or activity. Specifications for safe operation should also be used as input to the development of operational programs and procedures, including maintenance, inspection and testing. A formal mechanism should be established to link these operational programs and procedures to the safety assessment. Other important issues such as radioactive waste classification and clearance levels, and predisposal and disposal requirements, are not fully in line with the IAEA safety standards. Key limits and conditions for a facility or activity are set by the acceptability of the waste inventory and/or the activity concentrations of specific radionuclides. These should be defined based on the results of the safety assessment. Waste acceptance criteria for the facility may be established both for individual waste packages and for the facility as a whole.
- Acceptable inventory levels are usually dependent on the assessment of various scenarios, as well as on criteria associated with discharge, clearance and predisposal waste management activities. In addition, the safety case should be used to assess the chemical and physical properties of the waste that may cause degradation of key safety features.

The IRRS team concluded that safety standards relevant to waste management have not yet been fully addressed. Therefore, it is considered more constructive to close the above waste-related recommendations and suggestions and issue a consolidated recommendation that is actionable and supports BAPETEN's current initiatives to align the legislative framework to GSR Part 3 and other relevant IAEA safety standards in the area of waste management.

Status of the finding in the initial mission

Recommendations R3 (in section 5.4) is closed, as a new relevant Recommendation (RF1) has been introduced during the follow-up mission.

Follow-up Mission RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: Key issues related to waste classification, clearance levels and the development of the safety case and safety assessment as well as for its use and application for the safety justification and definition of limits, conditions and controls of predisposal management facilities and activities as well as for final disposal are still not established in the legal and regulatory framework.	
(1)	**Basis: GSR 5 Requirement 3 states that** *"The regulatory body shall establish the requirements for the development of radioactive waste management facilities and activities and shall set out procedures for meeting the requirements for the various stages of the licensing process. The regulatory body shall review and assess the safety case and the environmental impact assessment for radioactive waste management facilities and activities, as prepared by the operator both prior to authorization and periodically during operation."*
(2)	**Basis: GSR 5 Requirement 3, Para 3.8 states that** *"To facilitate compliance with regulatory requirements, the regulatory body has to do the following:* - *Provide necessary guidance on the interpretation of national standards and regulatory requirements that takes into consideration the complexity of the operations and the magnitude of the hazards associated with the facility and operations; …* - *Establish an appropriate definition and/or classification of radioactive waste [GSG-1]…"*

(3)	**Basis: GSR 5 Requirement 4, states that** *"... The operator shall carry out safety assessments and shall develop a safety case, and shall ensure that the necessary activities for siting, design, construction, commissioning, operation, shutdown and decommissioning are carried out in compliance with legal and regulatory requirements."*
(4)	**Basis: GSR 5 Requirement 4, Para 3.11 states that** *"Depending on the complexity of the operations and the magnitude of the hazards associated with the facility or the activities concerned, the operator has to ensure an adequate level of protection and safety by various means, including:* - *Demonstration of safety by means of the safety case, and for an existing facility or activity by means of periodic safety reviews; …* - *Derivation of operational limits, conditions and controls, including waste acceptance criteria, to assist with ensuring that the predisposal radioactive waste management facility is operated in accordance with the safety case;…"*
(5)	**Basis: GSR 5 Requirement 9, Para. 4.10 states that** *"Radioactive waste has to be characterized in terms of its physical, mechanical, chemical, radiological and biological properties."*
RF1	**Recommendation: BAPETEN should establish the safety requirements for radioactive waste management facilities and activities, consolidate the waste classification scheme, set out requirements for the development and review of the safety case and supporting safety assessment as well as guidance for meeting the requirements for the various stages of the licensing process.**

5.5. AUTHORIZATION OF RADIATION SOURCES, FACILITIES AND ACTIVITIES

There were no findings in this area in the initial IRRS missions.

5.6. AUTHORIZATION OF DECOMMISSIONING ACTIVITIES

There were no findings in this area in the initial IRRS missions.

5.7. AUTHORIZATION OF TRANSPORT

Original mission RECOMMENDATIONS, SUGGESTIONS	
	Observation: There is no formal and active coordination with relevant authorities involved in the regulation on the transport of radioactive material.
(1)	***BASIS*: GSR Part 1 Requirement 7, states that** *"Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties."* *...* *"This coordination and liaison can be achieved by means of memoranda of understanding, appropriate communication and regular meetings. Such coordination assists in achieving consistency and in enabling authorities to benefit from each other's experience.* *2.19. If responsibilities and functions do overlap, this could create conflicts between different authorities and lead to conflicting requirements being placed on authorized parties or on*

	applicants. This, in turn, could undermine the authority of the regulatory body and cause confusion on the part of the authorized party or the applicant."
R	**Recommendation: See R6 in Section 1.5**

Changes since the initial IRRS mission

Recommendation 6 (section 5.7): Government Regulation No. 58 of 2015 on "Radiation Safety and Security on the Radioactive Material Transportation" describes the responsibilities of the authorities and other stakeholders involved in the transport of radioactive materials, including the responsibilities of the Ministry of Transport. Both BAPETEN and the Ministry of Transport were involved in the development of this regulation.

In accordance with Article 16 of GR No. 58 of 2015, prior approval from the Ministry of Transport is one of the prerequisites for obtaining a licence for transport of radioactive material from BAPETEN. This requirement is also included in B@LIS Online.

The IRRS team was informed that BAPETEN in cooperation with the Ministry of Transport plans to conduct joint inspections for transport of radioactive sources in 2020.

The Presidential Regulation on national strategy and policy on nuclear and radiation safety stipulates the coordination between authorities, including the transport authorities (the Ministry of Transport, the sea transport authorities, the air transport authorities and the police). The IRRS team was informed that the Ministry of Transport has shown interest in formalizing and further enhancing existing cooperation with BAPETEN, however an MoU has not yet been developed.

Status of the finding in the initial mission

Recommendation 6 (in section 5.7) is closed on the basis of progress made and confidence in effective completion, as BAPETEN and Ministry of Transport has established informal cooperation arrangements (see R6 in section 1.5).

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: There is no provision in the regulation that requires competent authority to provide an approval for the design of low dispersible radioactive material, fissile material not classified by the regulations as fissile excepted, packages containing 0.1 kg or more of uranium hexafluoride, and type C packages.	
(1)	**BASIS: SSR 6 Requirement 802 states that "***Competent authority approval* shall be required for the following: (a) *Designs* for: (i) *Special form radioactive material*; (ii) *Low dispersible radioactive material*; (iii) *Fissile material* excepted under para. 417(f); (iv) *Packages* containing 0.1 kg or more of uranium hexafluoride; (v) *Packages* containing *fissile material*, unless excepted by para. 417, 674 or 675; (vi) *Type B(U) packages* and *Type B(M) packages*; (vii) *Type C packages*.".
R	**Recommendation: See R3 in Section 1.2**

Changes since the initial IRRS mission

Recommendation 3 (section 5.7): Within GR No. 58 of 2015 on "Radiation Safety and Security in the Transportation of Radioactive Materials", there are provisions for design approval of packages for low dispersible radioactive material, fissile material not classified by the regulations as fissile excepted, packages containing 0.1 kg or more of uranium hexafluoride, and type C packages.

This regulation also contains provisions concerning description of package design, engineering drawings, description of materials of construction, standards for manufacture, etc. This regulation is based on IAEA Specific Safety Requirements No. SSR-6, on "Regulations for the Safe Transport of Radioactive Material" (2012 Edition).

Status of the finding in the initial mission

Recommendation 3 (in section 5.7) is closed, as GR No.58 of 2015 includes provisions for an approval of the specified designs.

6. REVIEW AND ASSESSMENT

6.1. GENERIC ISSUES

There were no findings in this area in the initial IRRS missions.

6.1.1. MANAGEMENT OF REVIEW AND ASSESSMENT

There were no findings in this area in the initial IRRS missions.

6.1.2. ORGANIZATION AND TECHNICAL RESOURCES FOR REVIEW AND ASSESSMENT

There were no findings in this area in the initial IRRS missions.

6.1.3. BASES FOR REVIEW AND ASSESSMENT

There were no findings in this area in the initial IRRS missions.

6.1.4. PERFORMANCE OF REVIEW AND ASSESSMENT

There were no findings in this area in the initial IRRS missions.

6.2. REVIEW AND ASSESSMENT FOR RESEARCH REACTORS

There were no findings in this area in the initial IRRS missions.

6.3. REVIEW AND ASSESSMENT FOR FUEL CYCLE FACILITIES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not have specific regulatory requirements, regulations and guides providing the basis for its regulatory decisions during various stages of authorization.	
(1)	**BASIS: GS-G 1.2, Para. 3.32 states that ‘‘***The regulatory body should establish which requirements, regulations, guides and industrial standards are applicable to the facility in question and should determine the requirements to be placed on the operator. Where no such requirements, regulations, guides and industrial standards exist, the regulatory body should consider developing them. In carrying out its review and assessment, the regulatory body should use the applicable requirements as a reference in deciding on the acceptability of an operator's submissions".*
S9a	**Suggestion:** BAPETEN should consider developing regulatory requirements, regulations, and guides as applicable to the facility.

Changes since the initial IRRS mission

Suggestion 9a: Government Regulation No. 2 of 2014 on "Licensing of Nuclear Installations and Utilization of Nuclear Materials" sets out requirements regarding the licensing process, including the documents to be submitted by the applicant, in all authorization stages of nuclear installations from siting

to decommissioning stage. BCR No. 11 of 2007 on "Safety Requirements of Non-Reactor Nuclear Installation" elaborates the technical requirements pertaining to the construction and operation of non-reactor nuclear installation.

BAPETEN has undertaken a programme for developing and revising various regulatory requirements, regulations and guides for fuel cycle facilities, since 2015. BAPETEN has issued BCR No. 5 of 2019 "Safety Analysis Report of Non-Reactor Nuclear Installation" to revise its older version, i.e. BCR No. 10 of 2006. In addition, BCR No. 11 of 2007 on "Safety Requirements of Non-Reactor Nuclear Installation" has been under revision since 2016 and it is in the final stages of approval.

Status of the finding in the initial mission

Suggestion 9a is closed on the basis of progress made and confidence in effective completion, as significant progress was made in developing regulations.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not have systematic record keeping system for the review and assessment of fuel cycle facilities to allow for easy retrieval and maintaining consistency during the decision making process.	
(1)	BASIS: GS-G 1.2, para. 3.65 states that "The review and assessment process will invariably involve the production of reports by various experts in the regulatory body and by any consultants employed. A document control system should be set up for keeping records of the process so as to allow such documents and records to be readily retrieved. It should be possible to access the bases for previous decisions so as to achieve consistency and to facilitate any reassessment made necessary by new information".
S10	**Suggestion:** BAPETEN should consider developing appropriate record keeping system for effective follow up.

Changes since the initial IRRS mission

Suggestion 10: The IRRS team was informed that documents required for licensing of nuclear installations and materials, (such as a Safety Analysis Report) are submitted by the applicant in the form of electronic files, which are stored in the cloud belonging to the Licensing Directorate of Installation and Nuclear Materials. Also, licences issued by BAPETEN are scanned and stored in the cloud before been sent to the applicant.

As part of B@LIS Online, BAPETEN established user requirements pertaining to fuel cycle facilities for development of more user-friendly database systems. These requirements have been communicated to the IT Department of BAPETEN for action.

Status of the finding in the initial mission

Suggestion 10 is closed on the basis of progress made and confidence in effective completion, as progress has been made in development of a record keeping system.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has not established the criteria to review and assess the design of spent fuel storage facility.	
(1)	**BASIS: GSR Part 5 Requirement 3 states that** *"….The regulatory body shall review and assess the safety case and the environmental impact assessment for radioactive waste management facilities and activities, as prepared by the operator both prior to authorization and periodically during operation.…*
(2)	**BASIS: GSR Part 4 Requirement 5 states that** *"The first stage of carrying out the safety assessment shall be to ensure that the necessary resources, information, data, analytical tools as well as safety criteria are identified and are available".*
(3)	**BASIS: GSR Part 4 Requirement 5 para.(4.18) (d) states that** *"The safety criteria defined in national regulations or approved by the regulatory body to be used for judging whether the safety of the facility or activity is adequate have been identified".*
R16	**Recommendation: BAPETEN should promote establishing criteria to review and assess the design of spent fuel storage facility .**

Changes since the initial IRRS mission

Recommendation 16: BAPETEN Chairman Regulation No. 11 of 2007 on "Safety Requirements of Non-Reactor Nuclear Installation" has been under revision since 2016 and is in the final stage of approval. The revised version addresses various design safety aspects including design related criteria, features to facilitate lifting, movement and handling of spent fuel, and requirements for prevention of significant damage to items important to safety during the transfer of fuel or casks, or if fuel or casks are dropped.

Status of the finding in the initial mission

Recommendation 16 is closed on the basis of progress made and confidence in effective completion, as revision of BCR No. 11 of 2007 is in the final stages of approval.

6.4. REVIEW AND ASSESSMENT FOR WASTE MANAGEMENT FACILITIES

There were no findings in this area in the initial IRRS missions.

6.5. REVIEW AND ASSESSMENT FOR RADIATION SOURCES FACILITIES AND ACTIVITIES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has developed a Database (BAPETEN Licensing and Inspection System – B@LIS) for tracking and monitoring the reviewing and assessment process and information related to Radiation Sources Facilities and Activities (RFRM)	
(1)	BASIS: GS-G 1.2, para. 3.65 states that 4.1. "The regulatory body should ensure that the findings and decisions of the review and assessment process are subjected to a suitable process

Original mission RECOMMENDATIONS, SUGGESTIONS	
	of peer review conforming to the national practices of the State and the overall quality assurance system of the regulatory body. The regulatory body should document the findings of its review and assessment and should make them available to the operator and others in accordance with national practice. Further information is provided in Ref. [4]"
(2)	BASIS: GS-G 1.2, para. 3.65 states that 4.2. "The regulatory body should have a system to audit, review and monitor all aspects of its review and assessment process so as to ensure that it is being carried out in a suitable and efficient manner and that any changes to the process necessitated by advances in knowledge or improvements in methods or for similar reasons are implemented. This system should cover, among other things: (a) Regulations and guides; (b) Procedures for assessment within the regulatory body; (c) Procedures for contact with the operator; (d) Availability of suitable staff for review and assessment; (e) Procedures for using consultants and advisory committees in the process; (f) Procedures for commissioning and evaluating research initiated by the regulatory body; (g) Records of documentation; (h) Production, recording and dissemination of the results of reviews and assessments.
GP2	**Good practice**: BAPETEN has developed a comprehensive database management for authorization, reviewing and assessment, inspection, transport approval and occupational dose register. The system is fully implemented for review and assessment process and the reviewers can easily monitor the progress on the reviewing process and reach to the licensee's records.

6.6. REVIEW AND ASSESSMENT FOR DECOMMISSIONING ACTIVITIES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Interested parties are not provided an opportunity to review the final decommissioning plan and provide comments prior to BAPETEN's approval.	
(1)	**BASIS: WS-R-5 (5.13) states that** *"Interested parties shall be provided with an opportunity to review the final decommissioning plan and to provide comments on the plan to the regulatory body prior to its approval".*
(2)	**BASIS: GSR Part 6 para. 7.16 states that** *"Interested parties shall be provided with an opportunity to examine the final decommissioning plan and, as appropriate and subject to national regulations, supporting documents, and to provide comments prior to its approval".*
R	**Recommendation: See R 3 section 1.2**

Changes since the initial IRRS mission

Recommendation 3 (in section 6.6): The IRRS team was informed that involvement of the interested parties, including the public, in the licensing process is required under Act No. 30 of 2014 on "Government Administration". This Act requires all governmental institutions to provide opportunities for public hearings in the decision making process (see further Recommendation 14 in section 5.1).

Status of the finding in the initial mission

Recommendation 3 (in section 6.6) is closed on the basis of progress made and confidence in effective completion, as BAPETEN has strengthened its communication and consultation with interested parties, including the public, during the licensing of decommissioning of facilities.

6.7. REVIEW AND ASSESSMENT FOR TRANSPORT

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not have a requirement *to ensure safety of reusable packages.*	
(1)	**BASIS:** *SSR 6; 306. States that ".....Certification that the design specification has been fully implemented shall be available to the competent authority. The manufacturer, consignor or user shall be prepared:* *(a) To provide facilities for inspection during manufacture and use;* *(b) To demonstrate compliance with these Regulations to the competent authority."*
(2)	**TS-G-1.5 (2009); Page 52;4.72 (f) states** "*The consignor should have procedures in operation to ensure that ..... (For example, ... In the case of reusable packaging, the consignor should have evidence, in the form of inspection reports, release notes, certificates of conformity, etc., that all necessary and specified servicing and maintenance work has been carried out and that the packaging is suitable for the next complete transport operation or programme of movements. The consignor's procedures should be such as to prevent the use of a package that does not comply with the approved specifications or that has not been subjected to the required and specified servicing and maintenance.*)".
S11	**Suggestion: BAPETEN should consider establishing requirements for the safe reuse of packages.**

Changes since the initial IRRS mission

Suggestion 11: Government Regulation No. 58 of 2015 on "Radiation Safety and Security in the Transportation of Radioactive Materials", establishes requirement for the safe use of packages. Several types of packages are specified in Article 8, including "other packages", such as "the used empty packages that have previously been used to transport radioactive materials".

The procedures for using other packages are further developed in the draft revision of BCR No.4 of 1999 "Safety Requirement for the Transport of Radioactive Source. This draft provides several requirements for the safe reuse of packages.

The IRRS team was informed that this draft BCR is in its final stages of development. The discussion within the responsible Directorate is completed and the draft will be sent to BAPETEN's Legal Office for consideration.

Status of the finding in the initial mission

Suggestion 11 is closed on the basis of progress made and confidence in effective completion, as GR No. 58 of 2015 and the draft BCR No.4 of 1999 provides the requirements to ensure safety of reusable packages.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Modifications to be made to an approved package are not subject to approval by BAPETEN	
(1)	**BASIS: TS-G-1.5 (2009); Page 65; requirement 4.98 states that** "*For packages approved by the competent authority, the user should be required to record all safety related deviations from and modifications to the specifications, as well as any significant damage noted during the use of the packages. The competent authority should be informed of these deviations before the packages are returned to service, within a certain time period (e.g. 30 days), in accordance with the requirements of the competent authority. Corrective measures or modification proposals, including any plans for repairs, should be subject to the agreement of the competent authority. Any packages undergoing such repairs, modifications or changes should not be returned to use until the competent authority has agreed to or approved the change."*
S12	**Suggestion: BAPETEN should consider establishing and implementing requirements related to the approval of modified package**.

Changes since the initial IRRS mission

Suggestion 12: Government Regulation No. 58 of 2015 on "Radiation Safety and Security in the Transportation of Radioactive Materials" establishes requirements for the safe use of packages. Article 9 of GR58 provides that: "The Consignor is obliged to ensure that certain types of packages have certificate of approval of the package design".

The IRRS team was informed that BAPETEN is revising BCR No. 4 of 1999 on "Safety Requirement for the Transport of Radioactive Sources". The current draft includes several provisions related to the approval of modified package. The IRRS team was also informed that this draft BCR is in its final stages of development.

Status of the finding in the initial mission

Suggestion 12 is closed on the basis of progress made and confidence in effective completion, as GR No. 58 of 2015 and draft BCR No. 4 of 1999 provides requirements related to the approval of modified packages.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not have documented procedures for the assessment of the management system arrangements of the suppliers.	
(1)	**BASIS:** *SSR6, 2012; Page 16; Requirements 306 states that "A management system based on international, national or other standards acceptable to the competent authority shall be established and implemented for all activities within the scope of the Regulations, as identified*

Original mission RECOMMENDATIONS, SUGGESTIONS	
	in para. 106, to ensure compliance with the relevant provisions of these Regulations. Certification that the design specification has been fully implemented shall be available to the competent authority. The manufacturer, consignor or user shall be prepared: (a) To provide facilities for inspection during manufacture and use; (b) To demonstrate compliance with these Regulations to the *competent authority*. Where *competent authority approval* is required, such *approval* shall take into account and be contingent upon the adequacy of the *management system*."
R17	**Recommendation: BAPETEN should plan and carry out, in accordance with a documented procedure, assessment of the management system arrangement of the suppliers.**

Changes since the initial IRRS mission

Recommendation 17: BAPETEN has developed the "Procedure on Certification and Validation of Radioactive Material and Package" (No. PUK/DPIBN/00.24 Revision 1 of 2019). The purpose of this procedure is to provide guidelines on certification and validation of radioactive materials packages.

In accordance with the procedure, assessment of the management system arrangements is a requirement (Paragraph 7.a). BAPETEN may also perform verification of the management system in the factory (site visit) to ensure the compliance of the quality of product with the specified quality. The certificate is valid for 5 years and can be extended.

Status of the finding in the initial mission

Recommendation 17 is closed, as BAPETEN has developed and implemented procedures for the assessment of the management system arrangements of the suppliers.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not enforce the requirement of the radiation dose assessment for transport workers or monitoring of workplace or the assessment of dose to members of the public.	
(1)	**BASIS: SSR6 (2012), Requirement 303 states "***For occupational exposures arising from transport activities, where it is assessed that the effective dose either:* *(a) Is likely to be between 1 and 6 mSv in a year, a dose assessment programme via workplace monitoring or individual monitoring shall be conducted; or* *(b) Is likely to exceed 6 mSv in a year, individual monitoring shall be conducted*".
(2)	**BASIS: SSR6 (2012), requirement 308 states that "***The relevant competent authority shall arrange for periodic assessments of the radiation doses to persons due to the transport of radioactive material, to ensure that the system of protection and safety complies with the Basic Safety Standards*"
S13	**Suggestion: BAPETEN should consider implementing its regulation on the assessment of radiation doses to workers, public and workplace monitoring.**

Changes since the initial IRRS mission

Suggestion 13: Article 36 of Government Regulation No. 58 of 2015 on the "Radiation Safety and Security in the Transportation of Radioactive Materials" requires submission of a radiation protection programme for transport. The programme includes provisions for assessment of radiation doses to workers and the public, as well as for workplace and individual dose monitoring. BAPETEN's Licensing Directorate of Radiation Facility and Radioactive Material developed working instructions on how to conduct radiation dose assessments. BAPETEN also requires submission of dose reports for workers quarterly, which are uploaded to B@LIS Online.

BAPETEN has also developed a Procedure for "Certification and Validation of Radioactive Material and Package", (No. PUK/DPIBN/00.24 Revision 1 of 2019) to evaluate and assess radiation doses of workers, public and workplace monitoring during package certification.

Status of the finding in the initial mission

Suggestion 13 is closed, as BAPETEN has implemented the regulatory requirements on dose assessments.

7. INSPECTION

7.1. GENERIC ISSUES

There were no findings in this area in the initial IRRS missions.

7.1.1. INSPECTION PROGRAMME

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: *The inspection programme and frequency of inspections at different nuclear installations and materials are the same even though the radiation risks are significantly different.*	
(1)	**BASIS: GSR Part 1 Requirement 29, states that** ***"Inspections of facilities and activities shall be commensurate with the radiation risks associated with the facility or activity, in accordance with a graded approach.****…*
R18	**Recommendation: BAPETEN should apply a graded approach when planning and conducting inspections across all the facilities and activities.**

Changes since the initial IRRS mission

Recommendation 18: Regulatory inspections are carried out as per the guidelines given in BCR No. 1 of 2017 on "Conducting Inspections in the Nuclear Energy Oversight". Planned regulatory inspection schedules are developed annually for all nuclear and radiation facilities and activities. The facilities and activities are grouped based on the result of a risk analysis into 'high', 'moderate' and 'low' risk categories, and the frequency of inspections is decided accordingly.

The IRRS team reviewed the inspection schedules for the previous year and noted that the inspection plan demonstrates a graded approach across all facilities and activities. However, aspects such as maturity, ageing, operating history etc., which may change/affect the risk category, are not taken into consideration in BCR No. 1 of 2017. BAPETEN will take those aspects into consideration in the future revision of BCR No. 1 of 2017.

Status of the finding in the initial mission

Recommendation 18 is closed on the basis of progress made and confidence in effective completion, as the current regulations and inspection plans demonstrate a graded approach across all facilities and activities.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not share inspection reports, procedures, and findings with the public.	
(1)	**BASIS: GS-G-1.3, para. 4.37** *"In order to inform the public of the safety of nuclear installations and of the effectiveness of the regulatory body, findings of inspections and regulatory decisions may be made publicly available. The extent to which such information is made publicly available will depend on the legal provisions in the State concerned.*
S14	**Suggestion: BAPETEN should consider a means for the public to access information**

Original mission RECOMMENDATIONS, SUGGESTIONS	
	about inspection reports, procedures, and findings to maintain public confidence in BAPETEN.

Changes since the initial IRRS mission

Suggestion 14: As per Act No. 14 of 2008 on "Transparency of Public Information" inspection reports, procedures and findings are considered classified information and cannot be shared with the public. For implementation of the above Act, BAPETEN has developed guidelines as per BCR No. 9 of 2012 on "Management of Public Information", which stipulates the mechanisms of sharing of information.

However, BAPETEN has provisions in place for sharing inspection results with stakeholders through the BAPETEN Safety and Security Status Report, which is published on an annual basis. The report contains information on the safety and security status of all nuclear and radiation facilities. It also includes information on safety significant events reported by licensees, and major findings observed during the inspections.

BAPETEN has also developed a mechanism to recognize the contributions of licensees towards fulfilment of radiation safety objectives. This was considered by the IRRS team a good practice, see section 3.1.

Status of the finding in the initial mission

Suggestion 14 is closed on the basis of progress made and confidence in effective completion, as BAPETEN is having alternate provisions regarding sharing inspection results with the public by various means of communication.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The inspection programme does not include specific safety culture aspects.	
(1)	**BASIS: GSR Part 1, para. 4.53 states that** *" In conducting inspections, the regulatory body shall consider a number of aspects, including:* **……** —Safety culture;
S15	**Suggestion: BAPETEN should consider developing and implementing systematic collection of licensee's safety culture aspects during inspections.**

Changes since the initial IRRS mission

Suggestion 15: As per GR No. 54 of 2012 on "Safety and Security of Nuclear Installation", the licensee has to establish and implement a safety culture programme as part of their management system for nuclear installation. The draft revision of GR No. 33 of 2007 on "Safety of Ionising Radiation and Security of Radioactive Sources" article 6 and 7 also includes the requirement for safety culture and describes the means by which it can be implemented. The licensees have to continually improve safety culture as required in BCR No. 4 of 2010.

At present, however, BAPETEN's regulatory inspection programme does not include safety culture aspects. The Nuclear Inspection Directorate in BAPETEN plans to develop guidance to perform safety culture assessments as part of future regulatory inspections in nuclear installations and radiation facilities.

Status of the finding in the initial mission

Suggestion 15 is open, as presently the inspection programme of BAPETEN does not cover safety culture aspects.

7.1.2. INSPECTION PROCESS AND PRACTICE

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has not developed inspection procedures and checklists to conduct effective and efficient regulatory inspections during construction, commissioning, and decommissioning for nuclear facilities.	
(1)	***BASIS: GSR Part 1, para. 4.52 states that*** *"Regulatory inspections shall cover all areas of responsibility of the regulatory body……..*
(2)	***BASIS: GS-G 1.3, para. 4.1 states that*** *"To ensure that all nuclear facilities in a State are inspected to a common standard and that their level of safety is consistent, the regulatory body should provide its inspectors with written guidelines in sufficient detail. The guidelines should be followed to ensure a systematic and consistent approach to inspection while allowing sufficient flexibility for inspectors to take the initiative in dealing with new concerns that arise. Appropriate information and guidance should be provided to the inspectors and each inspector should be given adequate training in following this guidance. Consideration should be given to the extent to which this guidance should be made available to the operator or to the public. Appropriate subjects for guidance and instructions for inspectors could include:* *…* *(d) implementation of the inspection programme, including:* *—areas to be subject to inspection,* *—method of inspection to be used,* *—methods for selection of inspection samples,* *—relevant technical information and questionnaires;….*
S16	**Suggestion: BAPETEN should consider developing detailed guidance on inspections conducted during construction, commissioning and decommissioning stages to ensure they cover all the above mentioned stages.**

Changes since the initial IRRS mission

Suggestion 16: The IRRS team noted that, as per Article 20 of Act No. 10 of 1997 on "Nuclear Energy", BAPETEN is mandated to conduct inspections during all stages/sub-stages of the authorization process.

BAPETEN has initiated the development of detailed guidance in the form of working instructions for inspectors for conducting regulatory inspections during the construction, commissioning and decommissioning stages. Currently, various working instructions for site inspection and construction stages have been developed. For the future, the Directorate for Inspection of Nuclear Material and Installation plans to prepare working instructions for the commissioning and decommissioning stages of nuclear installations. These should be developed before inspections for these stages commence.

Status of the finding in the initial mission

Suggestion 16 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has taken significant steps towards developing detailed guidance such as a working instruction for inspectors during siting and construction stages.

7.1.3. INSPECTORS

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN inspectors are not empowered to stop potentially unsafe conditions in facility or activity without consulting the Chairman first.	
(1)	**BASIS: GSR-1, para. 4.58 states that** *"The regulatory body shall establish criteria for corrective actions, including enforcing the cessation of activities or the shutting down of a facility where necessary. On-site inspectors, if any, shall be authorized to take corrective action if there is an imminent likelihood of safety significant events."*
R19	**Recommendation: The Government should amend its regulation to provide direct authority to site inspectors to immediately stop a potential unsafe condition and direct actions to restore an adequate level of safety at a facility or activity.**

Changes since the initial IRRS mission

Recommendation 19: Article 19 of BCR No. 1 of 2017 on "Conducting Inspections in the Nuclear Energy Oversight" states that "the authority to suspend activities in utilization of nuclear energy can only be executed by an Inspector after giving a real time report to and is directly authorized to execute activity suspension by the BAPETEN Chairman". The BAPETEN Chairman has delegated this authority to the Director of Inspection.

Article 89 paragraph (2) of draft revision of Government Regulation No. 29 of 2008 on "Licensing for the Use of Ionizing Radiation Sources and Nuclear Materials" provides authority to site inspectors to take on-the-spot enforcement action and to immediately stop/terminate any activity that leads to unsafe conditions for the workers, the community and the environment, or impact the security of radioactive sources. The IRRS team encouraged BAPETEN to revise BCR No. 1 of 2017 in line with the revised GR No. 29 of 2008.

Status of the finding in the initial mission

Recommendation 19 is closed on the basis of progress made and confidence in effective completion, as the draft of GR No. 29 of 2008 empowers the site inspector to stop potentially unsafe activities or facility conditions, without consulting the Chairman.

7.2. INSPECTION OF RESEARCH REACTORS

There were no findings in this area in the initial IRRS missions.

7.3. INSPECTION OF FUEL CYCLE FACILITIES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not appear to have the required competence for inspecting all stages of fuel cycle facilities.	
(1)	***BASIS: GSR part 1 Requirement 18, States that*** *" The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its responsibilities."*
S17	**Suggestion: BAPETEN should consider making available qualified inspectors for all stages of fuel cycle facilities.**

Changes since the initial IRRS mission

Suggestion 17: BAPETEN has developed an inspector training, retraining and qualification programme in line with BCR No. 1 of 2017 to ensure the required level of competence of inspectors for all stages of fuel cycle facilities. BAPETEN also organizes inspection experience sharing forums, which are held twice a year. BAPETEN inspectors also attend training, workshops and internships organized by BAPETEN, IAEA and other organizations such as European Nuclear Safety Training and Tutoring Institute (ENSTTI) and Independent Technical Evaluation and Review (ITER). The IRRS team observed that BAPETEN presently has sufficient number of qualified inspectors for the fuel cycle facilities.

Status of the finding in the initial mission

Suggestion 17 is closed, as BAPETEN has a comprehensive training, retraining and qualification programme.

7.4 INSPECTION OF WASTE MANAGEMENT FACILITIES

8 There were no findings in this area in the initial IRRS missions.

7.5. INSPECTION OF RADIATION SOURCES FACILITIES, ACTIVITIES AND TRANSPORT

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The legal basis of announced and unannounced inspections is stipulated in the Act however, BAPETEN's inspectors never plan or conduct unannounced inspections for Radiation Sources' applications or transport.	
(1)	**BASIS: GSR Part 1 Requirement 27 states that** *"Inspection of facilities and activities, the regulatory body shall carry out inspections of facilities and activities to verify that the authorized party is in compliance with the regulatory requirements and with the conditions specified in the authorization".*

Original mission RECOMMENDATIONS, SUGGESTIONS	
(2)	**BASIS: GSR Part 1 Requirement 28, states that** *"Type of inspection of facilities and activities Inspections shall include programmed inspections and reactive inspections; both announced and unannounced.*
S18	**Suggestion: BAPETEN should consider including unannounced inspections and broaden the scope of transport inspections in their inspection programme.**

Changes since the initial IRRS mission

Suggestion 18: Article 44 (2) of BAPETEN Chairman Regulation No. 1 of 2017 on "Conducting Inspections in the Nuclear Energy Oversight" provides that inspections can be announced or unannounced. The IRRS team was informed that BAPETEN inspectors in recent years have performed several unannounced inspections in the presence of the local police to follow up on information received from the public about violation of regulations.

The IRRS team was informed that unannounced inspections of transport of radioactive sources are planned and will be carried out in cooperation with the Ministry of Transportation in 2020.

Status of the finding in the initial mission

Suggestion 18 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has carried out unannounced inspection for radiation sources; however, unannounced inspections for transport have not yet been carried out.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The formal provision of liaison with relevant organizations for joint inspections medical facilities is not in place; however there is limited cooperation with the BPOM to inspect radio-pharmaceutical activities.	
(1)	**BASIS: GSR Part 1 Requirement 29, para. 4.52 states that** *"* In conducting inspections, the regulatory body has to focus on a number of considerations, including inspections of: - … - Liaison with the relevant organization for joint inspections, where necessary.
R	**Recommendation: See R 6 in section 1.5**

Changes since the initial IRRS mission

Recommendation 6 (section 7.5): BAPETEN has a mechanism for establishment of cooperation and coordination at the national level in the form of Memorandum of Understanding (MoU). BAPETEN has signed an MoU with the Ministry of Health and extended its cooperation with the Ministry of Health since the initial IRRS mission in 2015. Development of BCR No. 2 of 2018 on the "Acceptance Test of X-Ray Machine" has been coordinated with the Ministry of Health. This situation was confirmed by IAEA appraisal service ORPAS invited to Indonesia in 2018. International experts identified improvement of existing policies and regulations together with further strengthening of cooperation between BAPETEN

and Ministry of Health as one of the areas where improvements may be required to meet international guidance and best practices.

Status of the finding in the initial mission

Recommendation 6 (in section 7.5) is closed on the basis of progress made and confidence in effective completion, as considerable progress in strengthening cooperation and coordination between BAPETEN and MoH has been made (see R6 in section 1.5).

7.6. INSPECTION OF DECOMMISSIONING ACTIVITIES

There were no findings in this area in the initial IRRS missions.

8. ENFORCEMENT

8.1. ENFORCEMENT POLICY AND PROCESS

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN enforcement process does not have provision for analysis of non-compliances and enforcements actions as a part of dissemination of the lessons learned from the regulatory experience.	
(1)	**BASIS: GSR Part 1 Requirement 15, states that** *"The regulatory body shall make arrangements for analysis to be carried out to identify lessons to be learned from operating experience and regulatory experience, including experience in other States, and for the dissemination of the lessons learned and for their use by authorized parties, the regulatory body and other relevant authorities".*
(2)	**BASIS: GSR Part 1 Para, 4.56. States that** *"At each significant step in the enforcement process, the regulatory body shall identify and document the nature of non-compliances and the period of time allowed for correcting them, and shall communicate this information in writing to the authorized party".*
R20	**Recommendation: BAPETEN *should collect, analyze and disseminate information on non-compliances and enforcement actions to provide feedback to enhance the performance of regulatory functions*.**

Changes since the initial IRRS mission

Recommendation 20: BAPETEN has issued BCR No. 1 of 2017 on conduct of regulatory inspection for all types of facilities and activities, which provides guidance on enforcement actions, and "Law Enforcement Procedure" No. PU/05 in 2017, regarding taking enforcement actions in collaboration with other enforcement agencies (e.g. Police, Ministry of Justice).

BAPETEN has a system for categorization of inspection findings. For nuclear installations working instruction No. IK/IIBN/00.1.33/Rev1 of 2014 is used for this categorization, while for radiation sources B@LIS INFARA is used.

Inspection findings and licensee response actions are reviewed and analysed. The outcomes of the analyses are used as one of the inputs to support revision of regulations and changes in the technical support material for law enforcement actions.

The IRRS team was informed that the most common enforcement measure taken by BAPETEN is written warnings. Licensees have to respond to these written warnings and submit progress reports to BAPETEN. An inspection is then performed to verify the follow-up actions.

The IRRS team was informed that the Inspection Directorate of BAPETEN performs an assessment of non-compliances and subsequent enforcement actions on an annual basis. Based on this assessment, areas for improvements are identified and disseminated among BAPETEN staff during coordination meetings. This process for collection and analysis, and its further utilization for improvement, will be formalized by revision of the existing enforcement procedure.

Status of the finding in the initial mission

Recommendation 20 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has mechanisms for assessment of non-compliance and for taking enforcement actions which provide feedback to enhance the performance of regulatory functions.

8.2. ENFORCEMENT IMPLEMENTATIONS

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not have procedures and guidelines governing the use and implementation of different types of enforcement actions related to transport of radioactive material.	
(1)	**BASIS: *GS-G 1.3 Para 5.14*, states that** *"The regulatory body should adopt clear administrative procedures and guidelines governing the use and implementation of enforcement actions. …* *The procedures and guidelines should cover in detail the decision making approach of the regulatory body in determining the level of actions to be taken and the way in which the actions should be taken, including dealing with failure of the operator to comply with requirement for regulatory enforcement".*
S19	**Suggestion: BAPETEN should consider developing procedures and guidelines governing the use and implementation of different types of enforcement actions.**

Changes since the initial IRRS mission

Suggestion 19: BAPETEN has issued "Law Enforcement Procedure" (PU/05 of 2016), which provides guidance for inspectors of radiation facilities and transport. The procedure complements section 8 of Government Regulation No. 58 of 2015 on "Radiation Safety and Security in the Transportation of Radioactive Materials", which includes specific provisions for administrative sanctions for transport of radioactive materials.

An MoU has been signed by BAPETEN and the Indonesian Police in 2019 to strengthen the cooperation between the two agencies.

Status of the finding in the initial mission

Suggestion 19 is closed, as BAPETEN has developed enforcement procedures.

9. REGULATIONS AND GUIDES

9.1. GENERIC ISSUES

There were no findings in this area in the initial IRRS missions.

9.2. REGULATIONS AND GUIDES FOR RESEARCH REACTORS

There were no findings in this area in the initial IRRS missions.

9.3. REGULATIONS AND GUIDES FOR FUEL CYCLE FACILITIES

There were no findings in this area in the initial IRRS missions.

9.4. REGULATIONS AND GUIDES FOR WASTE MANAGEMENT FACILITIES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN does not require measures to be taken to prevent the degradation of the waste containment particularly in long term storage, nor that account is taken of the expected period of storage and passive safety features.	
(1)	**BASIS**: **GSR Part 5 Requirement 11 states that** *"Waste shall be stored in such a manner that it can be inspected, monitored, retrieved and preserved in a condition suitable for its subsequent management. Due account shall be taken of the expected period of storage, and, to the extent possible, passive safety features shall be applied. For long term storage in particular, measures shall be taken to prevent degradation of the waste containment".*
R	**Recommendation: See R3 in section 1.2**

Changes since the initial IRRS mission

Recommendation (section 9.4): BAPETEN has developed BCR No.8 of 2016, where measures to prevent the degradation of the waste containment, particularly in long term storage, are included. This BCR covers the expected period of storage and passive safety features.

Status of the finding in the initial mission

Recommendation (in section 9.4) is closed, as appropriate regulations are in place. (See R3 in section 1.2)

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has established general requirements for disposal facilities but not for all types of disposals. However, procedures to meet the requirements have not been developed yet.	
(1)	**BASIS**:**GSR Part 5 Requirement 3 states that** "*The regulatory body shall establish the requirements for the development of radioactive waste management facilities and activities and*

Original mission RECOMMENDATIONS, SUGGESTIONS	
(2)	*shall set out procedures for meeting the requirements for the various stages of the licensing process…."* **BASIS:SSR-5 Requirement 2 states that** "*The regulatory body shall establish regulatory requirements for the development of different types of disposal facility for radioactive waste and shall set out the procedures for meeting the requirements for the various stages of the licensing process. It shall also set conditions for the development, operation and closure of each individual disposal facility and shall carry out such activities as are necessary to ensure that the conditions are met".*
S20	**Suggestion: BAPETEN should consider establishing regulations for all types of disposal facilities for radioactive waste and develop the procedures for meeting the requirements.**

Changes since the initial IRRS mission

Suggestion 20: The IRRS team was informed that BAPETEN plans to amend GR No 61 of 2013 on "Radioactive Waste Management" in 2023, to align it with the IAEA safety standards (GSR Part 5, SSR-5). The objective is to include requirements for all types of disposal facilities for radioactive waste. In the new Presidential Regulation No. 60 of 2019 on "National Policy and Strategy on Safety", it is foreseen that the policy and strategy for waste management, spent fuel management, decommissioning and disposal will be developed by 2025.

Status of the finding in the initial mission

Suggestion 20 is open, as appropriate requirements are not yet in place.

9.5. REGULATIONS AND GUIDES FOR RADIATION SOURCES FACILITIES AND ACTIVITIES

There were no findings in this area in the initial IRRS missions.

9.6. REGULATIONS AND GUIDES FOR DECOMMISSIONING ACTIVITIES

There were no findings in this area in the initial IRRS missions.

9.7. REGULATIONS AND GUIDES FOR TRANSPORT

There were no findings in this area in the initial IRRS missions.

10. EMERGENCY PREPAREDNESS AND RESPONSE – REGULATORY ASPECTS

10.1. GENERAL EPR REGULATORY REQUIREMENTS

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: There appears to be a good working-level cooperation between the different organizations involved in emergency preparedness and response, whereas the coordination at the highest executive level could be improved.	
(1)	**BASIS: GSR Part 7, para. 4.10 states that** *"The government shall establish a national coordinating mechanism to be functional at the preparedness stage, consistent with its emergency management system…"*
R21	**Recommendation: The government should improve the coordination mechanism between the relevant organizations within the national nuclear emergency preparedness and response system.**

Changes since the initial IRRS mission

Recommendation 21: The IRRS team noted that EPR coordination on the national level has been considerably improved. MoUs, I-CoNSEP (see below), Early Warning System (EWS) are important new components in the EPR management infrastructure. They have been tested through exercises. The concept of the response cooperation during a nuclear or radiological emergency is described in the operating procedures of the National Nuclear Emergency Response Organization (NNERO).

BAPETEN, with other relevant ministries and agencies initiated the establishment of a centre of excellence, which has been named "Indonesia Center of Excellence on Nuclear Security and Emergency Preparedness (I-CoNSEP). This centre was inaugurated on August 19, 2014 aiming to become a forum for coordination between relevant organizations in handling issues related to nuclear emergency preparedness and response at the national level. In addition, on April 25 2017, the Head of BAPETEN with the Chairman of BMKG signed an MoU on cooperation. The collaboration includes increasing nuclear supervision and also includes aspects of meteorology, climatology and geophysics.

BAPETEN has started installing the Indonesian Radiological Data Monitoring System (I-RDMS) in stages including 5 CTBTO stations and 48 observation stations. In 2018, 5 detectors, and in 2019 15 detectors of the I-RDMS were installed in different places.

The IRRS team was informed that there is no written commitment from the organizations involved in the NNERO concept document that they agree in their expected role and responsibilities. Such a commitment should be developed and signed by all relevant organizations involved in the national radiation emergency management system.

Status of the finding in the initial mission

Recommendation 21 is closed, as appropriate coordination mechanisms are in place.

Original mission RECOMMENDATIONS, SUGGESTIONS
Observation: The hazard categorization is not fully consistent with the emergency preparedness

Original mission RECOMMENDATIONS, SUGGESTIONS	
categories defined in GSR Part 7. While the relevant regulatory document BCR No 1 of 2010 defines category IV, the actual listing of the radiation sources in the country does not take category IV sources into consideration.	
(1)	**BASIS: GSR Part 7 para. 4.19 states that** "For the purposes of these requirements, assessed hazards are grouped in accordance with the emergency preparedness categories shown in Table I. The five emergency preparedness categories (hereinafter referred to as 'categories') in Table I establish the basis for a graded approach to be applied in application of these safety requirements and for developing generically justified and optimized arrangements for preparedness and response for a nuclear or radiological emergency."
S21	**Suggestion: BAPETEN should consider revising the relevant regulatory documents to adjust its hazard categorization to be fully consistent with the current IAEA categorization.**

Changes since the initial IRRS mission

Suggestion 21: BAPETEN is revising BCR No. 1 of 2010 on "Nuclear Emergency Preparedness and Response" to include the definition of hazard category IV in line with GSR Part 7. This revision is planned to be completed in 2020. Article 32 of the referred draft document is, indeed, dealing with EPC IV emergencies.

Status of the finding in the initial mission

Suggestion 21 is closed on the basis of progress made and confidence in effective completion, as the revision of BCR No. 1 of 2010 is in advanced stages of development.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: There is no protection strategy considered in the national regulatory documents.	
(1)	**BASIS: GSR Part 7, Requirement 5 state that** "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."
R	**Recommendation: See R3 in section 1.2**

Changes since the initial IRRS mission

Recommendation 3 (section 10.1): The IRRS team noted that the draft revision of BCR No. 1 of 2010 on "Nuclear Emergency Preparedness and Response" is in compliance with GSR Part 7. This document has stipulated the dose reference levels, the generic criteria and the use of operational intervention levels, which are the main components of the protection strategy.

Status of the finding in the initial mission

Recommendation 3 (in section 10.1) is closed on the basis of progress made and confidence in effective completion, as the protection strategy is incorporated in the revised BCR.

10.2. FUNCTIONAL REGULATORY REQUIREMENTS

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Regulations and criteria for agricultural countermeasures and countermeasures against ingestion of radionuclides have not yet been developed.	
(1)	**BASIS: GSR Part 7 para. 5.74 states that** "Within the ingestion and commodities planning distance (see para. 5.36), arrangements shall be made for prompt protection in relation to, and for restriction of, non-essential local produce, forest products (e.g. wild berries, wild mushrooms), milk from grazing animals, drinking water supplies, animal feed and commodities with or possibly with contamination following a significant radioactive release in accordance with the protection strategy…"
Observation: Management of radioactive waste in an emergency is not considered yet in the national regulatory documents.	
(1)	**BASIS: GSR Part 7 para. 5.81 states that** "The national policy and strategy for radioactive waste management shall apply for radioactive waste generated in a nuclear or radiological emergency taking into account these requirements"
Observation: The termination of an emergency is not considered yet in the national regulatory documents.	
(1)	**BASIS: GSR Part 7 requirement 18 states that** "The government shall ensure that arrangements are in place and are implemented for the termination of a nuclear or radiological emergency, with account taken of the need for the resumption of accustomed social and economic activities"
Observation: The analysis of the emergency and the emergency response is not considered yet in the national regulatory documents.	
(1)	**BASIS: GSR Part 7 para. 5.99 states that** "The government shall ensure that the nuclear or radiological emergency and the emergency response are analyzed in order to identify actions to be taken to prevent other emergencies and to improve emergency arrangements"
R22	**Recommendation: BAPETEN should revise its regulatory system in order to comply with the current relevant IAEA Safety Standards, namely:** • **develop regulations and criteria regarding countermeasures for early protective actions and restriction of food, drink and commodities, to ensure the safety to people;** • **ensure that the waste generated in an emergency situation will be managed safely;** • **develop regulations addressing the roles and responsibilities of the licensees and stakeholders, as well as the criteria for the termination of the radiological and nuclear emergency situation; and,** • **ensure that the nuclear or radiological emergency and the emergency response are analysed in order to identify actions to be taken to prevent other emergencies and to improve emergency arrangements.**

Changes since the initial IRRS mission

Recommendation 22: The draft revision of BCR No. 1 of 2010 on "Nuclear Emergency and Preparedness" stipulates the following:

1. provides countermeasures for early protective actions and restriction of food, drink and commodities;

2. ensures that the waste generated in an emergency situation will be managed safely;
3. clarifies the roles and responsibilities of the licensees and stakeholders, as well as the criteria for the termination of the radiological and nuclear emergency situation; and
4. ensures that the nuclear or radiological emergency and the emergency response are analysed in order to identify actions to be taken to prevent other emergencies and to improve emergency arrangements.

Status of the finding in the initial mission

Recommendation 22 is closed on the basis of progress made and confidence in effective completion, as the missing functional requirements are incorporated in the revised BCR.

10.3. REGULATORY REQUIREMENTS FOR INFRASTRUCTURE

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: A regulatory requirement requesting the licensees to place their emergency preparedness and response arrangements under appropriate quality management has not yet been developed.	
(1)	**BASIS: GSR Part 7, para. 6.34 states that** "The operating organization, as part of its management system …, and response organizations, as part of their emergency management system, shall establish a programme to ensure the availability and reliability of all supplies, equipment, communication systems and facilities, plans, procedures and other arrangements necessary to perform functions in a nuclear or radiological emergency as specified in Section 5 …. The programme shall include arrangements for inventories, resupply, tests and calibrations, to ensure that these are continuously available and functional for use in a nuclear or radiological emergency."
R23	**Recommendation: BAPETEN should develop regulations that oblige the licensees to place their EPR system under consistent and comprehensive quality management.**

Changes since the initial IRRS mission

Recommendation 23: The IRRS team noted that paragraph 6 (Articles 38-40) of the draft revision of BCR No. 1 of 2010 on "Nuclear Emergency and Preparedness" addresses quality management aspects of emergency preparedness and response.

Status of the finding in the initial mission

Recommendation 23 is closed on the basis of progress made and confidence in effective completion, as the missing infrastructural requirement is incorporated in the revised BCR.

10.4. ROLE OF REGULATORY BODY DURING RESPONSE

There were no findings in this area in the initial IRRS missions.

11. ADDITIONAL AREAS

11.1. CONTROL OF MEDICAL EXPOSURES

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Several BAPETEN inspectors also act as qualified experts to provide verification of compliance testing to the hospitals that may give rise to a conflict of interest.	
(1)	**BASIS: SF-1 Principle 1 states that** "*The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risks"* **BASIS: GSR Part 1 Requirement 17 states that** "*The regulatory body shall perform its functions in a manner that does not compromise its effective independence*.**"**
R24	**Recommendation: BAPETEN should refrain from providing verification of compliance testing to the hospitals, if they may lead to a real or perceived conflict of interest.**

Changes since the initial IRRS mission

Recommendation 24: BAPETEN Chairman Regulation No.1 of 2017 on "Conducting Inspections in the Nuclear Energy Oversight" and BCR No.2 of 2018 on "Compliance Test of Diagnostic Radiology and Interventional X-Ray" stipulate that both inspectors and qualified experts should conduct their task in line with applicable professional ethics. Inspectors from BAPETEN were previously acting as qualified experts. BAPETEN has recently introduced the National Priority Programme to accelerate the certification of compliance testing for all diagnostic and interventional radiology. On behalf of the Government, BAPETEN has concluded agreements with more than 40 institutions to assume the role of qualified experts to perform the compliance testing. It has provided impetus, particularly for hospitals located in remote areas and unable to fund the testing themselves. The IRRS team noted this as a good example of the commitment of BAPETEN to promote radiation safety of patients.

Status of the finding in the initial mission

Recommendation 24: is closed, as BAPETEN inspectors are no longer assuming the role of qualified experts.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Some roles and responsibilities of BAPETEN and MoH in regulation of medical uses of radiation are overlapping.	
(1)	**BASIS: see the basis for R6**
R 6-3	**Recommendation: See R6 Section 1.5**

Changes since the initial IRRS mission

Recommendation 6 (section 11.1): Overlapping responsibilities remain between BAPETEN and MoH. These include duplication of requirements for testing and calibration of radiation sources, and requirements regarding medical physicists. However, some improvements have been made, for example, under the MoU between BAPETEN and MoH, calibration should not be performed in the same year as the compliance testing.

Status of the finding in the initial mission

Recommendation 6 (in section 11.1) is closed on the basis of progress made and confidence in effective completion, as considerable progress in strengthening cooperation and coordination between BAPETEN and MoH has been made (See R 6 in section 1.5).

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The government has not fully ensured that relevant parties are authorized to assume their roles and responsibilities and that diagnostic reference levels, dose constraints, and criteria and guidelines for the release of patients are established.	
(1)	**BASIS: GSR Part 3 Requirement 34 states that "***The government shall ensure that relevant parties are authorized to assume their roles and responsibilities and that diagnostic reference levels, dose constraints, and criteria and guidelines for the release of patients are established.***"**
R	**Recommendation: See R3 in Section 1.2.**
Observation: The level of education and training of medical physicists appears not to be sufficient in all relevant areas of medical use of radiation to allow them to assume all the responsibilities of medical physicists defined in GSR Part 3.	
(1)	**BASIS: GSR Part 1 Requirement 11 states that "***The government shall make provision for building and maintaining the competence of all parties having responsibilities in relation to the safety of facilities and activities.* **...** 2.36. The government; … (c) Shall make provision for adequate arrangements for increasing, maintaining and regularly verifying the technical competence of persons working for authorized parties."
R	**Recommendation: See R3 in Section 1.2.**
Observation: Referrals for asymptomatic exposure and self-referred patients are not explicitly covered by the regulations.	
(1)	**BASIS: GSR Part 3 Requirement 36, para 3.150 states that** *"Registrants and licensees shall ensure that no patient, whether symptomatic or asymptomatic, undergoes a medical exposure unless:* *(a) the radiological procedure has been requested by a referring medical practitioner and information on the clinical context has been provided, or it is part of an approved health screening programme;* *(b) The medical exposure has been justified through consultation between the radiological medical practitioner and the referring medical practitioner, as appropriate, or it is part of an approved health screening programme;* *(c) A radiological medical practitioner has assumed responsibility for protection and safety in the planning and delivery of the medical exposure as specified in para. 3.153(a);* *(d) The patient or the patient's legal authorized representative has been informed, as appropriate, of the expected diagnostic or therapeutic benefits of the radiological procedure as well as the radiation risks."*
R	**Recommendation: See R3 in Section 1.2.**
Observation: The requirements for the responsibilities of medical physicists are not fully in line with the requirements in the current IAEA Safety Standards.	
(1)	**BASIS: GSR Part 3 Requirement 38 states that** *"Registrants and licensees and radiological medical practitioners shall ensure that protection and safety is optimized for each medical exposure."*

	BASIS: GSR Part 3 Para 3.166 states that *"in accordance with para. 3.153(d) and (e), the medical physicist shall ensure that:* *(a) All sources giving rise to medical exposure are calibrated in terms of appropriate quantities using internationally accepted or nationally accepted protocols;* *(b) Calibrations are carried out at the time of commissioning a unit prior to clinical use, after any maintenance procedure that could affect the dosimetry and at intervals approved by the regulatory body;* *(c) Calibrations of radiotherapy units are subject to independent verification prior to clinical use;* *(d) Calibration of all dosimeters used for dosimetry of patients and for the calibration of sources is traceable to a standards dosimetry laboratory.* **BASIS: GSR Part 3 Para 3.167 states that** *"registrants and licensees shall ensure that dosimetry of patients is performed and documented by or under the supervision of a medical physicist, using calibrated dosimeters and following internationally accepted or nationally accepted protocols, including dosimetry to determine the following:* *(a) For diagnostic medical exposures, typical doses to patients for common radiological procedures;* *(b) For image guided interventional procedures, typical doses to patients;"*
R	**Recommendation: See R3 in Section 1.2.**
Observation: The release of patients after I-131 therapy is not based on individual assessment.	
(1)	**BASIS: GSR Part 3 Requirement 40 states that** *"Registrants and licensees shall ensure that there are arrangements in place to ensure appropriate radiation protection for members of the public and for family members before a patient is released following radionuclide therapy."* **…** *"(a) The activity of radionuclides in the patient is such that doses that could be received by members of the public and family members would be in compliance with the requirements set by the relevant authorities (para. 3.149(b));"*
R	**Recommendation: See R3 in Section 1.2.**
Observation: There are no requirements that radiological medical practitioners informed patients or their legal representatives of any unintended or accidental medical exposure.	
(1)	**BASIS: GSR Part 3 Requirement 36 states that "***Registrants and licensees shall ensure that no person incurs a medical exposure unless there has been an appropriate referral, responsibility has been assumed for ensuring protection and safety, and the person subject to exposure has been informed as appropriate of the expected benefits and risks."* **BASIS: GSR Part 3 Requirement 41, para. 3.180 (c) states: "***Registrants and licensees shall, with regard to any unintended or accidental medical exposures investigated as required in para. 3.179: Ensure that the appropriate radiological medical practitioner informs the referring medical practitioner and the patient or the patient's legal authorized representative of the unintended or accidental medical exposure.*
R	**Recommendation: See R3 in Section 1.2.**
Observation: There are no requirements that reviews should include an investigation and critical review on justification and optimisation. Periods for retention of records of patient dosimetry are not specified. No requirement for independent audits is in place and, as a consequence, no third party verifications are carried out.	

(1)	**BASIS: GSR Part 3 Requirement 41, para. 3.181 states:** *Registrants and licensees shall ensure that radiological reviews are performed periodically by the radiological medical practitioners at the medical radiation facility, in cooperation with the medical radiation technologists and the medical physicists. The radiological review shall include an investigation and critical review of the current practical application of the radiation protection principles of justification and optimization for the radiological procedures that are performed in the medical radiation facility. of the unintended or accidental medical exposure.*
R	Recommendation**: See R3 in Section 1.2.**

Changes since the initial IRRS mission

The Government has published Presidential Regulation No. 60 of 2019 on "National Policy and Strategy for Nuclear and Radiation Safety". The appendix of this document identifies parties with responsibilities for medical uses of radiation. These include the Ministry of Health, BATAN, National Agency of Drugs and Food Control, Ministry of Research and Technology, Ministry of Trade, Ministry of Transportation, Ministry of Finance, and BAPETEN. The national policy and strategy also assign responsibilities to these organizations in the field of radiation safety in medicine.

Since the original IRRS mission in 2015, a number of developments have taken place. These include:

- BAPETEN has developed the SiINTAN database (National Information System for Patient's Dose) and in 2018 established DRLs for radiology and CT examinations for adults.
- Regulation of Ministry of Health No.83 of 2015 on "Standard of Public Service of Medical Physicists" has established the required education for medical physicists as a Bachelor's degree and associated training course.
- The draft MoH regulation "Practical Permit for Medical Workers" establishes different minimum education requirements depending on the area of work, such as minimum Bachelor's degree plus one year of clinical experience for conventional radiology, and Master's degree plus two years of clinical experience for radiotherapy. MoH evaluates all medical physicists once every five years in order to re-issue their registration. However, it appears that a formal mechanism for registration of medical physicists in the various fields (e.g. diagnostic radiology, radiation therapy, nuclear medicine) is to be developed. Also, the responsibilities of medical physicists should be described in detail, in order to ensure the optimization of protection and safety, and to fulfil the requirements for calibration, dosimetry and quality assurance.
- The draft revision of GR No. 33 specifies the provisions for general and individual justification, for consultation between the radiological medical practitioner and the referring medical practitioner, for the referrals. However, there are no provisions related to asymptomatic and self-referred patients or to the expected diagnostic or therapeutic benefits of the radiological procedure as well as the radiation risks. Independent audits have been performed, as part of the hospitals' accreditation process regulated by the MoH. There are two independent recognized institutions that can perform these audits: the Committee for Hospital Accreditation and the International Society for Quality in Health Care External Evaluation.

However, several of the initial observations from the initial mission for medical exposure are still valid. The IRRS team, therefore, concluded that it would be appropriate to close the initial recommendations and issue a new, overarching recommendation that may serve to guide BAPETEN and MoH in further efforts to align the national requirements for safe use of radiation in medicine with the IAEA safety standards.

In order to be in line with GSR Part 3 and to provide the legal basis for developing specific regulations for medical practices, the new draft of GR No 33 of 2007 on "Safety of Ionizing Radiation and the Security of Radioactive Sources" should include relevant aspects of medical exposure such as:

- Justification of medical exposure, including for self-referred and asymptomatic patients, and the use of referral guidelines;
- Responsibilities and competence requirements of relevant parties;
- Optimization of protection and safety taking into account all operational aspects;
- Prevention of unintended or accidental medical exposure, investigation and follow-up of such exposures;
- Criteria and guidelines for the release of patients;
- Radiological reviews and their records.

Status of the finding in the initial mission

Recommendations R3 (in section 11.1) are closed, as a new relevant Recommendation (RF2) has been introduced during the follow-up mission.

Follow-up Mission RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: Important requirements and associated criteria for safety, relevant to medical exposure such as: responsibilities, justification, optimization, accidental medical exposures, have not yet been fully established.	
(1)	**BASIS: GSR Part 3 Requirement 35 states that "***regulatory body shall require that health professionals with responsibilities for medical exposure are specialized in the appropriate area and that they fulfil the requirements for education, training and competence in the relevant speciality.***"**
(2)	**BASIS: GSR Part 3 Requirement 36 states that** *"Registrants and licensees shall ensure that no person incurs a medical exposure unless there has been an appropriate referral, responsibility has been assumed for ensuring protection and safety, and the person subject to exposure has been informed as appropriate of the expected benefits and risks.*
(3)	**BASIS:** *BASIS***: GSR Part 3 Requirement 37 states that: "***Relevant parties shall ensure that medical exposures are justified."*
(4)	**BASIS: GSR Part 3 Requirement 38 states that: "***Registrants and licensees and radiological medical practitioners shall ensure that protection and safety is optimized for each medical exposure."*
RF 2	**Recommendation: MoH and BAPETEN should establish safety requirements for control of medical exposures, including requirements for responsibilities, justification, optimization and accidental exposures.**

Policy Discussion on "the Implementation of Optimization of Radiation Protection"

The policy issue related to the implementation of optimization of radiation protection was briefly introduced by the Indonesian counterpart, who gave a brief overview of the background to the optimization principle as well as major challenges that have been faced by BAPETEN.

Twelve topics were identified for discussion, including the identification of priorities in Indonesia in relation to radiological protection of patients, justification of radiological procedures and use of referral guidance, increasing the awareness of optimization, regulatory control of dose constraints for comforters, carers, and volunteers, dose limits for the lens of the eye, regulation of hybrid modalities such as SPECT-CT, optimization of protection in interventional radiology, radiotherapy, nuclear installations and industrial radiography, issues related to limited number of medical physics, and RPOs in the country.

A significant step has been taken by BAPETEN in developing its national Diagnostic Reference Levels. DRLs have already been developed for conventional radiology and CT, and there are ongoing activities to develop DRLs for mammography. More than 100 hospitals have participated in this activity, on a voluntary basis. The web portal used to collect doses from hospitals referred to Australia's Regulatory Body (ARPANSA). The IRRS team offered views based on experiences in their respective countries. A general view is that including the DRL values in relevant regulations could impose a certain constraint. The team proposed to establish dynamic DRLs, which represent more relevant values and can be modified with time and as technology and procedures evolve. A good international practice is to require submission of dose values from hospitals at regular time intervals, instead of on a volunteer basis. An additional challenge in Indonesia is the huge number of old and obsolete equipment used in radiation medicine in hospitals.

During the discussions, it was emphasized that optimization should include consideration of choice of technology already in the planning stage based on evaluation of different options, refinement of the preferred option, and implementation of the preferred option including recurrent reviews of performance, in order to achieve the desired optimization of protection.

An important topic raised was the availability of medical physicists in the country. Medical Physicist is a recognized profession in Indonesia. Significant improvements have recently been introduced regarding requirements for education, training and certification of medical physicists. Recently, competency of medical physicists has been improved by Indonesia Medical Physicist Association (AFISMI) and universities. Currently, there are 110 Medical Physicists educated and trained, 15 of them are certified, six are under residency programme for certification and 89 are still to be certified. The Team members highlighted the importance of having access to well-educated medical physicists, in particular in radiotherapy. Considering the rapid development of new radiation technologies used in medicine, further competence building of all relevant parties is needed.

Optimization of protection in industrial applications has slightly different challenges, such as sometimes less qualified staff compared to the medical field. However, it was emphasised that a proactive approach is needed, and significant benefits can be gained from the early engagement of BAPETEN in relation to the optimization of protection in the future nuclear installations.

11.2. OCCUPATIONAL RADIATION PROTECTION

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The current equivalent dose limit for the lens of the eye is 50 mSv in a year for apprentices.	
(1)	**BASIS: GSR Part 3 Schedule III III.2 states that** *"For occupational exposure of apprentices of 16 to 18 years of age who are being trained for employment involving radiation and for exposure of students of age 16 to 18 who use sources in the course of their studies, the dose limits are: (b) An equivalent dose to the lens of the eye of 20 mSv in a year;"*
Observation: No specific requirements state that the conditions of service of workers should be	

Original mission RECOMMENDATIONS, SUGGESTIONS	
independent of whether they are or could be subject to occupational exposure. Any special compensatory arrangements should neither be granted nor be used as substitutes for measures for protection and safety.	
(1)	**BASIS: GSR Part 3 para. 3.111 states that** *"The conditions of service of workers shall be independent of whether they are or could be subject to occupational exposure. Special compensatory arrangements, or preferential consideration with respect to salary, special insurance coverage, working hours, length of vacation, additional holidays or retirement benefits, shall neither be granted nor be used as substitutes for measures for protection and safety in accordance with the requirements of these Standards."*
Observation: The regulation does not require employers to make all reasonable efforts to provide workers with suitable alternative employment in circumstances that workers, for health reasons, may no longer continue in employment in which they are or could be subject to occupational exposure	
(2)	**BASIS: GSR Part 3 para. 3.112 states that** *"Employers shall make all reasonable efforts to provide workers with suitable alternative employment in circumstances for which it has been determined, either by the regulatory body or in the framework of the programme for workers' health surveillance in accordance with the requirements of these Standards, that workers, for health reasons, may no longer continue in employment in which they are or could be subject to occupational exposure."*
Observation: Regulations do not fully require employers, registrants and licensees to facilitate compliance by workers with the requirements of the regulation.	
(3)	**BASIS: GSR Part 3 para. 3.82 states that** *"Employers, registrants and licensees shall facilitate compliance by workers with the requirements of these Standards."*
Observation: With respect to personal protective equipment (PPE), the regulations does not require that employers and licensees to ensure that: 1) workers receive adequate instruction including testing for good fit. 2) tasks requiring the use of certain PPE are assigned only to workers who on the basis of medical advice are capable of safely sustaining the extra effort necessary. 3) all PPEs are maintained in proper condition and tested at regular intervals. 4) if the use of PPE is considered for any given task, account is taken of any additional exposure and of any non-radiological risks.	
(4)	**BASIS: GSR Part 3 para. 3.95 states that** *"Employers, registrants and licensees shall ensure that: (b) Where appropriate, workers receive adequate instruction in the proper use of respiratory protective equipment, including testing for good fit. (c) Tasks requiring the use of certain personal protective equipment are assigned only to workers who on the basis of medical advice are capable of safely sustaining the extra effort necessary. (d) All personal protective equipment, including equipment for use in an emergency, is maintained in proper condition and, if appropriate, is tested at regular intervals. (e) If the use of personal protective equipment is considered for any given task, account is taken of any additional exposure that could result owing to the additional time taken or the inconvenience, and of any non-radiological risks that might be associated with using personal protective equipment while performing the task."*
Observation: There is no requirement on employers, registrants and licensees, to consult with workers in establishing in writing local rules and procedures.	
(5)	**BASIS: GSR Part 3 para. 3.94 states that** *"Employers, registrants and licensees, in consultation with workers, or through their representatives where appropriate: (a) Shall establish in writing local rules and procedures that are necessary for protection and safety for workers and other persons."*
Observation: The regulations do not fully require workers to 1) to follow any applicable rules and procedures for protection and safety; 2) to cooperate with the employer or licensee with respect to	

Original mission RECOMMENDATIONS, SUGGESTIONS	
protection and safety and the operation of radiological health surveillance and dose assessment programmes; 3) abstain from any wilful action that could put themselves or others in situations that contravene the requirements of the regulations;	
(6)	**BASIS: GSR Part 3 para. 3.83 states that** *"Workers:* *(a) Shall follow any applicable rules and procedures for protection and safety as specified by the employer, registrant or licensee;* *(c) Shall cooperate with the employer, registrant or licensee with regard to protection and safety, and programmes for workers' health surveillance and programmes for dose assessment;* *(e) Shall abstain from any wilful action that could put themselves or others in situations that would not be in accordance with the requirements of these Standards."*
R	**Recommendation: See R3 section 1.2**
S22	**Suggestion: BAPETEN should consider inviting an IAEA Occupational Radiation Protection Appraisal Service (ORPAS) mission in order to develop an action plan for further improving the infrastructure for occupational radiation protection.**

Changes since the initial IRRS mission

Recommendation R3 (section 11.2): Regulation GR No 33 of 2007 on "Safety of Ionising Radiation and The Security of Radiation Sources" has addressed the above recommendations. However, issuance of the revised document will take time. Therefore, IRRS team decided to close R3-18, R-22 and develop an overarching Recommendation to support the revision of GR No.33 and ensure it is line with the IAEA safety standards, particularly GSR Part 3. The new recommendation mainly addresses GSR Part 3 requirement 12 on dose limits, requirement 21 on the responsibilities of employers, registrants and licensees for the protection of workers, and requirement 22 on compliance by workers.

Status of the finding in the initial mission

Recommendations R3 (in section 11.2) are closed, as a new relevant Recommendation (RF3) has been introduced during the follow-up mission.

Follow-up Mission RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: Draft GR No 33 of 2007 "the safety of ionising radiation and the security of radiation sources" is not in line with GSR part 3 especially requirements related to dose limits, responsibilities of employers, registrants and licensees for the protection of workers, and compliance by workers.	
(1)	**BASIS: GSR Part 3 Requirement 12**: Dose limits *"The government or the regulatory body shall establish dose limits for occupational exposure and public exposure, and registrants and licensees shall apply these limits".*
(2)	**BASIS: GSR Part 3 Requirement 21**: Responsibilities of employers, registrants and licensees for the protection of workers *"Employers, registrants and licensees shall be responsible for the protection of workers against occupational exposure. Employers, registrants and licensees shall ensure that protection and safety is optimized and that the dose limits for occupational exposure are not exceeded.*

(3)	**BASIS: GSR Part 3 Requirement 22**: *Compliance by workers* *Workers shall fulfil their obligations and carry out their duties for protection and safety.*
RF 3	**Recommendation: BAPETEN should align the revision of GR No. 33 with GSR part 3, in particular requirements related to dose limits, responsibilities of employers, registrants and licensees for the protection of workers, and compliance by workers.**

Changes since the initial IRRS mission

Suggestion 22: BAPETEN has invited an IAEA Occupational Radiation Protection Appraisal Service (ORPAS) mission in order to develop an action plan for further improving the infrastructure for occupational radiation protection. This ORPAS mission took place from 4 to 13 November 2018.

Status of the finding in the initial mission

Suggestion 22 is closed, as BAPETEN has completed an ORPAS mission.

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The training courses available for radiation protection officers depending on the level of RPO are one or two week standard courses and there is no practice specific training for RPO.	
(1)	**BASIS: GSR Part 3 para. 2.22 states that** "*The government shall ensure that arrangements are in place for the provision of the education and training services required for building and maintaining the competence of persons and organizations that have responsibilities relating to protection and safety."*
S23	**Suggestion: Government and BAPETEN should consider to modifying the requirement for RPOs training and retraining to include practice specific part for each type of practices.**
S24	**Suggestion: BAPETEN should consider inviting an IAEA Education and Training Appraisal Service (EduTA) mission to define an action plan for the development of the education and training infrastructure in Indonesia.**

Changes since the initial IRRS mission

Suggestion 23: BAPETEN Chairman Regulation No.16 of 2014 on "Working Permit of Specific Personal on Ionizing Radiation Installation" is being revised to cover requirements for training and retraining of radiation protection officers (RPOs) to include a practice specific part for each type of practices. The IAEA Education and Training Appraisal Service (EduTA) mission (mentioned in suggestion 24) concluded that overall, the training programme (particularly for RPOs) is comprehensive and well managed.

Status of the finding in the initial mission

Suggestion 23 is closed on the basis of progress made and confidence in effective completion, as practice specific training related to RPO training is incorporated in the draft BCR No.16 of 2014.

Changes since the initial IRRS mission

Suggestion 24: BATAN has hosted the IAEA Education and Training Appraisal Service (EduTA) mission, that took place from 18 to 22 November 2019. One of the findings was that the overall training programme (particularly for RPOs) is comprehensive and well managed.

Status of the finding in the initial mission

Suggestion 24 is closed, as an IAEA Education and Training Appraisal Service (EduTA) mission was completed.

11.3. CONTROL OF RADIOACTIVE DISCHARGES, MATERIALS FOR CLEARANCE, AND EXISTING EXPOSURES SITUATIONS; ENVIRONMENTAL MONITORING FOR PUBLIC RADIATION PROTECTION

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The legal and regulatory frameworks do not include the expanded set of safety requirements for planned exposure situations yet.	
(1)	**BASIS:** SF-1, GSR Part 3, Paras 3.1-3.4, Req. 3.9 e, 3.15 d, 3.33 a, 3.118- 3.144, Schedule I and Definitions, and GSR Part 4.
R	**Recommendation: See R3 in Section 1.2**

Changes since the initial IRRS mission

Recommendation 3 (section 11.3): Safety requirements established mainly in GSR Part 3, but also in GSR Part 4, 5 and 6, are relevant to protection of the public and the environment from the harmful effects of ionizing radiation in both planned and existing exposure situations (existing exposure situations are covered in section 11.4).

Protection of the public and the environment in planned exposure situations is regulated and monitored based on several Government and BAPETEN Chairman Regulations, including GR No. 29 of 2008, GR No. 33 of 2007, GR No. 54 of 2012, BCR No. 4 of 2013, and BCR No. 7 of 2017.

However, since 2015 there has been little progress in relation to the implementation of GRS Part 3 provisions for the purpose of protection of the public and the environment in planned exposure situations, into the legislative framework for safety, subordinate to Act No.10 of 1997 on "Nuclear Energy". Currently, the regulatory framework in this area is based on the IAEA Basic Safety Standards of 1996. It is focused on practices and lacks the delineation between exposure situations and responsibilities of the government, regulatory body and other involved parties about protection of the public and the environment in planned (and existing) exposure situations.

Examples of issues covered in GSR Part 3 that should be considered in the legislative framework include the establishment of dose and risk constraints; operational limits and conditions relating to public exposures (including authorized limits for discharges), protection of the environment, radiological environmental impact assessments and safety assessments, provision for maintaining records of discharges, results of monitoring programs and results of assessments of public exposure and responsibilities regarding radioactive discharges.

Status of the finding in the initial mission

Recommendation 3 (in section 11.3) open, as the regulations are not in line with GSR Part 3 regarding protection of the public and the environment in planned exposure situations. (See R3 in Section 1.2)

11.4. CONTROL OF CHRONIC EXPOSURES AND REMEDIATION

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The national legislation and regulation do not include yet the expanded set of safety requirements for existing exposure situations, as stipulated in GSR Part 3.	
(1)	**BASIS:** GSR Part 3 Chapter 5 Existing Exposure Situation
R	**Recommendation: See R3 in Section 1.2**

Changes since the initial IRRS mission

Recommendation 3 (section 11.4): Existing exposure situations include situations of exposure to natural radiation including radon, as well as situations of exposure due to residual radioactive material that derives from past practices that were not subject to a proper regulatory control or that remains after an emergency exposure situation. Protection from exposures that emanate from naturally occurring radioactive material (NORM), previously referred to as "chronic exposures", are regulated by GR No. 33 of 2007, and technologically enhanced NORM (TE-NORM) are regulated by BCR No. 9 of 2009 and BCR No. 16 of 2013.

The legal framework is currently lacking full coverage of the requirements relating to protection and safety of the public and the environment in existing exposure situations. The legal framework should also cover a number of other aspects relevant to existing exposure situations, including but not limited to the development of a national strategy for remediation activities, definition of responsibilities for remediation and control, and justification and optimization of protective actions.

Status of the finding in the initial mission

Recommendation 3 (in section 11.4) is open, as the regulations are not in line with GSR Part 3 regarding protection of the public and the environment in existing exposure situations.

11.5. TRANSPORT

There were no findings in this area in the initial IRRS missions.

11.6. ASSESSMENT AGAINST THE PROVISIONS OF THE CODE OF CONDUCT ON THE SAFETY OF RADIOACTIVE SOURCES

There were no findings in this area in the initial IRRS missions.

12. TAILORED MODULE FOR COUNTRIES EMBARKING ON NUCLEAR POWER (SSG–16)

12.1. INTRODUCTION TO TAILORED MODULE FOR COUNTRIES EMBARKING ON NUCLEAR POWER

There were no findings in this area in the initial IRRS missions.

12.2. CONSIDERATION OF ELEMENTS OF SSG-16

There were no findings in this area in the initial IRRS missions.

12.2.1. SSG-16 Element 01 National policy and strategy for safety

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: A national policy and strategy for safety has not yet been established by Government.	
(1)	**BASIS: GSR Part 1 R1 states that:** "*The government shall establish a national policy and strategy for safety, the implementation of which shall be subject to a graded approach in accordance with national circumstances and with the radiation risks associated with facilities and activities, to achieve the fundamental safety objective and to apply the fundamental safety principles established in the Safety Fundamentals.*" **BASIS: SSG-16 Action 5:** "*The government should establish a clear national policy and strategy for meeting safety requirements in order to achieve the fundamental safety objective and to apply the fundamental safety principles established in the IAEA Safety Fundamentals.*" **BASIS: SSG-16 Action 6: "***The government should establish a policy for knowledge transfer for ensuring safety by means of contracts and agreements with organizations in other States that may be involved in the nuclear power programme."* **BASIS: SSG-16 Action 7: "***The government should ensure identification of responsibilities and their progressive allocation to the relevant organizations involved in the development of the safety infrastructure."*
R	**Recommendation: See R1 in Section 1.1.**
Observation: Effective coordination between the organizations involved in the establishment of a nuclear safety infrastructure for a nuclear power programme has not been implemented.	
(1)	**BASIS: GSR Part 1 R7 states that: "***Where several authorities have responsibilities for safety within the regulatory framework for safety, the government shall make provision for the effective coordination of their regulatory functions, to avoid any omissions or undue duplication and to avoid conflicting requirements being placed on authorized parties.***"** **BASIS: SSG-16 Action 2:** "*The government should provide for the coordination of all activities to establish the safety infrastructure.*"

Original mission RECOMMENDATIONS, SUGGESTIONS	
	BASIS: SSG-16 Action 8: "*The government should ensure that all the necessary organizations and other elements of the safety infrastructure are developed efficiently and that their development is adequately coordinated."*
S25	**Suggestion: The government should consider assigning the role of coordinating all activities regarding the establishment of a nuclear safety infrastructure to an existing organization, or establish a new organization to carry out this task.**

Changes since the initial IRRS mission

Recommendation 1 (section 12.2.1): Since the subject is already covered in Section 1 of this report, the subject has not been discussed in section 12.

Status of the finding in the initial mission

Recommendation 1 (section 12.2.1) is closed. (See section 1.1)

Changes since the initial IRRS mission

Suggestion 25: The IRRS team noted that the Government has not yet established an organization for coordinating all activities regarding the establishment of a safety infrastructure for nuclear power. Different activities regarding establishment of a nuclear safety infrastructure have been carried out by state ministries and institutions, such as BAPETEN, BATAN (National Nuclear Energy Agency of Indonesia), MEMR (Ministry of Energy and Mineral Resources), etc.

Particularly, BATAN and MEMR have taken some initiatives regarding formation of a NEPIO (nuclear energy programme implementing organization). BATAN studied structures of NEPIOs in other countries, including Malaysia, Argentina, Belarus, Egypt, Lithuania, Philippines, Bangladesh, Vietnam, Turkey and Jordan. Recently, BAPETEN started to get involved with other stakeholders at the national level in the discussions regarding formation of a NEPIO, in case the Government decides to embark on nuclear power.

Status of the finding in the initial mission

Suggestion 25 is open, as the national organization for coordinating all activities regarding establishment of nuclear safety infrastructure for nuclear power programme has not yet been established.

12.2.2. SSG-16 Element 02 Global Nuclear Safety Regime

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Indonesia is party to relevant conventions in the area of nuclear safety and is a member or participant in the activities of many international organizations. BAPETEN has cooperation agreements with different regulatory bodies.	
(1)	**BASIS: GSR Part 1 R14 states that:** *"The government shall fulfil its respective international obligations, participate in the relevant international arrangements, including international peer reviews, and promote international cooperation to enhance safety globally."*

Original mission RECOMMENDATIONS, SUGGESTIONS	
	BASIS: SSG-16 Action 11: "*The government should prepare for participation in the global nuclear safety regime.* **BASIS: SSG-16 Action 14: "***All the relevant organizations should participate in the global nuclear safety regime."* **BASIS: SSG-16 Action 15: "***The State should become a party to the relevant international conventions, as identified in Phase 1."*
GP	**Good Practice: See GP 1 in Section 2.1**

12.2.3. SSG-16 Element 03 Legal Framework

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: All essential elements of nuclear safety are not covered by the legal and regulatory framework.	
(1)	**BASIS: GSR Part 1 R2 states that:** "*The government shall establish and maintain an appropriate governmental, legal and regulatory framework for safety within which responsibilities are clearly allocated.*" **BASIS: SSG-16 Action 22: "***The government should enact and implement the essential elements of the legal framework for the safety infrastructure."*
R	**Recommendation: See R3 in Section 1.2**

Changes since the initial IRRS mission

Recommendation R3 (section 12.2.3): The IRRS team reviewed the draft amendment to Act No. 10 of 1997 on "Nuclear Energy" with the objective to assess if all nineteen essential nuclear safety elements described in paragraph 2.5 of GSR Part 1 (Rev. 1) had been incorporated. The IRRS team noted that the following two elements were missing:

1. Provision that would allow appeals against decisions of the regulatory body;
2. Responsibilities and obligations in respect of financial provision for the management of radioactive waste and of spent fuel, and for decommissioning of facilities and termination of activities.

The IRRS team was informed that the provision for appeals against Government agency decisions (including those taken by BAPETEN) is already included in Act No. 30 of 2014 on "Government Administration". Moreover, financial provisions will be included in relevant regulations for the management of radioactive waste, spent fuel and for decommissioning of facilities.

Status of the finding in the initial mission

Recommendation R3 (in section 12.2.3) is closed on the basis of progress made and confidence in effective completion, as almost all essential nuclear safety elements have been incorporated in the draft Act and the outstanding element will be included during revision of documents. (See R3 in Section 1.2)

12.2.4. SSG-16 Element 04 Regulatory Framework

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has not yet conducted systematic assessment of different regulatory approaches and decided which approach to be used in its regulatory framework for nuclear power plants.	
(1)	**BASIS: SSG-16 Action 29: "***The regulatory body should consider the various regulatory approaches that are applied for nuclear power programmes of the same size, and should tentatively plan its approach, taking into account the State's legal and industrial practices and the guidance provided in the IAEA safety standards."*
S26	**Suggestion: BAPETEN should consider performing a systematic assessment of different regulatory approaches and carrying out tentative planning of its approach to licensing and effective regulatory supervision of nuclear power plants.**
Observation: All the requirements to be known for the bidding process for NPPs have not yet been specified by BAPETEN.	
(1)	**BASIS: GSR Part 1 R32 states that: "***The regulatory body shall establish or adopt regulations and guides to specify the principles, requirements and associated criteria for safety upon which its regulatory judgements, decisions and actions are based."* **BASIS: SSG-16 Action 31: "***The regulatory body should specify the safety requirements that should be known for the bidding process."*
S27	**Suggestion: BAPETEN should consider completing the set of regulations and guides that define the safety requirements that are essential for the bidding process for nuclear power plants, taking into consideration the scheduling of the nuclear power programme.**

Changes since the initial IRRS mission

Suggestion 26: The IRRS team was informed that a working group has been established in BAPETEN with the task to perform systematic assessment of different regulatory approaches to regulatory supervision of NPPs. An IAEA Workshop on Regulatory Framework and Regulatory Approaches was organized in 2014 with the aim to provide guidance and information on alternative regulatory approaches that could be followed by BAPETEN as a regulatory body in a newcomer country.

The working group conducted assessments of different regulatory approaches and compiled the assessments in a working group document. The result of this assessment is incorporated in Appendix 1B of the BAPETEN Management System Manual BCR No. 14 of 2014 (Page-55), and states that BAPETEN Regulations are based on a performance-based approach. However, a prescriptive approach can also be used (if required).

Status of the finding in the initial mission

Suggestion 26 is closed, as BAPETEN has carried out a systematic assessment of different regulatory approaches in order to develop its regulatory approach to regulatory supervision of NPPs.

Changes since the initial IRRS mission

Suggestion 27: The IRRS team noted that BAPETEN has developed regulations and guides for defining the safety requirements essential for the bidding process for nuclear power plants. These regulations provide regulatory requirements for different stages of NPPs i.e. site evaluation, design, operation and decommissioning. Moreover, BAPETEN also developed regulations regarding safety and security, management system, emergency preparedness and response, safeguards, physical protection, environmental impact, etc.

Status of the finding in the initial mission

Suggestion 27 is closed on the basis of progress made and confidence in effective completion, as adequate safety requirements have been developed by BAPETEN for the bidding process for NPPs.

12.2.5. SSG-16 Element 05 Transparency and Openness

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: A mechanism for consultation with interested parties and the public is not included in BAPETEN's licensing process for nuclear power plants.	
(1)	**BASIS: GSR Part 1 R36 states that:** "*The regulatory body shall promote the establishment of appropriate means of informing and consulting interested parties and the public about the possible radiation risks associated with facilities and activities, and about the processes and decisions of the regulatory body*." **BASIS: SSG-16 Action 42: "***All relevant organizations should continue to inform the public and interested parties on safety issues, including the expected health and environmental impacts of a nuclear power programme."* **BASIS: SSG-16 Para 2.90:** "*The involvement of the public and interested parties, including public hearings, and resolution of the issues expressed in those hearings, should be made part of the licensing process."*
S28	**Suggestion: BAPETEN should consider establishing and implementing a mechanism for consultation with interested parties and the public in its licensing process for nuclear power plants.**
Observation: BAPETEN has not used its website to inform the public of nuclear safety issues concerning nuclear power plants.	
(1)	**BASIS: GSR Part 1 R36 states that:** "*The regulatory body shall promote the establishment of appropriate means of informing and consulting interested parties and the public about the possible radiation risks associated with facilities and activities, and about the processes and decisions of the regulatory body*." **BASIS: SSG-16 Action 42: "***All relevant organizations should continue to inform the public and interested parties on safety issues, including the expected health and environmental impacts of a nuclear power programme."*
S29	**Suggestion: BAPETEN should consider improving its website to inform the public of nuclear safety issues concerning nuclear power plants.**

Changes since the initial IRRS mission

Suggestion 28: The IRRS noted that involvement of the public and interested parties in the licensing process is stipulated in Act Number 30 of 2014 on "Government Administration". This Act requires that all government institutions should provide opportunity for public hearings during the decision making process, including licensing of NPPs. Also, there are provisions in a specific section of the draft amendment of Act No.10 of 1997 on "Nuclear Energy" dealing with communication and consultation with the public.

The IRRS team noted that Directorate of Licensing of Nuclear Installation and Materials (DPIBN) recently revised its "Procedure of Licensing for Nuclear Reactor Installation" PUK/DPIBN/02.2 (April 2019) to include that "DPIBN perform a public consultation meeting involving the local government and community representatives around the site, before issuance of licence or approval". Furthermore, BAPETEN carried out a public hearing together with the local authorities before granting the site permit for Serpong site.

On the other hand, the mechanism of consultation with interested parties (e.g. describing how to consult, when to consult, whom to consult, how to entertain the outcome of consultation, etc.) has not yet been clearly defined in the relevant regulations and procedures. BAPETEN will revise relevant documents to clearly define the existing mechanism after the enactment of the draft amendment of Act No.10 of 1997 on "Nuclear Energy".

Status of the finding in the initial mission

Suggestion 28 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has carried out public hearings before granting a site permit. Relevant documents need to be revised to clearly document existing mechanism for consultation with interested parties.

Changes since the initial IRRS mission

Suggestion 29: The IRRS team observed that some information regarding nuclear safety issues is available on BAPETEN's website, as follows;

- SEED mission carried out for an NPP candidate site;
- Participation of Indonesia in review meetings under the terms of the Convention on Nuclear Safety (CNS), which also includes Indonesia's National Reports from 2004 to 2017;
- Nuclear Safety Regulations;
- Links to the video interviews available on social media regarding nuclear energy and safety of NPPs.

However, the website does not provide information regarding processes carried out by BAPETEN to evaluate candidate sites for NPPs as per national regulations, safety implications associated with the factors considered in the site evaluation process, etc. BAPETEN may further elaborate the information on its website regarding nuclear safety issues.

The IRRS team also noted that BAPETEN Regulation BCR No. 3 of 2018 on "Public Communication Strategy of BAPETEN" describe principles and methods for sharing information with the public. Each department will establish its own strategy for communication with the public in order to meet the intent of this regulation. The team was informed that the communication strategy for the directorate responsible for licensing of NPPs has not yet been established.

Status of the finding in the initial mission

Suggestion 29 is closed on the basis of progress made and confidence in effective completion, as information sharing with the public regarding nuclear safety issues is being carried out through the

BAPETEN website. However, BAPETEN may further improve nuclear safety related information sharing through its website.

12.2.6. SSG-16 Element 06 Funding and Financing

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: There are requirements, in GR No 2 of 2014, on the operating organization to have adequate financial resources for the construction stage but not for the operation stage for nuclear power plants.	
(1)	**BASIS: SSG-16 Action 54: "***The operating organization should establish a policy for ensuring adequate funding so as not to compromise safety at any stage of the nuclear power programme."*
S30	**Suggestion: BAPETEN should consider including in its regulations requirements for sustainable financing for the safety of nuclear power plants at all stages of the nuclear power programme**
Observation: The financial provisions provided in the Act and GRs do not adequately cover the long term nature of radioactive waste management, spent fuel management and decommissioning, including the possibility of decommissioning before the end of design life.	
(1)	**BASIS: GSR Part 1 R10 states that:** "*The government shall make provision for the safe decommissioning of facilities, the safe management and disposal of radioactive waste arising from facilities and activities, and the safe management of spent fuel.*" **BASIS: SSG-16 Action 55: "***The government should enact legislation that requires financial provision for the funding of long term radioactive waste management, spent fuel management and decommissioning."*
R	**Recommendation**: See R 8 in Section 1.7

Changes since the initial IRRS mission

Suggestion 30: The IRRS team noted that there is a requirement in Article 6 of GR No. 2 of 2014 on "Licensing of Nuclear Installation and Utilization of Nuclear Material" for sustainable financing of the NPP project in construction, commissioning and decommissioning stages. The form of the financial guarantee for these stages is also described in Article 13 and 14 of the aforementioned regulation.

However, requirements regarding sustainable financing during operation stage have not yet been described in the regulations. The IRRS team was informed that these requirements for the operation stage will be included during revision of the regulations, which is planned to be done from 2020 to 2024. The revision process for this regulation has not yet been initiated.

Status of the finding in the initial mission

Suggestion 30 is open, as the revision process for incorporating financial provisions in the regulation regarding operation stage of NPP has not been started.

Changes since the initial IRRS mission

Recommendation 8: The IRRS team noted that there is no legislation or regulation containing financial provisions for long term management of radioactive waste, management of spent fuel, and

decommissioning including the possibility of decommissioning before the end of design life. The IRRS team observed that this issue has not been addressed in the amendment of Act No. 10 of 1997 on "Nuclear Energy".

Status of the finding in the initial mission

Recommendation 8 is open, as financial provisions for long term management of radioactive waste, management of spent fuel, and decommissioning including the possibility of decommissioning before the end of design life have not been included in the legal framework.

12.2.7. SSG-16 Element 07 External Support Organizations and Contractors

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has not yet systematically assessed its needs for external support for its licensing of nuclear power plants.	
(1)	**BASIS: GSR Part 1 R20 states that:** "*The regulatory body shall obtain technical or other expert professional advice or services as necessary in support of its regulatory functions, but this shall not relieve the regulatory body of its assigned responsibilities.*" **BASIS: SSG-16 Action 61: "***The government should consider the availability of expertise, industrial capability and technical services that could support the safety infrastructure in the long term."*
S31	**Suggestion: BAPETEN should consider conducting a systematic assessment of external technical expertise needed during the licensing process of an NPP Project, and identifying the organizations that could potentially provide such expertise.**
Observation: BAPETEN does not have a formal system for overseeing contractors providing it with external technical services.	
(1)	**BASIS: GSR Part 1 R20 states that:** "*The regulatory body shall obtain technical or other expert professional advice or services as necessary in support of its regulatory functions, but this shall not relieve the regulatory body of its assigned responsibilities.*" **BASIS: SSG-16 Action 66: "***The regulatory body and the operating organization should plan arrangements for overseeing the activities performed by their respective external support organizations and contractors."*
S32	**Suggestion: BAPETEN should consider establishing arrangements for overseeing external support services provided to it, taking into account the quality requirements for activities related to nuclear safety.**

Changes since the initial IRRS mission

Suggestion 31: The IRRS team reviewed the document "Preparation for Regulatory Control of Nuclear Power Plant in Indonesia, Qualification and Human Resource Development Programme" of 2011 which deals mainly with:

- The status of available human resources;
- Future needs for competent regulatory body (including assessment of areas where internal or external TSO expertise will be needed for licensing of NPPs);

- Training framework for future NPP project; and
- Qualification programme for regulatory body staff.

Areas where support of internal and external TSOs is required for licensing of NPPs have already been identified in this document. Since the decision for embarking on nuclear power has been delayed, areas where external support is needed have not been updated after 2011.

The IRRS team was informed that BAPETEN has also performed its competence need assessment (CNA) for the existing BAPETEN functions as well as for upcoming functions connected with the NPP project. The CNA was based upon SARCoN methodology and, accordingly, a human resource development (HRD) plan was also developed by BAPETEN in 2014 which is being updated frequently.

Status of the finding in the initial mission

Suggestion 31 is closed on the basis of progress made and confidence in effective completion, as BAPETEN conducted assessment regarding external technical expertise needed during licensing of an NPP project.

Changes since the initial IRRS mission

Suggestion 32: The IRRS team was informed that the following criteria (code of conduct) are being used by BAPETEN for selection and utilization of TSOs;

- Competence / Expertise;
- Independence;
- Integrity;
- Transparency and openness;
- Efficiency;
- Accountability.

In order to ensure technical competency of personnel providing technical support, work experience of personnel is checked. Moreover, an undertaking is also signed by personnel providing technical support to ensure their integrity and independence from the potential licensees. The work done by contracted TSOs is evaluated by BAPETEN and is the only means of overseeing external support services by BAPETEN.

The IRRS team was also informed that there is a general procedure "Providence of Goods and Services Procedure" described in section 5.4 of the Management System Manual that defines a general process for contracting out for goods and services. However, this procedure does not specifically describe arrangements for overseeing external support services. This procedure may be further elaborated to include areas mentioned in GSG-12 (Appendix I) regarding contractor oversight by the regulatory body.

Status of the finding in the initial mission

Suggestion 32 is closed on the basis of progress made and confidence in effective completion, as BAPETEN has plans to update the relevant documents in the light of GSG-12 to oversee external support services.

12.2.8. SSG-16 Element 08 Leadership and Management for Safety

Original mission RECOMMENDATIONS, SUGGESTIONS
Observation: The existing management system of BAPETEN does not fully cover or elaborate on some of the important elements, such as safety culture and graded approach.

Original mission RECOMMENDATIONS, SUGGESTIONS	
(1)	**BASIS: GSR Part 1 R19 states that:** "*The regulatory body shall establish, implement, and assess and improve a management system that is aligned with its safety goals and contributes to their achievement.*" **BASIS: GSR Part 2 (GS-R-3):** *As a whole* **BASIS: SSG-16 Action 75: "***The regulatory body and the operating organization should start developing and implementing effective management systems in their respective organizations and should promote a strong safety culture."*
R	**Recommendation: See R&S given in Section 4.**

Changes since the initial IRRS mission

Recommendations and Suggestions of section 4: Since the subject is already covered in Section 4 of this report, the subject has not been discussed in section 12.

Status of the finding in the initial mission

Recommendations and Suggestions: See section 4.

12.2.9. SSG-16 Element 09 Human Resources Development

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: A strategy for attracting, training and retaining qualified personnel for all the organizations involved in future nuclear power programme, including BAPETEN, has not yet been established by the Government.	
(1)	**BASIS: GSR Part 1 R11 states that:** "*The government shall make provision for building and maintaining the competence of all parties having responsibilities in relation to the safety of facilities and activities.*" **BASIS: SSG-16 Action 85:** "*The government should consider a strategy for attracting, training and retaining an adequate number of experts to meet the needs of all organizations involved in ensuring safety in a prospective nuclear power programme.***"** **BASIS: SSG-16 Action 90:** "*All relevant organizations should implement a strategy to attract and retain high quality trained personnel***."**
S33	**Suggestion: The Government should consider a strategy to enable all organizations involved in ensuring safety of a potential future nuclear power programme, including BAPETEN, to attract, train and retain an adequate number of highly qualified personnel.**
Observation: BAPETEN has not completed and finalized its human resource development plan and its training programme is not based on a human resource development plan.	
(1)	**BASIS: GSR Part 1 R18 states that:** "*The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its responsibilities.*"

Original mission RECOMMENDATIONS, SUGGESTIONS	
	BASIS: SSG-16 paragraph 2.169: "*Early in Phase 2, a policy decision should be made regarding the implementation of the plans that were developed in Phase 1 for ensuring the availability of experts. Implementation of the selected plan should begin early enough in Phase 2 so that sufficient numbers of individuals can complete the necessary training and occupy positions in the regulatory body, the operating organization, external support organizations and industrial organizations before the commissioning of the first nuclear power plant.***"**
S	**Suggestion: see Suggestion 6 Section 3.3**

Changes since the initial IRRS mission

Suggestion 33: The IRRS team was informed that BAPETEN has performed its Competence need assessment (CNA) for the existing BAPETEN functions as well as for upcoming functions connected with an NPP project. The CNA was based upon the IAEA SARCoN methodology and accordingly a human resource development (HRD) plan was developed in 2014 (Draft BCR on "Human Resources Development and Plan") which is being updated frequently. Training and retraining of personnel are being carried out on the basis of this assessment.

However, the IRRS team was informed that the Government has not documented a strategy or implemented a practice for enabling all organizations involved in ensuring safety to attract and retain an adequate number of qualified personnel.

Status of the finding in the initial mission

Suggestion 33 is open, as the Government has not documented a strategy or implemented a practice for attracting and retaining qualified personnel.

Changes since the initial IRRS mission

Suggestion 6 (section 12.2.9): The IRRS team observed that there is sufficient number of core staff available in BAPETEN with sufficient level of knowledge for early Phase 2 regulatory duties. Furthermore, there is an ongoing effort with the help of the IAEA and EC for a long time to increase human resources to get ready for effective regulatory supervision of the future NPP project.

The IRRS team was informed that BAPETEN has also performed its competence need assessment (CNA) for the existing BAPETEN functions as well as for upcoming functions connected with the future NPP project. The CNA was based upon the IAEA SARCoN methodology and accordingly a human resource development (HRD) plan was developed in 2014 (Draft BCR on "Human Resources Development and Plan") which is being updated frequently. Training and retraining of personnel are being carried out on the basis of this assessment.

Status of the finding in the initial mission

Suggestion 6 (in section 12.2.9) is closed on the basis of progress made and confidence in effective completion, as BAPETEN has developed a draft human resource plan considering future staffing needs in case of embarking on nuclear power programme.

12.2.10. SSG-16 Element 10 Research for safety and regulatory purposes

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: Specific safety areas for research, to support the potential future nuclear power programme, have not been identified by BAPETEN and relevant national organizations.	
(1)	**BASIS: GSR Part 1 R11 para 2.38 states that:** "*Development of the necessary competence for the operation and regulatory control of facilities and activities shall be facilitated by the establishment of, or participation in, centres where research and development work and practical applications are carried out in key areas for safety.*" **BASIS: SSG 16 Action 101: "***The operating organization and the regulatory body should be involved in identifying areas for safety research*." **BASIS: SSG 16 Action 103: "***Research centres should begin conducting research relating to safety in areas in which in-depth knowledge is essential to support safe long term operation of nuclear power plants.***"**
S34	**Suggestion: BAPETEN and relevant national organizations should consider performing a systematic analysis in order to identify specific safety areas for research to support the nuclear power programme.**

Changes since the initial IRRS mission

Suggestion 34: The IRRS team noted that Safety Assessment Center of BAPETEN carried out research and studies regarding safety of HTGR reactors and SMR under "Strategic Plan 2015-2019" in collaboration with Gadjah Mada University and Bandung Institute of Technology (ITB).

Areas of research and studies for HTGR include mainly general design, qualitative safety analysis, quantitative safety analysis for neutronic safety calculation and thermohydraulic safety calculations. However, areas of research and studies for SMRs are focused mainly on conceptual design.

Status of the finding in the initial mission

Suggestion 34 is closed on the basis of progress made and confidence in effective completion, as BAPETEN conducted research and studies on HTGR and different types of SMRs.

12.2.11. SSG-16 Element 11 Radiation protection

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: An evaluation guiding the updating of the regulations to adequately elaborate on radiation protection of the worker, the public and the environment, taking into account the potential future NPP programme, has not been made.	
(1)	**BASIS: GSR Part 1 R32 states that: "***The regulatory body shall establish or adopt regulations and guides to specify the principles, requirements and associated criteria for safety upon which its regulatory judgments, decisions and actions are based.***"** **BASIS: SSG 16, Action 108: "***The regulatory body and/or the government should amend the legislation and/or regulations as appropriate for the purposes of regulating radiation protection.*"

Original mission RECOMMENDATIONS, SUGGESTIONS	
	BASIS: SSG-16 Action 109: "*The regulatory body should establish or approve, as appropriate, the limits and constraints regarding workers and the public both for normal and potential exposure situations in a nuclear power plant.*"
R	**Recommendation: See R 3 Section 1.2**

Changes since the initial IRRS mission

Recommendation R3 (section 12.2.11): The IRRS team noted that BAPETEN is currently developing a new regulation "BCR on the Radiation Protection Aspects in the Design of Power Reactor" to adequately address radiation protection aspects in the design of NPPs. The regulation is being developed based on NS-G-1.13 ("Radiation Protection Aspects of Design for NPPs"). The IRRS team was informed that the regulation is currently under review by ministries to check harmonization with other regulations and is expected to be issued in 2019 or early 2020.

Status of the finding in the initial mission

Recommendation 3 (in section 12.2.11) is closed on the basis of progress made and confidence in effective completion, as BCR on "Radiation Protection Aspects in the Design of Power Reactor" is at the final stages of approval. (See R3 in Section 1.2)

12.2.12. SSG-16 Element 12 Safety Assessment

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has not completed developing its staff skills for safety assessment in all technical fields that are relevant for safety as regards the licensing process for nuclear power plants.	
(1)	**BASIS: GSR Part 1 R18 states that.** "*The regulatory body shall employ a sufficient number of qualified and competent staff, commensurate with the nature and the number of facilities and activities to be regulated, to perform its functions and to discharge its responsibilities*." **BASIS: SSG 16 Action 118: "***The operating organization, the regulatory body and external support organizations, as appropriate, should develop the expertise to prepare for the conduct or review of safety assessments.*"
S35	**Suggestion: BAPETEN should consider further developing staff skills for safety assessment in all technical fields that are relevant for safety as regards the licensing process for nuclear power plants.**

Changes since the initial IRRS mission

Suggestion 35: The IRRS team noted that many training activities have been carried out from 2015–2019 towards development of skills of technical staff in the safety assessment areas concerning NPPs.

Status of the finding in the initial mission

Suggestion 35 is closed on the basis of progress made and confidence in effective completion, as many activities have been conducted to develop staff skills for safety assessment.

12.2.13. SSG-16 Element 13 Safety of radioactive waste, spent fuel management and decommissioning

There were no findings in this area in the initial IRRS missions.

12.2.14. SSG-16 Element 14 Emergency preparedness and response

There were no findings in this area in the initial IRRS missions.

12.2.15. SSG-16 Element 15 Operating Organization

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation*:* The Government has not yet identified or established an operating organization for potential future nuclear power plants.	
(1)	**BASIS: SSG 16 Action 149: "***The operating organization should be formed, if it has not already been formed, and it should be expressly assigned its prime responsibility for safety.*" **BASIS: SSG 16 Action 147: "***The government should consider the financial resources and the necessary competences and staffing that are expected from an organization operating a nuclear power plant so as to ensure long term safety."*
S36	**Suggestion: The Government should consider identifying or establishing an Operating Organization with the required financial resources and necessary competencies, in a timely manner considering the scheduling of the future nuclear power plants.**

Changes since the initial IRRS mission

Suggestion 36: The IRRS team noted that GR No 2 of 2014 (Article 3) stipulates that power reactor category consists of "commercial power reactor" and "non-commercial power reactor". Article 5 (para 1) of the GR No 2 of 2014 states that 'development, operation, and decommissioning of non-commercial power reactor or non-commercial non-powered reactor are performed by BATAN". However, Article 5 (para 2) also states that "development, operation, and decommissioning of commercial power reactor or commercial non powered reactor are performed by state owned enterprises, cooperative, and/or incorporated legal entity".

The IRRS Team was informed that BATAN is defined as operating organization for non-commercial power reactor or non-commercial non-powered reactor as per GR No. 2 of 2014 and Act No. 10 of 1997 on "Nuclear Energy". Since, the Government's decision to embark on nuclear power is delayed, hence, action for identifying or establishing an operating organization for commercial power reactor or commercial non powered reactor is non-applicable at the moment.

Status of the finding in the initial mission

Suggestion 36 is closed, as the suggestion is non-applicable at the moment due to the delay in Government's decision to embark on nuclear power.

12.2.16. SSG-16 Element 16 Site survey, site selection and evaluation

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: The Government has not identified potential sites, based on a set of defined criteria, and candidate sites for potential future nuclear power plants.	
(1)	**BASIS: SSG 16 Action 160: "***The government should ensure that potential sites are identified and candidate sites are selected on the basis of a set of defined criteria, at a regional scale and with the use of available data.***"** **BASIS: SSG 16 Action 164: "***The regulatory body should review and assess the site evaluation report, and should make a decision regarding the acceptability of the site selected and the site related design bases.*"
S37	**Suggestion: The Government should consider identifying potential sites and select candidate sites for future nuclear power plants on the basis of a set of site selection criteria, and prepare and submit a site evaluation report for the selected site to BAPETEN for review and assessment.**

Changes since the initial IRRS mission

Suggestion 37: The IRRS team noted that BATAN has selected potential sites and candidate sites for future NPPs. Potential sites include Muria Site, Banten Site, Bangka Site, East and West Kalimantan Site, Batam Site and Serpong Site. Candidate sites have been identified from each of these potential sites. The IRRS team also noted that BAPETEN has recently granted a site permit to Serpong site after carrying out review and assessment of the site evaluation report and associated documents.

Status of the finding in the initial mission

Suggestion 37 is closed, as BAPETEN has granted site permit to Serpong Site on January 2017.

12.2.17. SSG-16 Element 17 Design safety

Original mission RECOMMENDATIONS, SUGGESTIONS	
Observation: BAPETEN has regulations for defining design requirements of NPPs; however, they have not been updated to conform to the current IAEA Safety Standards.	
(1)	**BASIS: GSR Part 1 R32 states that: "***The regulatory body shall establish or adopt regulations and guides to specify the principles, requirements and associated criteria for safety upon which its regulatory judgments, decisions and actions are based."* **BASIS: SSG 16 Action 174: "***The regulatory body should prepare and enact national safety regulations on design that are necessary for bid specification.*"
R	**Recommendation: See R 3 Section 1.2**

Changes since the initial IRRS mission

Recommendation R3 (section 12.2.17): The IRRS team noted that BAPETEN is revising BCR No. 3 of 2011 on "Safety Requirements for the Design of Power Reactors" on the basis of IAEA Safety Standard SSR 2/1. It is expected that the new revision will be published by March 2020.

The IRRS team was informed that terminology of Design Extension Conditions (DEC) is not used in the new draft due to unavailability of this terminology in GR No. 2 of 2014 on "Licensing of Nuclear Installations and Utilization of Nuclear Material" and GR No. 54 of 2012 on "Safety and Security of Nuclear Installations, which are the bases of BCR No. 3 of 2011. Therefore, the old terminology of "design basis accidents" and "beyond design basis accidents" is retained in the new draft.

Status of the finding in the initial mission

Recommendation R3 (in section 12.2.17) is closed on the basis of progress made and confidence in effective completion, as the revised BCR No.3 of 2011 will be issued in March 2020. (See R3 in section 1.2)

12.2.18. SSG-16 Element 19 Transport Safety

There were no findings in this area in the initial IRRS missions.

Policy Issue on "Regulatory Framework of Construction of Nuclear Installation"

At the beginning of the discussion of the policy issue subject, BAPETEN delivered a short presentation on relevant government regulations (GR No. 2 of 2014 and GR No. 54 of 2012), the content of the draft BCR on "Nuclear Installation Construction" and the technical issues and questions connected with this draft regulation which is mainly referring to SSG-38 on "Construction of Nuclear Installations". Subsequently, the discussions focused on:

- what are the main requirements to be set out in the draft BCR and how to use SSG 38 for this purpose;
- what kind of oversight activities should be conducted by BAPETEN during the construction of a nuclear installation after giving the construction licence and competency areas to be needed by BAPETEN for this purpose.

Members of the IRRS team summarized the general guidance given in the relevant IAEA Safety Standards. Noting that SSG-38 is mainly written for the Operating Organization/Licensee, a discussion on how to use SSG 38 by BAPETEN during drafting the BCR and developing relevant internal procedures to be used by BAPETEN took place.

The discussion highlighted and explored the main responsibilities and duties of the Licensee, such as performing an intense and effective oversight on the vendor and its sub-contractors during all construction activities, in accordance with the established Integrated Management System (IMS) of the Licensee organization. Additionally, the discussion provided more details and provided real examples on the following aspects, mainly based on the experiences in the countries of the IRRS team members in attendance:

- Stages and main areas that BAPETEN should pay more attention during the regulatory oversight of the construction phase;
- Identification of competency areas and then external support needs of BAPETEN for adequate and timely preparation for a construction licence application;

- Regulatory oversight of the IMS in the Licensee organization;
- Establishment of appropriate communication mechanisms between the regulatory body and the licensee (and its vendors/contractors through the licensee);
- “Hold points” and “witness points”;
- Construction programme;
- Importance of the Regulatory Body and the Licensee (and its vendors/contractors) having the same understanding of some important definitions, such as “non-conformances” and “significant design change or modification”;
- Strategies that can be followed by BAPETEN for effective and adequate regulatory oversight of the construction phase;
- Advantages and disadvantages of different regulatory approaches (goal based/performance based vs. prescriptive) during the regulatory oversight of the construction phase;
- Level of emergency preparedness and response activities to be expected during this phase;
- Learning from experiences of other countries` regulatory bodies that regulated and licensed the same or similar reactors and/or vendors.

Finally, the IRRS Team has appreciated that BAPETEN will receive an IAEA Expert Mission to discuss regulatory oversight during construction and commissioning phases of nuclear reactors, that will provide detailed guidance to BAPETEN on all those aspects and topics.

APPENDIX I LIST OF PARTICIPANTS

INTERNATIONAL EXPERTS			
1.	Carl-Magnus Larsson	Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) AUSTRALIA	carl-magnus.larsson@arpansa.gov.au
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6.	Rajnish Kumar	Atomic Energy Regulatory Board INDIA	rajnish@aerb.gov.in
7.	Malgorzata Sneeve	Norwegian Radiation Protection Authority NORWAY	malgorzata.sneve@nrpa.no
8.	Shahbaz Ali Nasir Bhatti	Pakistan Nuclear Regulatory Authority (PNRA) PAKISTAN	shahbaz.ali@pnra.org
9.	Peter Zombori	Senior Expert HUNGARY	petezombori@gmail.com

IAEA STAFF MEMBERS			
1.	Jovica Bosnjak	Division of Radiation, Transport and Waste Safety	j.bosnjak@iaea.org
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3.	Tom Alexander	Division of Radiation, Transport and Waste Safety	t.alexander@iaea.org

LIAISON OFFICER			
1.	Dahlia Cakrawati Sinaga	Nuclear Energy Regulatory Agency (BAPETEN)	d.sinaga@bapeten.go.id

APPENDIX II LIST OF COUNTERPARTS

MODUL	TITLE	COUNTERPARTS 2015	COUNTERPARTS 2019
1	Responsibilities and Functions of The Government	Farid Arif Binaruno	Sugeng Sumbardjo lukman Hakim
2	Global Nuclear Safety Regime	Yudi Pramono	Yudi Pramono
3	Responsibilities of the Regulatory Body	Taruniyati Handayani	Farid Binaruno Indra Gunawan
4	Management Systems of The Regulatory Body	Taruniyati Handayani	Farid Binaruno Satria Prahara
5	Authorization - Nuclear Installation and Material	Dahlia Cakrawati Sinaga	Budi Rohman
	Authorization - Radiation Facilities and Radioactive Material	Zainal Arifin	Ishak
6	Review and Assessment - Nuclear Installation and Material	Djoko Hari Nugroho Dahlia Cakrawati Sinaga	Yudi Pramono Budi Rohman
	Review and Assessment - Radiation Facilities and Radioactive Material	Zainal Arifin Syahrir	Ishak Djoko Hari Nugroho
7	Inspection - Nuclear Installation and Material	Budi Rohman	Amil Mardha
	Inspection - Radiation Facilities and Radioactive Material	Sugeng Sumbarjo	Zainal Arifin
8	Enforcement - Nuclear Installation and Material	Budi Rohman	Amil Mardha Indra Gunawan
	Enforcement - Radiation Facilities and Radioactive Material	Sugeng Sumbarjo	Zainal Arifin Indra Gunawan
9	Regulations and Guides - Nuclear Installation and Material	Yudi Pramono	Dahlia Cakrawati Sinaga
	Regulations and Guides - Radiation Facilities and Radioactive Material	Ishak	Taruniyati H
10	Emergency Preparedness and Response	Dedik Eko Sumargo	Totok Heriyanto
11	Transport	Indra Gunawan Ishak	Aris Sanyoto Sugeng Rahadi
	Control of Medical Exposure	Rini Suryanti Ferdinan Siahaan	Rusmanto Ida Bagus Manuaba

	Occupational Radiation Protection	Ishak Aris Sanyoto Kristio Rumboko	Aris Sanyoto Sugeng Rahadi Ida Bagus Manuaba
	Control of Radioactive Discharges and Materials for Clearance	Agus Yudi Indra Gunawan Diella Ayudha Susanti	Zalfy Hendry Alfiyan Kristyo R
	Environmental Monitoring Associated with Authorized Practices for Public Radiation Protection Purposes	Lilin Indayani Asep Saefulloh Ferdinan Siahaan	Ida Bagus Manuaba Aris Sanyoto Lia Astuti
	Control of Chronic Exposures (Radon, NORM and Past Practices and Remediation)	Nur Syamsi Syam Moekhamad Alfiyan	Evin Yuliati Zalfy Hendry Dyah Kalista
12	Tailored module for embarking countries (phase II of SSG 16)	Dahlia Cakrawati Sinaga Yudi Pramono Budi Rohman	Dahlia Cakrawati Sinaga Amil Mardha Budi Rohman
	Policy Discussion on the Implementation of Optimization of Radiation Protection		Taruniyati H. Ishak
	Policy Discussion on the Regulatory Framework of Construction of Nuclear Installation		Dahlia Cakrawati Sinaga Budi Rohman

APPENDIX III MISSION PROGRAMME

INDONESIA FOLLOW UP IRRS MISSION PROGRAMME, 24 November – 4 December 2019

Sunday, 24 November 2019		
IRRS Initial IRRS Review Team Meeting		**Venue and Participants**
13:30 - 18:00	Opening remarks by the IRRS Team Leader Introduction by IAEA (TC) Self-introduction of all attendees FU IRRS Process (TC) Report writing (TC) Schedule (TL, TC) First impression from experts arising from the Advanced Reference Material (ARM) (All Experts) Administrative arrangements (BAPETEN) and IRRS Liaison Officer, IAEA: Detailed Mission Programme	Venue: Harris Hotel Participants: IRRS Team + the LO
Monday, 25 November 2019		
IRRS Entrance Meeting		
09:00 – 12.30	09:00 Arrival, registration, 09:30 *Official from BAPETEN* - Welcoming Address 09:45 IRRS Team Leader – Expectations for the Mission and introduction of the IRRS Team 10:15 Coffee break and Group Photo 11:00 BAPETEN – Regulatory Overview, Current Status of Recommendation and Suggestion of IRRS Mission 2015 11:45 Discussion	Venue: BAPETEN Auditorium 8th floor Participants: High Level Government Official, BAPETEN Management and staff, Official from relevant organizations, IRRS Team + the LO
12:30 – 13:30	Lunch	
13:30 – 17:00	Interviews and Discussions with Counterparts (parallel discussions)	Topics, counterparts, and offices: M 1,2,3 - *BAPETEN Building B 8th floor* Sources and Transport (M 5-9) - *Building B 3rd floor* Waste facilities and decommissioning (M 5-9) - *Building B 4th floor* Research reactor (M 5-9) - *Building B 4th floor* M4 - *BAPETEN Building B 1st floor* M10 - *BAPETEN Building C* M11 (ORP) - *Building B 3rd floor* M11 (EM) - *Building B 4th floor* M11 (CoME) - *Building B 5th floor* M11 (CoRD) - *Building B 2nd floor*
17:00 - 18:00	Daily IRRS Review Team meeting	Venue: BAPETEN Meeting room (8th floor) Participants: IRRS team + LO.
Tuesday, 26 November 2019		
Daily Discussions / Interviews		
09:00 – 12:30	Interviews and discussions with counterparts (parallel discussions)	M 1,2,3 - *BAPETEN Building B 8th floor* Sources and Transport (M 5-9) - *Building B 3rd floor* Waste facilities and decommissioning (M 5-9) - *Building B 4th floor* Research reactor (M 5-9) - *Building B 4th floor* M4 - *BAPETEN Building B 1st floor* M10 - *BAPETEN Building C* M11 (ORP) - *Building B 3rd floor* M11 (EM) - *Building B 4th floor*

		M11 (CoME) - *Building B 5th floor* M11 (CoRD) - *Building B 2nd floor*
12:30 – 13:30	Lunch	
13:30 – 17:00	Interviews and discussions with counterparts (parallel discussions)	*continued*
17:00 – 18:00	Daily IRRS Review Team meeting / Discussion of the preliminary findings	Venue: BAPETEN Meeting room (8th floor) Participants: IRRS team + LO.
Wednesday, 27 November 2019		
Daily Discussions / Interviews		
09:00 – 12:30	Interviews and discussions with counterparts for all modules	M 1,2,3 - *BAPETEN Building B 8th floor* Sources and Transport (M 5-9) - *Building B 3rd floor* Waste facilities and decommissioning (M 5-9) - *Building B 4th floor* Research reactor (M 5-9) - *Building B 4th floor* M4 - *BAPETEN Building B 1st floor* M10 - *BAPETEN Building C* M11 (ORP) - *Building B 3rd floor* M11 (EM) - *Building B 4th floor* M11 (CoME) - *Building B 5th floor* M11 (CoRD) - *Building B 2nd floor* M 12 - *SSG 16 (Tailored module for embarking countries) - Building B 4th floor*
12:30 – 13:30	Lunch	
13.30 - 16.00	Interviews and discussions with counterparts for all modules	M 1,2,3 - *continued* M 5-9 (sources & transport) - *continued* M 10 - emergency preparedness & response - continued M 11 - Occupational Radiation Protection - continued Waste facilities and decommissioning (M 7,8) - *Building B 3rd & 4th floor* M 4 - *BAPETEN Building B 1st floor*
16:00 – 17:00	Writing first draft of preliminary findings (Rs, Ss and GPs)	Venue: BAPETEN Meeting room (8th floor) Participants: the IRRS team
17:00 – 18:00	Daily IRRS Review Team meeting: Discussion of the preliminary findings (conclusions)	Venue: BAPETEN Meeting room (8th floor) Participants: IRRS team + LO.
20:00 – 24:00	Report conclusions drafting	
Thursday, 28 November 2019		
Daily Discussions / Interviews		
09:00 – 12:30	Interviews and discussions with counterparts for all modules as needed	Continued if needed
12:30 – 13:30	Lunch	
13.30 – 17.00	Report preparation	Venue: BAPETEN Meeting room (8th floor) IRRS Team
17:00	Written preliminary findings (conclusions) delivered to the Team Leader copied to IAEA Coordinator	IRRS Team
17:00 – 18:00	Daily IRRS Review Team Meeting: conclusions discussions	Venue: BAPETEN Meeting room (8th floor) Participants: IRRS team + LO.
Friday, 29 November 2019		
09:00 – 11:30	Interviews as required Report preparation	continued
11:30 – 13:30	Lunch	
13.30 – 15.30	Policy issue discussion	Topics:

		- Regulatory Framework for Construction of Nuclear Installation Including its Regulation – *Building B 4th floor* - The Implementation of Optimization of Radiation Protection – *Building B 3rd floor*
15:30 – 16:00	Discussion of the interviews with team and revising conclusions (if necessary)	Venue: BAPETEN Meeting room (8th floor) Participants: IRRS team
16:00 – 17:00	Individual discussion of findings with counterparts	Counterparts and Offices according the interviews schedule
17:00 – 18:00	Daily IRRS Review Team Meeting: conclusions discussions, cross reading assignment	Venue: BAPETEN Meeting room (8th floor) Participants: IRRS team + LO.
20:00 – 24:00	Report revision	IRRS Team
Saturday, 30 November 2019		
Daily Discussions		
09:00 – 17:00	Team members cross reads and discusses report draft Collective reading and revising the draft report	Venue: Harris Hotel IRRS Team
Sunday, 1 December 2019		
Cultural event and Report writing		
Monday, 2 December 2019		
Daily Discussions		
09:00 – 12:30	Finalize and Review report text	Venue: BAPETEN Meeting room (8th floor) IRRS team + LO.
12:30 – 13:30	Lunch	
12:30 – 17:00	BAPETEN review the draft Executive summary and exit presentation finalization Press release draft preparation	Venue: BAPETEN Meeting room (8th floor) IRRS team + LO
Tuesday, 3 December 2019		
09:00 – 12:30	Review of amendments based on BAPETEN's comments	Venue: BAPETEN Meeting room (8th floor) IRRS team + LO
12:30 – 13:30	Lunch	
13:30 – 15:30	Discussion with BAPETEN (if necessary)	Venue: BAPETEN Meeting room (8th floor) IRRS team + LO
15:30 – 17:00	Report finalization by the team and handover the report to BAPETEN Press release finalization	Venue: BAPETEN Meeting room (8th floor) IRRS team + LO
Wednesday, 4 December 2019		
09:00 – 12:00	IRRS Exit meeting, Closing remarks by IAEA Official by BAPETEN Chairman	Venue: BAPETEN Auditorium 8th floor

APPENDIX IV RECOMMENDATIONS AND SUGGESTIONS FROM THE 2015 IRRS MISSION THAT REMAIN OPEN

Section	Module	R/S	Recommendations/Suggestions
1.2	RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT	R3	The Government and BAPETEN should ensure that the legal and regulatory framework is kept up to date and corresponds to the current IAEA standards.
1.3	RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT	R4	The Government should provide BAPETEN with human and financial resources to ensure adequate discharge of its statutory regulatory obligations.
1.7	RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT	R7	The Government should establish and promulgate a national policy and strategy for radioactive waste management and decommissioning.
1.7	RESPONSIBILITIES AND FUNCTIONS OF THE GOVERNMENT	R8	The Government should establish provisions, in the legal framework, governing long-term radioactive waste management, spent fuel management and decommissioning, including funding of such activities.
3.1	RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	R9	The Government should authorize BAPETEN to develop and implement the organizational structure that would be best suited to allow it to carry out its obligatory functions effectively.
4.5	MANAGEMENT SYSTEM OF THE REGULATORY BODY	S9	BAPETEN should consider enhancing the implementation of self-assessments and to include safety culture aspects.
4.5	MANAGEMENT SYSTEM OF THE REGULATORY BODY	R13	BAPETEN should implement the management system review stated in the BMS manual.
7.1	INSPECTION	S15	BAPETEN should consider developing and implementing systematic collection of licensee's safety culture aspects during inspections.
9.4	REGULATION AND GUIDES	S20	BAPETEN should consider establishing regulations for all types of disposal facilities for radioactive waste and develop the procedures for meeting the requirements.
12.2.1	TAILORED MODULE FOR COUNTRIES EMBARKING ON NUCLEAR POWER (SSG–16)	S25	The government should consider assigning the role of coordinating all activities regarding the establishment of a nuclear safety infrastructure to an existing organization or establish a new organization to carry out this task.
12.2.6	TAILORED MODULE FOR COUNTRIES EMBARKING ON NUCLEAR POWER (SSG–16)	S30	BAPETEN should consider including in its regulations requirements for sustainable financing for the safety of nuclear power plants at all stages of the nuclear power programme
12.2.9	TAILORED MODULE FOR COUNTRIES EMBARKING ON NUCLEAR POWER (SSG–16)	S33	The Government should consider a strategy to enable all organizations involved in ensuring safety of a potential future nuclear power programme, including BAPETEN, to attract, train and retain an adequate number of highly qualified personnel.

APPENDIX V RECOMMENDATIONS (RF), SUGGESTIONS (SF) AND GOOD PRACTICES (GPF) FROM THE 2019 IRRS FOLLOW-UP MISSION

Section	Module	RF/SF/GPF	Recommendations, Suggestions or Good Practices
5.4	AUTHORIZATION	RF1	BAPETEN should establish the safety requirements for radioactive waste management facilities and activities, consolidate the waste classification scheme, set out requirements for the development and review of the safety case and supporting safety assessment as well as guidance for meeting the requirements for the various stages of the licensing process.
11.1	CONTROL OF MEDICAL EXPOSURES	RF2	MoH and BAPETEN should establish safety requirements for control of medical exposures, including responsibilities, justification, optimization and accidental exposures.
11.2	OCCUPTIONAL RADIATION PROTECTION	RF3	BAPETEN should align the revision of GR No. 33 with GSR Part 3, in particular requirements related to dose limits, responsibilities of employers, registrants and licensees for the protection of workers, and compliance by workers.
3.1	RESPONSIBILITIES AND FUNCTIONS OF THE REGULATORY BODY	GPF1	BAPETEN implements an award system for outstanding performance of licensees for their compliance with the safety requirements. The annual publication of the list of winners on the website will have a positive impact on the promotion of safety culture.

APPENDIX VI REFERENCE MATERIAL USED FOR THE REVIEW

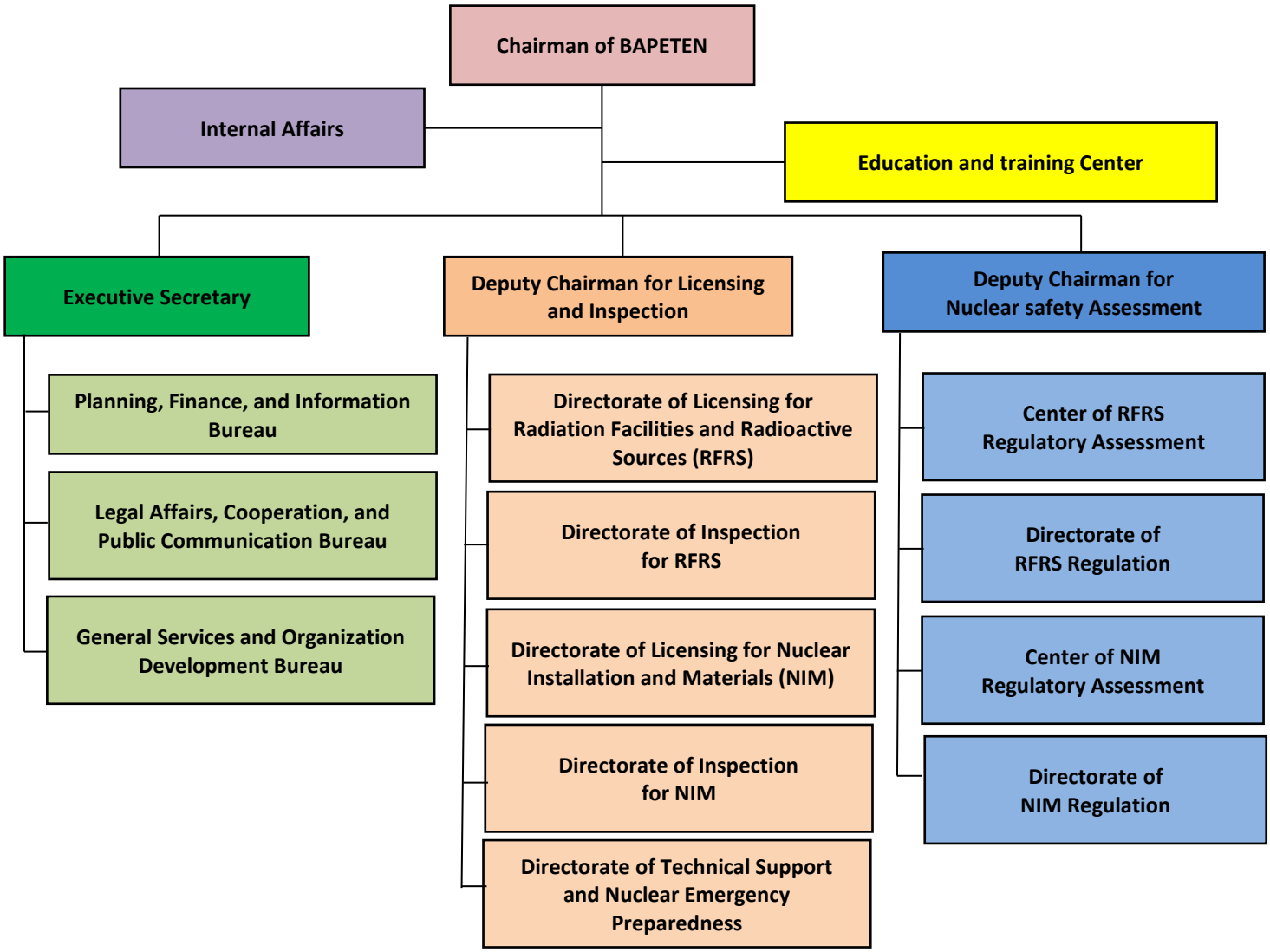
LIST OF ACTS, GOVERNMENT REGULATIONS AND PRESIDENTIAL REGULATIONS	
ARM	ARM Rev 9 date 12 Sept 2019
Act	Act No. 5 of 2014 on "State Civil Apparatus"
	Act No. 30 of 2014 on "Government Administration"
	Draft amendments to Act No. 10 of 1997 on "Nuclear Energy"
Government Regulation	GR No. 29 of 2008 on "Licensing of the Use of Ionizing Radiation Sources and Nuclear Materials"
	GR No. 33 of 2007 on "Safety of Ionizing Radiation and Security of Radioactive Sources"
	GR No. 61 of 2013 on "Radioactive Waste Management"
	GR No. 2 of 2014 on "Licensing of Nuclear Installations and Utilization of Nuclear Materials"
	GR No. 58 of 2015 on "Radiation Safety and Security in the Transportation of Radioactive Materials"
	GR No. 54 of 2012 on "Safety and Security of Nuclear Installation"
	Draft Revision of GR No 33 of 2007 on "Safety of Ionizing Radiation and Security of Radioactive Sources"
	Draft of Revision of GR No 29 of 2008 on "Licensing of the Use of Ionizing Radiation Sources and Nuclear Materials"
Presidential Regulation	PR No. 60 of 2019 on "National Policy and Strategy on Safety"

LISTS OF BAPATEN CHAIRMAN AND MINISTER OF HEALTH REGULATIONS	
BCD No 1 rev 1 of 2001	BAPETEN Org and Work Procedure
BCD No 01 REV2 of 2004	BAPETEN Org and Work Procedure
BCR No 1 of 2006	Dosimetry Lab and Radionuclide Standardization
BCR No 1 of 2010	Nuclear Emergency Preparedness and Response
BCR No 8 of 2011	Radiation Safety of Radiology Diagnostic and Interventional

BCR No 9 of 2011	Compliance Test of X Ray Diagnostic and Interventional Radiology
BCR No 9 of 2012	Service Standard on Management of Public Information in BAPETEN
BCR No 17 of 2012	Radiation Safety in Nuclear Medicine
BCR No 3 of 2013	Radiation Safety for Radiotherapy
BCR No 4 of 2013	Radiation and Safety Protection in the Utilization of Nuclear Energy
BCR No 14 of 2014	Management System of BAPETEN
BCR No 16 of 2014	Working License for Personnel in Inst Utilize Ionizing Source
BCR No.8 of 2016	Low & Intermediate Level Radioactive Waste Management
BCR No.4 of 2016	Management System for Work & Envy Safety & Health in BAPETEN
BCR No.1 of 2017	Inspection in the utilization of Nuclear Energy
BCR No.2 of 2018	Compliance Test of X-Ray Diagnostic and Interventional Radiology
BCR	Manual of BAPETEN Management System 2015 to 2019
MoH Regulation No 363 of 1998	Testing and Calibration of Med Equipment at Health Service Facilities
MoH Regulation No 83 of 2015	Standard of Public Service of Medical Physicists
Regulation of LKKP No 10 of 2018	Guidelines of International Tender
Draft BCR	Design of Power Reactor Revision BCR No 3 of 2011
Draft BCR	the Radiation Protection Aspects in the Design of Power Reactor
Draft BCR	BAPETEN Management System Manual Revision of BCR No 14 of 2014
Draft BCR	Revision of BCR No 1 of 2010 on Nuclear Emergency and Preparedness

PROCEDURE, WORK INSTRUCTION, REPORT AND OTHER DOCUMENTS
Draft Procedure of Management Review
Licensing Procedure for Non Reactor Nuclear Installation
Licensing Procedure for Nuclear Reactor
List of Work Instruction for Inspection in Site Stage
PM 08 Self-Assessment Procedure
Procedure for Licensing for Utilization of Nuclear Materials
Procedure for Certification and Validation of Packages and Rad Materials
PU 05 Procedure of Law Enforcement
Work Instruction for Inspection during site Evaluation on Volcanoes Hazards Aspects
BAPETEN NUCLEAR SAFETY REPORT 2014
BAPETEN NUCLEAR SAFETY REPORT 2015
BAPETEN OJT PRORAMME NPP Siting Construction ToR 2010
BAPETEN Process Business
NATIONAL REPORT ON COMPLIANCE TO CONV ON NUCLEAR SAFETY 2014
PREPARATION FOR REGULATORY CONTROL OF NPP IN INDONESIA 15 FEB 2015
REPORT OF ASSESSMENT RESULT_SAFETY AND SECURITY OF FLOATING NPP
REPORT OF ASSESSMENT RESULT_SAFETY AND SECURITY OF MSR
REPORT OF ASSESSMENT RESULT_SAFETY ASSESSMENT OF HTGR
TRAINING NEED ANALYSIS - DIRECTORATE OF LICENSING FOR NUCLEAR INSTALLATION AND MATERIAL

APPENDIX VII ORGANIZATION CHART



APPENDIX VIII IAEA REFERENCE MATERIAL USED FOR THE REVIEW

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1, IAEA, Vienna (2006)

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Governmental, Legal and Regulatory Framework for Safety, IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), IAEA, Vienna (2016).

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).

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[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Research Reactor, IAEA Safety Standards Series No. SSR-3, IAEA, Vienna (2016).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Disposal of Radioactive Waste, IAEA Safety Standards Series No. SSR-5, IAEA, Vienna (2011).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Communication and Consultation with Interested Parties by the Regulatory Body, IAEA Safety Standards Series No. GSG-6, IAEA, Vienna (2017)

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[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Functions and Processes of the Regulatory Body for Safety, IAEA Safety Standards Series No. GSG-13, IAEA, Vienna (2018).

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Radiation Protection and Safety in Medical Uses of Ionizing Radiation, IAEA Safety Standards Series No. SSG-46, IAEA, Vienna (2018)
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