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INTEGRATED REVIEW SERVICE FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT, DECOMMISSIONING AND REMEDIATION (ARTEMIS)

MISSION

TO

MALTA

St Julian's, Malta

16-21 October 2022

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY
DEPARTMENT OF NUCLEAR ENERGY

IAEA

Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation

ARTEMIS

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IAEA ARTEMIS

REPORT OF THE

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INTEGRATED REVIEW SERVICE FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT, DECOMMISSIONING AND REMEDIATION (ARTEMIS) MISSION

TO

MALTA

Mission dates: *16-21 October 2022*
Location: *St Julian's, Malta*
Organized by: *IAEA*

ARTEMIS REVIEW TEAM	
Mr Michael Tzortzis	ARTEMIS Team Leader (Cyprus)
Mr Rustem Paci	Reviewer (Albania)
Mr David Bennett	IAEA Team Coordinator
Mr John Zarling	IAEA Deputy Team Coordinator
Ms Irene Bollozos-Semaña	IAEA Admin. Assistant

IAEA-2022

The number of recommendations, suggestions and good practices is in no way a measure of the status of the national infrastructure for nuclear and radiation safety. Comparisons of such numbers between ARTEMIS reports from different countries should not be attempted.

CONTENTS

EXECUTIVE SUMMARY

At the request of the Commission for the Protection from Ionising and Non-Ionising Radiation of Malta, on behalf of the Government of Malta, the International Atomic Energy Agency (IAEA) organized an Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) peer review mission.

The objective of the ARTEMIS Peer Review Service is to provide independent expert opinion and advice on radioactive waste and spent nuclear fuel management, decommissioning and remediation, based upon the IAEA safety standards and technical guidance, as well as good international practice. Malta requested this ARTEMIS review to fulfil its obligations under Article 14.3 of the Council Directive 2011/70/Euratom of 19 July 2011, establishing a *Community Framework for the Responsible and Safe Management of Spent Fuel and Radioactive Waste.*

The review was performed by a team of two senior international experts in the field of management of radioactive waste and disused sealed radioactive sources (DSRS), from IAEA Member States, with IAEA staff providing coordination and administrative support. A preparatory meeting was convened in March 2022, and Advanced Reference Material was received and reviewed in August 2022. Subsequently, the review team evaluated the Maltese national framework, competent regulatory authority, and national programme for safe management of radioactive waste and DSRS.

Malta has only a small amount of radioactive waste and DSRS. Malta's national programme includes the following:

- Storage and decay of short-lived radioactive materials, followed by clearance.
- Return of DSRS to a supplier, in line with the return agreements.
- Storage of other DSRS (including 'legacy' sources) and waste at a Centralized Storage Facility until a long term management strategy is established.

The Commission is committed by the end of 2023 to identify and evaluate long term management options for consideration by the government.

The review team noted the remarkable work done by the Maltese authorities in ensuring safety of waste in Malta given the human resources available. The review team considered that Malta is managing radioactive waste and DSRS in a safe and responsible manner. The review team identified recommendations and suggestions to maintain and further improve the safe management of radioactive waste and DSRS in Malta:

- The government should demonstrate its intent and commitment to the effective management and control of radioactive waste and DSRS by approving the policy at the government's level.
- The government should continue to explore and evaluate options for safe, secure and sustainable long term management solutions for radioactive waste.
- The government should provide for a clear allocation of responsibility for safety throughout the entire waste management process, in particular with respect to the Centralized Storage Facility and the transfer of responsibility between operating organizations.

— The government should ensure that appropriate financial provision for the management of radioactive waste and DSRS, including disposal, is made available on a timely basis.

— The government should ensure that sufficient human and financial resources, are available for the regulatory body to acquire and maintain appropriate competence to be able to perform its regulatory functions, ensuring the unimpeded implementation of the Radioactive Waste Management Programme.

The review team also identified further recommendations and suggestions addressed to the regulatory body, including a) to systematically review, update or revise, as appropriate, the Radioactive Waste Management Programme, including incorporating and monitoring on a systematic basis the SMART key performance indicators; b) to define clear timeframes and progress indicators for all policy areas in the Radioactive Waste Management Programme; c) to provide effective means to prevent and mitigate the consequences of potential delays, omissions, failures and deviations; d) to include in the national inventory current and anticipated radioactive waste streams; e) to enhance provisions on the agreement required by users to have with the supplier for the return of DSRS; f) to ensure that financial provisions are in place to cover the costs of management once the radioactive source becomes disused and for unforeseen circumstances that may require the management of the source, such as abandonment of the source or bankruptcy of the user; and g) to prepare updated cost estimates for the potential long term management solutions, taking into account the associated risks and uncertainties.

The review team commended the Maltese authorities for the professionalism displayed by its staff, and the commitment to safety in all its efforts.

The action plan carried out as part of the Maltese ARTEMIS self-assessment was discussed in the context of the ARTEMIS mission. The review has validated the need to implement the actions identified in the action plan. It was agreed that a number of refinements to the action plan are needed. Malta is encouraged to update its action plan in order to take into account and implement the findings of the review.

Malta intends to make the ARTEMIS review report publicly available once finalized.

I. INTRODUCTION

On 21 June 2019, the Commission for the Protection from Ionising and Non-Ionising Radiation of Malta, requested the International Atomic Energy Agency (IAEA) to organize and carry out, in mid to late 2022, an Integrated Review Service for Radioactive Waste and Spent Fuel, Decommissioning and Remediation (ARTEMIS) review. Malta requested the ARTEMIS review to satisfy its obligations under Article 14(3) of the European Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (hereinafter the EU Waste Directive).

The review was performed by a team of senior international reviewers from IAEA Member States expert in the fields of radioactive waste management and the management of disused sealed radioactive sources, with IAEA staff providing coordination and administrative support.

A preparatory meeting between the review team leader, the Maltese counterparts, and IAEA staff was convened in March 2022 to agree the Terms of Reference (ToR) for the review. In accordance with the ToR, Malta provided documents comprising the Advanced Reference Material in August 2022 for review by the review team.

In accordance with the ToR, the ARTEMIS Review Mission to Malta took place in October 2022, during which the review team completed its evaluation of the Maltese framework for the safe management of radioactive waste, and the competent regulatory authority, national programme and its implementation.

II. OBJECTIVE AND SCOPE

The objective of the ARTEMIS review was to provide an independent, international evaluation of the Maltese national framework for safe management of radioactive waste, and the competent regulatory authority, national programme and its implementation.

The review was made against the relevant IAEA Safety Standards, taking account of proven international practice and experiences and the combined expertise of the international peer review team selected by the IAEA.

The ARTEMIS review addressed the Maltese national framework, competent regulatory authority, national programme and its implementation for safe management of radioactive waste. The review included discussion of the challenges faced for the disposal of small volumes and activities of radioactive waste, and the repatriation of radioactive material detected in transhipment through Malta.

In accordance with the ToR, the review did not consider, the transport of radioactive material, safeguards, nuclear security, naturally occurring radioactive material, remediation or decommissioning.

III. BASIS FOR THE REVIEW

A) PREPARATORY WORK AND IAEA REVIEW TEAM

At the request of the Government of Malta, the preparatory meeting for the ARTEMIS Review mission, was conducted on-line on the 23rd March 2022. The preparatory meeting was carried out by the Review Team Leader, Mr Michael Tzortzis, the IAEA Team Coordinator, Mr David Bennett, and the deputy IAEA Team Coordinator, Mr John Zarling, and the team of National Counterparts led by Mr Paul Brejza from the Commission for the Protection from Ionising and Non-Ionising Radiation of Malta.

During the preparatory meeting the following were discussed:

— the Terms of Reference for the ARTEMIS review; and

— relevant detailed aspects for organization and conduct of the review.

IAEA staff presented the ARTEMIS principles, process and methodology. This was followed by a discussion on the work plan for the implementation of the ARTEMIS review in Malta.

Mr Paul Brejza, the National Counterpart for the ARTEMIS mission was designated as the point of contact in Malta for the review.

In accordance with the ToR, on 15th August 2022, Malta provided the IAEA with various documents comprising the Advance Reference Material (ARM) for the review. On the basis of initial review of the ARM, on 30 September 2022, the review team provided Malta with a list of preliminary questions intended for further discussion during the review mission.

B) REFERENCES FOR THE REVIEW

The primary references for the review included the IAEA Safety Standards, the draft guidelines for the ARTEMIS review service, the ARM (including the Maltese responses to the ARTEMIS self-assessment questionnaire).The materials presented during the review mission and the associated discussions, as well as the Articles of the EU Waste Directive were also considered. The complete list of IAEA publications used as the basis for the review is provided in Appendix E.

C) CONDUCT OF THE REVIEW

An initial review team meeting on Sunday, 16th October 2022, directed by the ARTEMIS Review Team Leader, Mr Michael Tzortzis, supported by the IAEA Team Coordinator, Mr David Bennett, and the IAEA Deputy Team Coordinator, Mr John Zarling. Mr Paul Brejza was present at the initial review team meeting, in accordance with the ARTEMIS guidelines, and presented logistical arrangements planned for the mission.

The Review Mission commenced formally with an ARTEMIS Entrance Meeting on Monday, 17th October 2022. This included participation of senior management and staff from the Commission for the Protection from Ionising and Non-Ionising Radiation of Malta, and the Minister for Inclusion, Voluntary Organisations and Consumer Rights. Opening remarks were made by Dr Lourdes Farrugia and by Mr Michael Tzortzis, ARTEMIS Review Team Leader. Mr Paul Brejza, gave an overview of the Maltese context. The Entrance Meeting concluded with comments on behalf of the Government from the Hon Julia Farrugia Portelli Minister for Inclusion, Voluntary Organisations and Consumer Rights.

During the ARTEMIS Review Mission, all topics within the agreed scope were considered with the objective of providing Maltese authorities with recommendations and suggestions for improvement and, where appropriate, identifying good practices.

The review team performed its review according to the programme given in Appendix B.

The ARTEMIS Exit Meeting was held on Friday, 21 October 2022. A presentation summarising the findings of the review was given by the ARTEMIS Review Team Leader, Mr Michael Tzortzis. Closing remarks were made by Mr Peter Johnston, Director of the Division of Radiation, Transport and Waste Safety, Department of Nuclear Safety and Security and Ms Nancy Caruana Permanent Secretary of the Ministry for Inclusion, Voluntary Organisations and Consumer Rights.

An IAEA press release was issued.

1. NATIONAL POLICY AND FRAMEWORK FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT

1.1 NATIONAL POLICY AND LEGAL, REGULATORY AND ORGANIZATIONAL FRAMEWORK

Maltese position

The National Framework for Radioactive Waste Management aims to protect the environment and the population from the effects of ionizing radiation emanating from radioactive waste. The National Framework consists of the Nuclear Safety and Radiation Protection Act, the Regulations on the Management of Radioactive Waste (the Waste Regulations), the Radioactive Waste Management Programme (RWMP) and the regulatory body, i.e. the Commission for the Protection from Ionising and Non-Ionising Radiation (the Commission). The Commission has a Secretariat with four full-time technical staff. The Secretariat is the executive branch of the Commission.

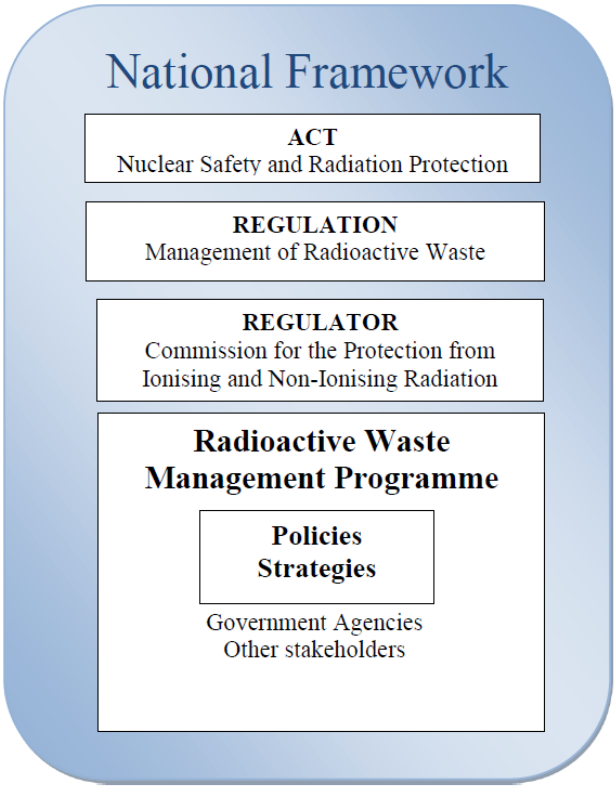

Figure 1: The Maltese Framework for the management of radioactive waste (Source: Malta ARTEMIS self-assessment).

The Waste Regulations require that Malta has an appropriate RWMP in place for the management of radioactive waste. There is no spent fuel in Malta. Malta does not have a separate radioactive waste management organization. The RWMP includes the policy and the strategy on the safe management of radioactive waste in Malta and aims to provide for the safety and sustainability of radioactive waste management over generations. Malta is committed to managing radioactive waste in line with all relevant international legal instruments, including

the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Joint Convention).

The National Framework for Radioactive Waste Management contains the following general principles:

i the prime responsibility for radioactive waste resides with the waste producer,
ii minimization of the generation of radioactive waste,
iii ensuring adequate and suitable conditioning of waste,
iv development of adequate financing schemes to allow for management of radioactive waste,
v setting up of a Centralized Storage Facility (CSF),
vi prohibition of the importation of radioactive waste into Malta,
vii take-back arrangements shall be in place with the original suppliers for sealed sources,
viii Malta will manage any radioactive waste that cannot be sent overseas and will seek disposal options for such waste in Malta,
ix gain control over sources that are out of regulatory control,
x safe recovery of orphan sources,
xi export of sources for reuse/recycling,
xii all stakeholders shall be adequately trained,
xiii participation in international research activities,
xiv to reduce the likelihood of accidents due to, or resulting from, loss of radioactive wastes,
xv storage of short lived medical unsealed radioactive sources by the waste producer,
xvi to have an appropriate emergency response system in place,
xvii that radioactive waste shall be centrally managed in the long term,
xviii to enhance public confidence in relation to radioactive waste management through public consultation,
xix to define how and when the identified goals and requirements will be achieved for the management of radioactive waste,
xx to identify the competencies needed for achieving the goals and how they will be provided,
xxi to elaborate on the ways in which the various types of radioactive waste in the country, including, where appropriate, spent fuel, will be managed during all phases of the radioactive waste life cycle,
xxii the implementation of waste management options proportionate to the waste using a graded approach,
xxiii evidence-based and documented decision-making process shall be applied with regard to all stages of the management of radioactive waste,
xxiv the interdependencies between all steps in radioactive waste generation and management shall be taken into account, and
xxv the use of passive safety features for the long term management of radioactive waste.

The RWMP takes into account the current national legal and regulatory framework. The policy requires sufficient funds to be available for the management of radioactive waste. The policy allows the use of waste management solutions and facilities/technologies available in other countries. Moreover, the policy provides that the public is to be given the necessary opportunities to participate effectively in the decision-making process regarding radioactive waste management.

ARTEMIS observation

The policy establishes national priorities and includes provisions on financial resources. The review team noted that the policy is also compatible with relevant international instruments and is consistent and coherent with other, non radiation safety-related policies, in particular, those dealing with other hazardous materials. Malta has made a political commitment to the Code of Conduct on Safety and Security of Radioactive Sources and has notified the IAEA of its intention to act in accordance with the Guidance on the Import and Export of Radioactive Sources. However, Malta has not supported yet the Guidance on the Management of Disused Radioactive Sources.

The national policy addresses the needs to minimize the generation of radioactive waste and the number of sources that need to be managed as radioactive waste, and to ensure that the volume of waste is minimized so far as is safely achievable. The review team observed that Malta applies a clear policy on the return of disused sealed radioactive sources (DSRS) to a supplier and on the prohibition of the import of radioactive waste. The review team also observed that the policy is commensurate with the amount, type and the characteristics of the radioactive waste in the country and reflects the magnitude and scale of the hazard posed by the waste.

Part XI of the Act states that the Commission in conjunction with the Secretariat shall maintain a national policy and strategy for radioactive waste management. However, the Maltese policy is only approved, together with the strategy, at the regulatory body's level, in accordance with the Waste Regulations. Hence, there is no clear demonstration of the Government's intent and commitment to ensure the effective management and control of radioactive waste in Malta through the policy.

The Government has the ultimate responsibility for the management of radioactive waste in the country. The review team noted that the Commission has clear and documented authority and clear allocation of responsibility to regulate and control issues concerning radioactive management. The policy provides that the operator of the CSF shall set up and manage the CSF, obtain a licence for operation of the facility, take over the responsibility of safety for all disused/spent radioactive sources within the CSF, ensure the safety and security of disused/spent radioactive sources during long term storage at its facilities, keep records of all radioactive sources within its facilities and keep the Commission informed about the inventory of disused/spent radioactive sources. However, the review team was informed that most of the equipment of the CSF, including a purposly modified shipping container, shielding was provided to and is owned by the Government. The current licensee is only responsible for the operation of the CSF, as long as its contract with the Government is in force.

The review team noted that the guiding principles in the policy require prohibition of the importation of radioactive waste in Malta, and the Commission will not authorize the import of new sources unless a declaration is provided by the user for the export of the radioactive source. Also, Malta will not accept the import of radioactive waste in the country.

Moreover, the national policy provides for the identification of the main sources of radioactive waste. The review team noted that the policy does not identify the end points of waste management, i.e. clearance, discharge, or disposal. Also, the policy does not require radioactive waste characterization.

With regard to orphan sources and radioactive material in shipment through Malta, the review team observed that the policy is to develop a source recovery plan and gain control over any sources discovered out of regulatory control, to detect radioactive material in trans-shipment through Malta, and to return any material discovered in trans-shipment to its country of origin.

Concerning emergencies, the review team noted that the policy provides that the employers shall have their own appropriate plans to deal with safety and security of any material in use or in storage, and the Commission and the Civil Protection Department have joint responsibility to respond to emergencies as required.

Discharges to the environment are to be kept as low as reasonably achievable. The policy seeks to keep the public fully informed and involved in the long term management of radioactive waste. The public is to be given the necessary opportunities to participate effectively in the decision-making process regarding radioactive waste management.

The review team noted that the policy provides that the staff of operating organizations and the Commission should have adequate competence for the work to be performed and training should be provided to ensure that the organizations achieve and maintain competence.

The review team also noted that the regulatory activities have fallen over the last years under the responsibility of at least three different Ministries. The Commission explained that this does not create any implications in the effective exercise of the regulatory functions and allocation of appropriate resources (human and financial).

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The Radioactive Waste Management Programme, which contains both the policy and strategy is approved at regulatory body level, comprises actions implemented and decisions to be substantially taken at the government's level, but it is not clear how the government demonstrates its intent and commitment to ensure the effective management and control of radioactive waste and disused sealed radioactive sources in Malta.*	
(1)	**BASIS: GSR Part 1 (rev. 1), Requirement 1, para. 2.3 states that** *"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".*
(2)	**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 policy and a strategy for radioactive waste management are established.*
(3)	**BASIS: GSR Part 5, para. 3.5 states that** *"The national policy on radioactive waste management has to […] reflect national priorities […]."*
(4)	**BASIS: SSG-45, para. 3.6 states that** *"The government is responsible for establishing a national policy and corresponding strategies for the management of radioactive waste.*
R1	**Recommendation: The government should demonstrate its intent and commitment to the effective management and control of radioactive waste and disused sealed radioactive sources by approving the policy at the government's level.**

2. NATIONAL STRATEGY FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT

2.1. SCOPE

Maltese position

The Maltese strategy on the management of radioactive waste is expressed through the RWMP, as provided in Regulation 5 in the Waste Regulations. The Maltese RWMP is one of the vital elements of the National Framework for Radioactive Waste Management, as described in Section 1. The RWMP sets out the country's position with regard to the management of radioactive waste and DSRS.

The RWMP foresees the management of radioactive waste in a sustainable manner and aspires not to impose undue burdens on future generations. Regulation 5 also provides that the strategies shall consider the concepts or plans for the post-closure period of a disposal facility's lifetime and the research, development and demonstration activities that are needed in order to implement solutions for the management of radioactive waste. Section 3 of RWMP outlines 25 principles addressing different aspects of radioactive waste management, which are further analysed in Section 5 of the RWMP.

The roles of the Government in the RWMP are summarized below:

(i) To decide on how the programme shall be financed over time (RWMP, Section 5.1).

(ii) To identify an entity to set up and run the CSF (RWMP, Section 5.4).

(iii) To set any fees to be charged for the use of the CSF (RWMP, Section 5.4).

(iv) To decide on a disposal option (RMWP, Section 6 on key performance indicators).

(v) To meet any shortfall between the expenses and the income (RWMP, Section 7.2).

Regulation 12 in the Waste Regulations allocates the responsibility for the development and maintenance of RWMP to the Commission. Specifically, the Commission is charged with the responsibility of monitoring the progress in the implementation of the RWMP's through key performance indicators (KPIs), which include the significant milestones to achieve a permanent solution (including central storage and disposal) and time-frames for the achievement of those milestones. Moreover, it is the Commission's task to advise the Minister on financial issues relating to the RWMP and on the assignment of responsibilities to various stakeholders. The Commission is also responsible to provide the Minister with estimates of the costing of the RWMP, thus of an assessment of the national programme costs and the underlying basis and hypotheses for that assessment, including a cost estimation profile over time.

The Waste Regulations stipulate that the Commission is responsible to review and update the RWMP, taking into account technical and scientific progress, as appropriate, as well as recommendations, lessons learned and good practices from peer reviews. At least every 10 years, the Commission is required to arrange for self-assessments of the country's national framework, of the regulatory body, and of the national programme and its implementation, and invite relevant international peer reviews.

Apart from the Commission, the RWMP allocates responsibilities to the operating organizations who use radioactive material, to the licence holders of waste management facilities and to technical service providers.

ARTEMIS observation

The RWMP is part of the Commission's management system (coded "Doc 058 Rev 01") and contains in a single document the national policies and strategies in fifteen areas related to the management of radioactive waste and DSRS, considering all stages in their management, from generation to disposal, namely:

(i) Financing of radioactive waste management
(ii) Waste Minimization
(iii) Waste Conditioning
(iv) Centralized Storage Facility
(v) Future Disposal
(vi) Gaining control over sources that are out of regulatory control
(vii) Emergency Plans
(viii) Orphan Source Recovery
(ix) Return of Radioactive Sealed Sources
(x) Shipment of Radioactive Waste out of Malta
(xi) Shipments of Radioactive Waste and Spent Fuel Regulations
(xii) Imports of Waste
(xiii) Discharges from Nuclear Medicine Departments
(xiv) Education and Training
(xv) Research
(xvi) Public Participation

While the policies form a starting point for the development of radioactive waste management strategies, the strategies express the means for achieving the goals and requirements set out in the policies. The review team was informed that the policy aspects have been designed to be valid in the long term and should only need revision in the event of new international obligations or if there is a significant change in the characteristics of the radioactive waste of Malta.

The Maltese RWMP was first drafted and put into force in 2014, and it was then updated in 2019 to reflect the new Act and the Waste Regulations. It was then re-updated in June 2022 to change definitions, references to the Waste Regulations and make editorial corrections, but no other substantial changes were made. The review team noted that, even though the programme has made significant progress since it was first put into place, for instance a CSF was set up and put into operation in 2019 as a vital interim step to centrally collect various sources from across the country until a disposal solution is decided, not all sections of the RWMP have been updated in a systematic manner, i.e. the last revisions of the programme did not include an update, review or revision, as appropriate, of certain parts of the RMWP. Many timelines set for achieving the respective milestones in 2014 are already in the past. Issues relevant to assessing the achievement of milestones and monitoring and RWMP progress are addressed in Section 2.2.

Although the Government appears in the RWMP to have roles in setting fees to be charged for the use of the CSF and for meeting any shortfall between expenses and income, the review team noted that none of the above is actually happening in practice, as no fees have been set for any of the management activities prescribed in the RWMP. The review team was informed that there is no intention to do so the reason being not to discourage reporting of DSRS. The issue is further dicsussed in Section 6.

The review team observed that there seems to be a good perception within the RWMP as concerns the interdependencies to be taken into account between the various steps in the management of radioactive waste in Malta and how these have been considered in setting out the KPIs, however there are uncertainties in the implementation of RWMP, which are not actually taken into consideration, for instance the uncertainties associated with the cost estimates of what is planned in the RWMP for Malta to do in future. Nevertheless, the review team was informed that the Commission has planned certain activities within 2023 to identify potential solutions and provide to the Government associated cost estimates for these solutions. The issue is also further discussed in Section 6.

The RWMP has been issued following consultation with the relevant stakeholders and has also undergone public consultation. The review team was informed that public participation is generally limited to consultation on regulations and the RWMP, while for other types of documentation, such as guides, criteria and the qualifications of experts, only stakeholders are usually consulted. The texts under consultation are made available to the public through the Commission's website. The review team was also informed that, although there may be no criteria set for what documents should undergo public consultation, any new facilities or activities related to the management of radioactive waste in Malta that require a "planning permit" from the relevant Governmental authorities, will be required to undergo public consultation. In practice, the Commission received no substantial feedback through the established public consultation processes for the current RWMP. Also, as concerns the establishment of the CSF, the Commission considers that it was not appropriate for the CSF to undergo public consultation, as this only concerns temporary siting of a modified shipping container in its current location on land that belongs to the Government and that has been leased to the contractor. Nevertheless, the review team was informed that the Commission considers it appropriate to consult the relevant Governmental authorities (e.g. environmental protection authorities) and the public in case that a local disposal solution in Malta, for instance a borehole disposal facility, is decided on. The Commission further ensures public participation in decision making through the publication of various types of reports in its website.

2.2. MILESTONES, TIMEFRAMES AND PROGRESS INDICATORS

Maltese position

The Commission has the responsibility for monitoring the progress in the implementation of the RWMP. For each policy area and for the strategic actions corresponding to each such policy area, the Commission has developed relevant KPIs in the RWMP, in the form of discernible events that can be used to determine if Malta is meeting its policy targets. Thus, each of the policy issues (as listed in Section 5 of the RWMP) has its own KPI, aiming at capturing the significant milestones to ensure that all current waste streams are properly managed and achieve a permanent radioactive waste management solution in the country (including storage and disposal) and timeframes to evaluate whether those strategic milestones are achieved.

Apart from monitoring the KPIs, the Commission is responsible to produce reports at least every three years coinciding with the relevant Joint Convention review cycles, on the progress achieved in the implementation of the RWMP. The self-assessment performed by the Maltese authorities for the purposes of the current ARTEMIS mission also includes an update on the status of KPIs (as of July 2022), and previously to this update the KPIs were last completed in August 2021 as reflected in the national report prepared for the implementation of the Directive 2011/70/Euratom.

Malta is developing the KPIs to be as Specific, Measurable, Attainable, Realistic Time-based (SMART), meaning that KPIs should reflect specific actions under each policy area, the means of measuring progress for these actions, the factors affecting the attainability, relevance to the policy area (the reason for that task), and the end date for the task. The progress review in meeting the KPIs includes the status of completion for each specific policy action, an assessment whether there is a need for intervention to keep the policy action on track or if modifications are needed, and an assessment whether the policy action is completed, delayed or still ongoing. Since 2021, Malta considers that they apply the SMART principle to the KPIs to a greater extent.

ARTEMIS observation

The review team observed that the RMWP does not actually differentiate between milestones and KPIs and that the KPIs that have been set are in the form of milestones and basic timelines to enable the Commission monitor and evaluate if these are achieved through the implementation of the RWMP. The progress monitoring is actually done through reviewing the progress in KPIs, however the review team was informed that the progress against the various milestones in the RWMP through reviewing the relevant KPIs is not done systematically. This is only done in an hoc basis, for instance, the Commission carries out such KPI reviews to derive and include relevant information in the reports to be submitted to the European Commission under the Directive 2011/70/Euratom or to IAEA for the purposes of the review process of the Joint Convention, which notably both rely on a back-to-back 3-year cycle. The last time that such a review took place was in July 2022 and this was again done on an occasional basis, to cover the need to include such information in the ARTEMIS self-assessment.

Moreover, the review team noted that clear timeframes and KPIs have not been set for all policy areas in the RWMP. For instance, under the policy area “Gaining control over sources that are out of regulatory control”, the KPIs set are a) Emergency plan and Customs Stamdard Operating Procedure to be reviewed, and b) Targeted campaign to be performed, which do not include defined dates of scheduled implementation. Also, the new KPIs do not fully match the respective policy areas and KPIs currently in force.

Although thirty KPIs for monitoring the progress and timely implementation of the RWMP have been set in the initial RWMP, the review team noted that this has not prevented the RWMP from experiencing some delays in its implementation. For instance, under the policy area “Financing of radioactive waste management”, the current KPI is that the Commission should have presented to Government indicative cost options by January 2019. Based on the ARM and the discussions with the Counterpart, the review team noted that the Commission now estimates that this will probably be implemented in 2023, following the completion of expert missions from the IAEA to assist the country assess the various potential disposal options for the current inventory. The review team observed that, despite the use of KPIs, there is no mechanism providing effective means to prevent and mitigate the consequences of potential delays, omissions, failures and deviations in the implementation of RWMP. An explanation given by

the Counterpart for these delays was that, being a matter of prioritizing the various functions of the Commission, the Commission has chosen to put a lot of emphasis in providing education and training for the new staff. In the latest progress assessment made (July 2022), the review team observed that the Commission has used a more analytical monitoring table that includes special provisions for assessing the need for intervention or to perform actions to keep the policy area on track or identify the need to modify that specific policy area.

Moreover, although the review team took note of the remarkable effort that has been made by a small State to set up relevant KPIs applying the SMART principle, the compilation of the new SMART KPIs now in use and described in the ARTEMIS self-assessment have not been incorporated to the RWMP, even if this was updated in June 2022. The review team also noted that the policy areas and the respective KPIs set for each policy area do not match to the policy areas and the respective KPIs set in Section 6 of the initial RWMP, which is the one still in force.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Not all sections of the Radioactive Waste Management Programme (RWMP) have been updated in a systematic manner. The progress monitoring against the various milestones in the RWMP is not done systematically and there is no mechanism in place to ensure a systematic review and updating of the respective Key Performance Indicators (KPIs) and for preventing and mitigating the consequences of potential delays, omissions, failures and deviations in the implementation of RWMP.* *Clear timeframes and KPIs have not been set for all policy areas in the RWMP.* *The new KPI do not fully match the respective policy areas and KPIs currently in force.*	
(1)	**BASIS: GSR Part 2, Requirement 4 states that** *"Senior management shall establish goals, strategies, plans and objectives for the organization that are consistent with the organization's safety policy.* *4.4. Senior management shall ensure that measurable safety goals that are in line with these strategies, plans and objectives are established at various levels in the organization.* *4.5. Senior management shall ensure that goals, strategies and plans are periodically reviewed against the safety objectives, and that actions are taken where necessary to address any deviations.*
(2)	**BASIS: GSG-16, para. 5.16 states that** *"Radioactive waste management strategies should be developed taking full advantage of opportunities and synergies arising from national, regional and international cooperation and experience, where appropriate. Radioactive waste management strategies should include milestones and clear time frames for the achievement of these milestones".*
R2	**Recommendation: The regulatory body should ensure that:** — **The RWMP is systematically reviewed, updated, or revised, as appropriate, including incorporating and monitoring on a systematic basis the SMART KPIs, to enable the regulatory body to effectively evaluate the progress against the milestones in the RWMP.** — **Clear timeframes and KPIs are defined for all policy areas in the RWMP, to provide effective means to prevent and mitigate the consequences of potential delays, omissions, failures and deviations.**

3. INVENTORY OF SPENT FUEL AND RADIOACTIVE WASTE

Maltese position

Malta has no spent fuel and is not undertaking any activities that might lead to the generation of spent fuel. The current uses of radioactive material in Malta are:

— Diagnostic and therapeutic nuclear medicine including Positron Emission Tomography (F-18)

— Industrial gauging

— Industrial non-destructive testing (with Se-75)

— Limited use in research and teaching

— There are also radioactive materials from previous applications, including

- Lightning rods (Am-241)
- Industrial non-destructive testing (with Cs-137)
- School teaching

Malta has a CSF, but does not have a radioactive waste disposal facility. The CSF is located in the south of the island. It is operated by a private company and the initial licence was issued in November 2019. The CSF is not designed for the indefinite storage of radioactive material or waste. The operator of the CSF keeps the inventory of sources stored in its premises. The inventory of DSRS in storage at the CSF is shown in Table 1. The confirmed inventory of sources not currently at the CSF is shown in Table 2.

Cs-137			
Original use	Number of sources	Activity of individual sources	Total Activity
NDT	1	37.8 GBq	37.8 GBq
Humbolt source	1	370 MBq	370 MBq
Liquid level gauge	4	10 MBq	40 MBq
NDT (Army)	1	Not known as not fully dismantled	
NDT (Shipyard)	1	Not known as not fully dismantled	
Total Cs-137 activity excluding two NDT sources not as yet fully dismantled			**38.2GBq**

Am-241			
Original use	Number of sources	Activity of individual sources	Total Activity
Humbolt source	1	1.48 GBq	1.48 GBq
Liquid level gauge	5	1.67 GBq	8.33 GBq
Lightning rod - pellet source	12	35 MBq	0.42 GBq
Lightning rod - foil source	113	23 MBq	2.60 GBq
Smoke Detectors	88	37 kBq	3.26 MBq
Total activity			**12.83 GBq**

Table 1: Inventory of DSRS in storage at the CSF

Original use	Radionuclide	Amount / Number of individual sources	Activity of individual sources	Total Activity	Notes
Laboratory analytical	Uranium and thorium salts	2.23kg uranium salts 0.125kg thorium salts			In storage at one government site. Material declared under safeguards
Calibration	Ra-226	1	Activity unknown		Part of equipment used for dosemeter probe
School sources	Ra-226	3	0.185 MBq	0.56MBq	Data from survey performed in 2016 of schools
	Sr-90	8	0.185 MBq	1.48MBq	
	Co-60	8	0.185 MBq	1.48MBq	
	Am-241	7	0.185 MBq	1.30MBq	
	Pu-239	1	0.185 MBq	0.19MBq	

Table 2: Inventory of DSRS not yet transferred to the CSF

The volume of the conditioned waste is circa 0.1 m^3.

A variety of waste types and storage needs are encountered in practice, for example, in terms of the storage duration, radioactive inventory, radionuclide half-lives and associated radiological hazards.

The policies and strategies for waste management address the types of storage facility that are appropriate for the national waste inventory. Legislation requires the operator of the CSF to submit annual reports to the Commission in relation to the inventory.

The inventory shall take account of the waste form (i.e. solid, liquid or gas), its radionuclide content and half-lives, its activity concentrations, the total radioactive inventory, its non-radiological characteristics and the expected duration of storage. The information should include radionuclide type, activity concentration, half-life and the physical, chemical and pathogenic properties of the waste and the results should be documented in an inventory log.

ARTEMIS observation

There is clear distinction of the responsibility on the operator and the Commission on maintaining the inventory of the radioactive waste and DSRS at the CSF. However, requirements for the type of data to be collected for a source are not clearly set. Also, the review team noted that there are no regulatory provisions for the characterization of sources and waste at the CSF.

The review team noted that the Commission is responsible to define the management routes for radioactive waste and DSRS and the Government will be responsible to approve it.

Malta has some DSRS from past industrial applications, as well as Am-241 lightning rods, Am-241 smoke detectors and Uranium and Thorium salts. The review team noted that these are not declared as waste, but it was informed that, when a disposal solution is decided, such radioactive materials could be designated as a waste. It was not made clear to the review team who takes the decision for declaring radioactive waste as such.

From the discussions it was made clear that the future inventory of the CSF might include further sources, such as gauges (Cs-137), old non-destructive testing (NDT) sources (Cs-137), lightning rods, as well as various disused calibration sources. The establishment of a cyclotron

in Malta that has already been delivered remains uncertain. The review team observed that, in practice, there is not available any information on estimates of anticipated inventory, for instance DSRS as the ones described above or waste that could be generated during decommissioning of facilities or from emergencies, which could be used as a basis of knowledge of the waste to be managed in future for setting the national priorities through the policy.

The operators are required to have a quality management system for data related to waste and DSRS. The waste producers are required to provide the operator of the CSF with basic information on their waste or DSRS when the waste are transferred to the CSF. The review team noted that the operator of the CSF is required to keep information concerning the inventory of sources kept in storage such as, information on the point of origin, location, physical state (solid, liquid, gas), quantity, volume and/or mass, types of waste, activity, physical and chemical properties, and other relevant information.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *There are no regulatory provisions for the characterization of sources and waste at the Centralized Storage Facility (CSF).*	
(1)	**BASIS: GSR Part 5 Requirement 9 states that** *"At various steps in the predisposal management of radioactive waste, the radioactive waste shall be characterized and classified in accordance with requirements established or approved by the regulatory body.* *4.10. Radioactive waste has to be characterized in terms of its physical, mechanical, chemical, radiological and biological properties. …* *4.11. The characterization serves to provide information relevant to process control and assurance that the waste or waste package will meet the acceptance criteria for processing, storage, transport and disposal of the waste. The relevant characteristics of the waste have to be recorded to facilitate its further management."*
(2)	**BASIS: WS-G-6.1 5.5. "***The stored radioactive waste should be characterized (e.g. by radionuclide type, inventory, activity concentration, half-life and the physical, chemical and pathogenic properties of the waste) and the results should be documented in an inventory log. If pathogenic radioactive waste is to be stored, it should be deactivated before its placement in storage."*
R3	**Recommendation: The regulatory body should ensure that regulatory provisions are in place for characterization of sources and waste at the CSF in order to:** **— facilitate planned predisposal waste management activities.** **— verify compliance with acceptance criteria.** **— ensure that the inventory of the CSF fully reflects waste volumes and properties.**

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The regulatory body does not have a documented approach for compiling the inventory of anticipated radioactive waste and disused sealed radioactive sources, for instance waste that could be generated during decommissioning of facilities or waste from emergencies.*	
(1)	**BASIS: GSR Part 5 para 3.5 states:** *"The national policy on radioactive waste management has to set out the preferred options for radioactive waste management. It has to reflect national priorities and available resources and has to be based on knowledge of the waste to be managed (e.g. knowledge of the inventory and of waste streams) now and in the future."*
(2)	**BASIS: SSG-45 para 3.18 states** *"In order to facilitate the establishment of a national policy and strategy, the government should establish a national inventory of radioactive waste (both current waste and anticipated waste, including waste generated during the decommissioning and dismantling of facilities) and should update it at regular intervals."*
S1	**Suggestion: The regulatory body should consider including in the national inventory current and anticipated radioactive waste streams.**

4. CONCEPTS, PLANS AND TECHNICAL SOLUTIONS FOR SPENT FUEL AND RADIOACTIVE WASTE MANAGEMENT

Maltese position

Section 3 of the RWMP sets out general principles for making decisions on the concepts, plans and technical solutions being implemented or are eligible to be implemented for the safe radioactive waste management in Malta. Several policies and strategies in Section 5 of the RWMP set the base for the relevant concepts, plans and solutions.

Malta seeks to limit the amount of radioactive waste by using take-back arrangements with overseas suppliers when sealed radioactive sources (SRS) become disused. The Commission authorizes the import of new SRS only after the user provides a declaration to export the SRS. In case of any undeclared radioactive material detected at the Malta Freeport, minimization takes the form of arranging for the shipment of the radioactive material back to its origin. Other means of applying the minimization principle are through the import of radioactive material only where the use is justified, the replacement of SRS by non-radioactive alternatives if available, the export of DSRS for recycling purposes, and volume reduction of DSRS in storage.

Essential steps in the process of radioactive waste management (excluding medical unsealed radioactive sources) are that a) prior to the planned import of radioactive material, authorization from the Commission is required to allow the import to take place; b) requirement for DSRS to be exported under takeback arrangements when the SRS is no longer in use; c) discharges to the environment from nuclear medicine is under a discharge authorization; d) if an undertaking has a SRS that was acquired before the take-back arrangement requirement, the undertaking should still try to have the DSRS exported, if that is not possible then the DSRS may go to the CSF; e) material out of regulatory control discovered in Malta (excluding in ports of entry) will go to CSF, and f) radioactive material discovered at ports returned to the country of origin.

The national framework requires waste conditioning to be done in accordance with waste acceptance criteria set for the CSF or in a manner that allows for future waste disposal. Some conditioning of DSRS currently takes place in the CSF. Until a disposal solution is made available in Malta, the Commission is tasked to ensure that waste is not embedded in any permanent matrix such as lead or concrete, waste is shielded using the ALARA principle, and full documentation to be created for each waste package and the organization operating the CSF seeks the Commission's approval before performing any conditioning.

Doc 46 outlines the regulatory requirements for the temporary storage of radioactive material. For short term storage, justified reasons considered are a) before a shipment of a DSRS back to a supplier; b) during shipment/transhipment; c) decay in the storage of radioactive material with a half-life of less than 30 days; and d) storage during use of the radioactive material during its operation life. Storage for ultimate disposal or recycling is the only justified reason for long-term storage in a dedicated.

A key milestone in implementing the RWMP was setting up the CSF in 2019, where radioactive material is stored until a long term management option is identified. The CSF is planned to store long-lived sources centrally until a disposal option becomes available in Malta. The CSF is built from a 20 foot modified shipping container containing Type A packages and capsules designed for transport, storage, and lead shielding bricks. Once the CSF became operational and authorized, users started transferring DSRS to the CSF for safe and secure storage. The operator of the CSF is a private company chosen after a public procurement process for the expression of interest in running the CSF. The company also performs industrial radiography and is considered by the Commission to have qualified and experienced personnel for the

operation of the CSF. The operator of the CSF was obliged to dismantle, recover, condition, and temporarily store lightning rods.

The operator of the CSF has performed volume reduction on the material by removing the radioactive material from their devices/housing. Currently, the total conditioned volume of radioactive material in the CSF is approximately 0.1 m^3. Apart from ensuring the safety and security of DSRS during the long-term storage at the CSF, the operator takes ownership of all DSRS within its facility. The contract between the Government and the CSF operator is valid for five years up to 5 April 2024. The contractor is responsible for ensuring inter alia monitoring radioactive doses in all areas, decontamination, security, and response to emergencies or radiation accidents. It is the Government's responsibility to set any fees to be charged for the use of the store.

Recognizing that indefinite storage is not a viable option for radioactive waste management, Malta will seek a disposal solution before 30 years have elapsed since the national programme first came into effect, thus before 2044. Any final solution to be decided will have to consider the current inventory and sources recovered due to detection at the ports, recovery campaigns of DSRS at schools, laboratories and lightning rods. The options to be considered include the export of the material, the borehole disposal option, and any other multi-lateral solution as may become available. Whatever the selected option, Malta believes it will need to take into account the nature of the waste, i.e. the total number of existing DSRS and possible future acquisitions to waste inventory, radionuclide activities, the physical state of the DSRS, including any potential degradation of the DSRS, and site characterization, and any relevant environmental aspects. A complete environmental risk assessment should also be performed.

Malta foresees that through a number of expert missions planned under the IAEA's Technical Cooperation project MAT9009 throughout 2023, will be assisted in a) reviewing the borehole disposal technology in connection with the disposal feasibility study; b) preparing a feasibility study to assess the disposal needs for future radioactive waste needs and technical capabilities and resources within Malta and discussing initial disposal options; c) presenting initial proposals for potential disposal options to the Commission and refining a feasibility study; and d) conducting final consultations and finalising the feasibility study, including summarising options with the Commission and other relevant stakeholders. The disposal/export options are expected to be presented to the Government by the end of 2023. If a disposal facility is to be set up in Malta, the concepts or plans for the post-closure period of a disposal facility's lifetime, including the period during which appropriate controls are retained, and the means to be employed to preserve the knowledge of that facility in the longer term, have to be considered.

As concerns the discharges to the environment, all nuclear medicine departments are equipped with decay in storage tanks for patient excreta to reduce discharges to the environment in line with the ALARA principle. All unsealed nuclear medicine sources should be stored for as long as reasonably achievable, and emissions to the environment should be under discharge authorization. Emissions are subject to radiological assessment following a relevant Commission's standard operating procedure.

As an alternative to disposal, Malta seeks other ways to minimize its existing inventory, such as participating in the IAEA's Global Ra-226 recycling initiative and establishing contacts with appropriate receivers abroad (currently a company in the UK) to export DSRS.

R&D

Malta doce not consider it feasible to be a leading contributor to radioactive waste management research activity owing to its limited inventory. Malta would be willing to share any solutions

it arrives at dealing with radioactive waste management with other Member States and learn from other Member States' solutions in this regard.

Malta will support and participate, if possible, in any international research initiatives in the management of radioactive waste, thus the Commission to a) keep abreast of any EU/IAEA activities in this area and to get support for such activities; and b) seek to get any relevant stakeholders involved in any EU/IAEA training activities.

ARTEMIS observation

The RWMP, first issued in 2014, prescribed three options for the setting up of CSF with costings: a) A general Governmental waste agency takes the responsibility for the management of the store; b) A private organization takes responsibility for the management of and storage at their facility; c) A private organization takes on the responsibility for the management of the store at a Government site. Malta has implemented the third option. The private company operating the CSF has a five-year contract with the Government (Ministry for Inclusion, Voluntary Organisations and Consumer Rights, under which the Commission fall). The current contract expires 5th April 2024. The review team was informed that the Commission requires Government approval to issue another call for bidding for CSF management prior to when the CSF contract ends. If a contract is not awarded, the Government assumes the responsibility of managing the CSF.

The review team was provided with a detailed description of the process followed for a DSRS to be transferred to the CSF. The CSF operator is required to inform the Commission of the arrangements made with the owner of the source to transfer the DSRS to the CSF. The review team was notified that upon receipt of the DSRS at the CSF, the responsibility for safety, security, liability, and ownership of the DSRS is transferred to the facility's operator. In further exploring the issue, it was clarified that the facility's operator is only responsible for managing the material in the CSF. All the equipment, including the modified shipping container, belongs to the Government. Whatever solution is to be decided for further management of the sources kept at the CSF, this will be funded by the Government. The review team observed that the "polluter pays" principle does not seem to apply if anybody can transfer a DSRS to the CSF, and if then the Government takes over their disposal, including providing funding. It was explained to the review team that most of the sources at the CSF are legacy sources and already belong to the Government as they originate from past activities in Governmental buildings. It is not therefore an issue for the CSF to receive a few other sources from past activities.

The strategy of the CSF includes setting fees to be charged for the use of the CSF by the Government. However, no charge for storage or ultimate possible future disposal of legacy sources has been set, and it is not the intention of the Government or the Commission to do so in future. As said, most of the DSRS at the CSF are legacy sources and belong to the Government. Also, the Counterpart explained that setting a fee for transferring a DSRS to the CSF would discourage potential owners, for instance, users of lightning rods or smoke detectors with radioactive sources, to transfer the DSRS to the CSF for safe and secure storage. The review team also observed that a provision in Article 38 of the Act that states that "The licensee who is in possession of the radioactive waste shall be responsible for financing the disposal of the waste" remains in practice inactive.

The strategy on the CSF also provides that, once the CSF becomes operational, users are to transfer their DSRS to the facility. The review team was informed that the only known radioactive material that has not yet been transferred to the CSF comprises uranium and thorium salts and a limited number of sources currently on the roofs of churches. The review team also

observed that, although it is not justified for a user to keep a DSRS for indefinite storage on their premises, no time limit has been set in the Waste Regulations or the license conditions.

Moreover, the strategy of CSF provides that the facility has a planned operating life of at least 50 years. Malta assesses that whatever the future disposal solution to be decided will eventually be, there will be no need by that time to maintain any storage facility, such as the current CSF, since there will be no waste or DSRS to be managed.

Malta's self-assessment states that an IAEA expert mission in 2018 assisted in the preparation of the safety assessment for CSF and that the Commission, together with the expert, produced the documentation. The Counterpart clarified that there was no substantial involvement of the Commission in preparing the safety assessment that would have been submitted to the Commission for review and assessment, and authorization, and that the role of the Commission was only to provide guidance and appropriate information to the expert to be assisted in completing its task.

The review team noted that Malta does not have the capabilities domestically to reuse or recycle some of the legacy radioactive material, apart from exploring options for sending those sources abroad for this purpose.

Regarding the strategy on disposal, the review team was informed that the time horizon of 30 years chosen to be included in the RWMP does not necessarily mean that the country should wait until that time to decide and implement an appropriate disposal solution. This timeline should be seen as an achievable, "safe" date in future, estimated in 2014, to allow the Government to complete the required processes for decision making, funding and implementing whatever solution is to be decided. The Commission considers that, by the end of 2023, they will have proposals to the Government with cost estimates for each potential disposal option. Therefore, things are progressing better than expected back in 2014. On the same issue, the review team was informed that the strategy for future disposal provides that an environmental risk assessment must be performed and that the Commission will be responsible for conducting, evaluating and approving / accepting such an environmental assessment. However, depending on the complexity of the proposed solution, they might need assistance with some technical aspects. Other Governmental authorities will also have to issue permits.

Concluding the discussion on potential future disposal solutions, the review team noted that, although there are provisions in the RWMP for possible local disposal, Malta considers the associated financial and physical cost as an important factor that cannot be ignored. Malta will likely try to avoid having a disposal facility in Malta, because of likely disproportionate cost when considering the associated risk, limited land area and high population density.

The strategy on the return of DSRS is that the Commission will not authorize the import of new sources unless the user provides a declaration for the export of the DSRS that the supplier accepts to take back the DSRS after its operational life. The review team noted that no special measures are in place to ensure that a source receives appropriate management attention in case the operator or with whom an export declaration exists becomes insolvent. Malta considers that this will not be a big issue if paradoxically happens and that, in the worst-case scenario, the source for which the export declaration fails for any reason to be enforced will be transferred to the CSF for decay (short half-lives, mostly Selenium-75 sources used in industrial radiography). Upon further investigating the issue, the review team was informed that these take-back declarations only comprise a written commitment of the supplier overseas to take back the source when it becomes disused. However, they do not include any provisions on the financial aspects associated with the take-back agreement, thus, an initial estimation, periodic revision, where needed, and allocation of the costs of return between the user and the supplier is not carried out. Also, the Commission does not require the licensees to have any other means

of financial security, such as insurance, a guarantee of funds or a bank guarantee. Such agreements with the supplier abroad do not specify a period for the supplier to take the DSRS back. It is the exclusive responsibility of the licensee to make appropriate arrangements for the transport and associated packaging of the DSRS in connection with its return.

The review team was informed that, as concerns implementing actions on the policy area of gaining control over sources that are out of regulatory control, the Commission is tasked to decide on targeted areas which may be subject to search within Malta and run campaigns for the collection of sources currently in use, including schools and lightning rods, and develop targeted initiatives, such as at metal recycling facilities in Malta.

Investigating the issue of further management solutions to minimize inventory, the review team was informed that no substantial progress was made with the company identified in the UK to receive part of the existing DSRS in Malta, therefore this solution of reducing the inventory is not considered to be a viable option. The review team, while acknowledging the small inventory in the country, shared with the Counterpart its concern that if an export solution becomes available for the sources currently kept at the CSF, this could compromise the efforts in seeking an appropriate, sustainable, long-term management solution domestically that could accommodate both current and anticipated waste in Malta, such as from the decommissioning of facilities that could be developed in Malta, or waste arising from a radiological emergency in the country, which cannot be 100% excluded.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *In accordance with the Radioactive Waste Management Programme, Malta is working to explore and evaluate options for safe, secure and sustainable long term management solutions for radioactive waste, however, no solution has been identified yet to accommodate the long term radioactive waste management needs of the country.*	
(1)	**BASIS: SF-1, Principle 7, para. 3.29 states that** *"Radioactive waste must be managed in such a way as to avoid imposing an undue burden on future generations; that is, the generations that produce the waste have to seek and apply safe, practicable and environmentally acceptable solutions for its long-term management. The generation of radioactive waste must be kept to the minimum practicable level by means of appropriate design measures and procedures, such as the recycling and reuse of material.*
(2)	**BASIS: GSR Part 1 (rev. 1), para. 2.33 states that** *"Radioactive waste generated in facilities and activities shall be managed in an integrated, systematic manner up to its disposal..."*
R4	**Recommendation: The government should continue to explore and evaluate options for safe, secure and sustainable long term management solutions for radioactive waste.**

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *A declaration is required to be provided by the user of a source that a supplier accepts to take back the source after its operational life. The regulatory body does not require any provisions to be included in the declaration on the financial aspects associated with taking back the source, nor do they specify a time period for the supplier to take the DSRS back.*	
(1)	**BASIS: SSG-45 para 4.78** *"The most sustainable option for managing disused sealed sources is further use by another authorized operator. If that is not possible, the preferred management option for disused sealed radioactive sources is the return of the source to its supplier."*
(2)	**BASIS: Code of Conduct on the Safety and Security of Radioactive Sources: Guidance on the Management of Disused Radioactive Sources, para. 24 states that** "*When return to a supplier is the selected option for a disused source, the State should consider requiring that prior to the acquisition of the radioactive source, the user has an agreement with the supplier for its return once it becomes disused. In this agreement, consideration should be given to at least the following elements:* *a. An undertaking by the supplier to take the disused source within a specified time period;* *b. The arrangements for transport and associated conditioning of the disused source in connection with its return, including the provision of a transport package certified in accordance with transport regulations and the maintenance of the source special form certificate as applicable; and* *c. The initial estimation, periodic revision, if needed, and allocation of the costs of return between the user and the supplier.*
S2	**Suggestion: The regulatory body should consider establishing requirements to ensure that, when return to a supplier is the selected option for a DSRS, the user is required, prior to the acquisition of a radioactive source, to have an agreement with the supplier for its return that includes binding provisions on:** **— A specified time period within the supplier undertakes to take the DSRS;** **— The initial estimation, periodic revision, if needed, and allocation of the costs of return between the user and the supplier.**

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The regulatory body does not require the licensees to have in place any financial assurances, such as an insurance, a guarantee of funds or a bank guarantee to ensure that a source receives appropriate management attention in case that the operator or an undertaking with whom an export declaration exists becomes insolvent.*	
(1)	**BASIS: GSR Part 5 para 3.17 states:** *"The operator is responsible for establishing and implementing the overall strategy for the management of the waste that is generated, and for providing the required financial securities, taking into account interdependences among all steps in waste management, the available options and the national radioactive waste management policy."*
(2)	**BASIS: Code of Conduct on the Safety and Security of Radioactive Sources: Guidance on the Management of Disused Radioactive Sources, para. 17 states that** "*Each State should ensure that the regulatory body: …* *b. Establishes regulatory provisions for acquisition and use of a radioactive source that include: …* *(ii) Adequate financial provisions, where appropriate, to cover the costs of management once the radioactive source becomes disused, including the identification of responsibilities for implementing these provisions; …* *d. Establishes provisions for unforeseen circumstances that may require the management of a radioactive source as a disused source, such as abandonment of a radioactive source or bankruptcy of the user; …*
S3	**Suggestion: The regulatory body should consider establishing requirements to ensure that for the acquisition and use of a radioactive source:** — **Adequate financial provisions are in place to cover the costs of management once the radioactive source becomes disused.** — **Provisions are in place for unforeseen circumstances that may require the management of the source, such as abandonment of the source or bankruptcy of the user.**

5. SAFETY CASE AND SAFETY ASSESSMENT OF RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT ACTIVITIES AND FACILITIES

Maltese position

Radioactive materials, mainly SRS, have been used in Malta for various medical, industrial, research and teaching activities during the past fifty years. Malta, through the IAEA, acquired a modified shipping container and several pieces of equipment in order to set up a CSF, which has been in operation since 2019. The modified shipping container and the equipment used in the container are owned by the Government. The purpose of the CSF is to provide for safe and secure storage of DSRS, mainly radioactive lightning rods (Am-241), but also of various legacy industrial gauges and sources previously used in industry and in medicine. In addition, low level solid radioactive waste collected incidentally, such as fire detectors, can also be stored there.

The CSF is managed and operated by the private company, under a five-year contract. It was chosen after a call for the expression of interest in managing the waste storage facility. In addition to operating the CSF, the operator also performs industrial radiography and has adequate qualified and experienced staff for carrying out radiography applications. The prime responsibility for the safety of waste management rests with the generator of the waste, i.e. the ownership and responsibility for safety are transferred to the operator of the CSF at the time that the sources are transferred and accepted.

The purpose of the safety case for the CSF is to assess safety of the facility. A principal use of the safety case was to support the license application and approval process. The safety case was also prepared with the aim of optimization of the dose received by the workers, identifying measures to upgrade the facility and identifying how to process the DSRS. The safety case includes the safety assessment for the operation of the CSF. Conducting an Environmental Impact Assessment (EIA) is not within scope of this safety case. The safety case will be reviewed every five years. In case of significant operational changes, the safety case needs to be updated and submitted to the Commission for approval.

The strategy for demonstrating the safety of the management of the DSRS at the CSF is based on isolation and containment and includes both passive and active elements. The safety case was developed by an expert identified by the IAEA and takes into consideration the following: the management system, the need to be compliant with Maltese radiation protection legislation and relevant international standards and guidelines, the need for clearly defined responsibilities for waste management, work procedures designed to reduce duration, frequency and severity of exposure to hazards, the use of trained, qualified and competent persons to undertake work that is safety related, the need to keep appropriate, up to date records on waste inventory and dose records, multiple safety functions, designation of radiation areas, monitoring during waste management activities, defence in depth, site security, robust structure of the facility with high integrity locks, a system for intrusion detection, shielding and confinement, storage of DSRS inside proper containment such as the original working shields or other appropriate containers, dismantling of radioactive lightning rods inside a shielded hotbox, the optimization of shielding usage during all waste management activities, selection of appropriate approaches to waste processing, acceptance criteria, minimization of the generated waste - secondary radioactive waste is only expected when a leaking source is found or during accident scenarios when a source is damaged. The generation of secondary waste during such an incident will be minimized by isolating the source in a secondary containment to prevent further contamination.

The CSF has been divided into two controlled areas: the front part is used for the simple operations of receipt of DSRS, whilst the aft part has a working bench and storage containers. The workbench will be used for dismantling radioactive lighting rods and smoke detectors, and for volume reduction and or conditioning of other DSRS. The front area consists of a reception area for packages, the aft area is where any conditioning or other necessary work is carried out, and includes the storage area. The modified shipping container structure is constructed in steel, with a minimum of two mm thickness. During storage, DSRS are placed inside several containers within the modified shipping container.

The modified shipping container is designated as a controlled area, and workers of the operator are designated as occupationally exposed personnel with the necessary dosimetry control. A radiation monitoring programme has been established for routine monitoring and this has the ability to monitor external radiation levels and surface contamination. Operational activities within the modified shipping container involve the reception and emplacement of packages, and dismantling, conditioning and storing of DSRS. Disassembly of radioactive lightning rods and smoke detectors involves: source removal from the holder, contamination check, dose rate check and activity estimation, transfer of the source to the storage container, storage of conditioned and unconditioned waste, transfer of the waste packages into the storage area, acceptance and placing of the waste packages.

Periodic inspections and radiological monitoring is carried out at the CSF. Conditioned sources are stored in a Type A transportation package specifically procured for such storage. The CSF has twelve empty steel drums, six of which are already concreted, whilst the other six can be concreted should the need arises. A number low activity sources may be collected, mainly smoke detectors (Am-241), educational and check sources. The highest amount of DSRS expected to be collected and stored in the CSF are radioactive lightning rods (Am-241).

Since the modified shipping container is a free-standing facility, it could in theory be lifted and transported to any other site if such a move was authorized. A decommissioning plan has not been developed, but would be developed prior to any such movement, with the aim to demonstrate that the area where the modified shipping container was initially sited is safe for unrestricted use following the removal of the modified shipping container and all of the radioactive sources. The operator would prepare the stored radioactive waste for the transport and perform contamination tests within the modified shipping container and its surrounding area. In case of contamination being encountered, the operator would carry out the necessary decontamination under the approval of the Commission. A separate from that of the operator contamination check would be performed by the Commission. A final decommissioning report will be prepared by the operator and be submitted to Commission for approval.

The modified shipping container was designed to provide for safe temporary storage of DSRS and low-level radioactive waste. According to the safety case for the CSF, the storage period “would not exceed 25 years”, but according to the RWMP the planned operating life of the facility is “at least 50 years”. The purpose of the safety assessment is to consider the radiological safety aspects for the CSF.

The safety assessment methodology includes the following components: assessment context, identification and screening of hazards based on the modified shipping container design, the operations and stored waste, the development and justification of scenarios, dose assessments for workers and members of the public, analysis of site and engineering aspects. In general, cautious assumptions, based on actual data and records and documents from the Commission, are used for the assessment which covers both normal operations and accident situations.

The safety assessment was carried out using deterministic models. Safety considerations for normal operations included exposures of operators of the facility, security personnel and members of the general public living/working in the vicinity of the modified shipping container. Analysis of accident conditions included incidents arising from internal and external events. The assessment results obtained are used for the management of uncertainties, and for establishing limits, control and conditions, including waste acceptance criteria.

ARTEMIS observation

A safety case and a safety assessment are an essential part of safe management of radioactive waste. There is a good understanding of the safety issues and a safety case including a safety assessment for the CSF is in place. The approach to the assessment of safety is broadly appropriate and includes normal operations.

The Commission has licenced the CSF for use at the specific site of the operator. The review team was informed that the safety case will need to be revised if the management and operation of the CSF is decided to be transferred to a new operator or a new site.

The safety case for the CSF does not include an environmental impact assessment, as no impact is considered to exist from the operation of the CSF to the environment.

There is a possibility that the contract of the operator of the CSF is not renewed beyond 2024. Hypothetically, this could happen for several reasons, one of them is that it might happen that there is no expression of interest from the current operator or any other appropriate company in the bidding process that is estimated to take place in 2024. The review team noted that this could have implications for the continuity of responsibility for safety for the management of the radioactive material stored at the CSF, as well as to the liability and the ownership of the material. The review team was informed that in case of an unsuccessful procedure, the Government will take over, but it is not clear what entity is meant that will take over the responsibility in such a case.

The review team noted that, in order to be consistent with IAEA safety standards, an initial decommissioning plan should have been developed prior to authorization of the CSF. However, a decommissioning plan has not been included in the authorization of the CSF.

The review team also noted that no guidance on preparing a safety case by the operating organization for the CSF has been issued by the Commission. The Counterpart responded that the operation of the CSF is a unique case of operation of such a facility in Malta and they do not consider that it is necessary to issue such a guidance or any other guidance for just one case where such activities are conducted. Moreover, the review team observed that the safety case of the CSF addresses doses to workers and also potential impacts on the public during operations, however it should be updated in the future to assess the safety of the site following decommissioning.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *The potential non-renewal of the contract of the operator of the Centralized Storage Facility (CSF) could have implications for the continuity of responsibility for safety.*	
(1)	**BASIS: GSR Part 5 para. 3.4 states that** *"Matters that have to be considered by the government include:* *....Ensuring the continuity of responsibility for safety through regulatory control (e.g. by means of a licensing system) over the different steps in waste management, including the transfer of waste.*
(2)	**BASIS: SSG-45 para. 3.10 states that** *"The management of radioactive waste may entail the transfer of radioactive waste from one operator to another, or from one State to another. Such transfers create interdependences in legal responsibilities as well as physical interdependences in the various steps in the management of radioactive waste. The legal framework should include provisions to ensure a clear allocation of responsibility for safety throughout the entire waste management process, in particular with respect to the interface of waste management with the storage of radioactive waste and with respect to its transfer between operating organizations.*
R5	**Recommendation: The government should provide for a clear allocation of responsibility for safety throughout the entire waste management process, in particular with respect to the Centralized Storage Facility (CSF) and the transfer of responsibility between operating organizations**.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *A decommissioning plan has not been included in the authorization of the Centralized Storage Facility (CSF). No guidance on preparing a safety case by the operating organization for the CSF has been issued by the Commission.*	
(1)	**BASIS: GSR Part 6, Requirement 10 states that,** *"The licensee shall prepare a decommissioning plan and shall maintain it throughout the lifetime of the facility, in accordance with the requirements of the regulatory body, in order to show that decommissioning can be accomplished safely to meet the defined end state.* *7.4. The licensee shall prepare and submit to the regulatory body an initial decommissioning plan together with the application for authorization to operate the facility. This initial decommissioning plan shall be required in order to identify decommissioning options, to demonstrate the feasibility of decommissioning, to ensure that sufficient financial resources will be available for decommissioning, and to identify categories and estimate quantities of waste that will be generated during decommissioning."*
R6	**Recommendation: The regulatory body should establish requirements for decommissioning of the Centralized Storage Facility (CSF), including provisions for an initial decommissioning plan to be submitted by the operating organization for authorization.**

6. COST ESTIMATES AND FINANCING OF RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT

Maltese position

The policy statement and associated strategic implementation on financing radioactive waste management are provided in Section 5.1 of the RWMP. Based on this policy statement targeting to ensure sufficient funds for the management of radioactive waste in Malta are available, the owner of the waste will be responsible for financing its management. In this regard, the Government shall decide how the programme will be funded over time. The Commission is responsible for assessing the whole RWMP costs by producing various budget estimates over time for different storage and disposal scenarios and the underlying basis and hypotheses for that assessment. The programme costs should also be updated and reviewed by the Commission.

By virtue of Regulation 7 of the Waste Regulations, the Commission is tasked to provide the Minister for Inclusion, Voluntary Organisations and Consumer Rights with estimates of the costs of the RWMP. The estimates shall include an assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must consist of a profile over time. Committed to finding an export/disposal option by 2044, the Commission is to present to the Government disposal/export options, including estimated costs, at the end of 2023. The long-term management solution options, such as disposal or export, will be the product of expert missions' activities planned in 2023 under the IAEA Technical Cooperation national project for 2022-23 entitled "Enhancing National Capabilities on Radioactive Waste Management and Disposal of Radioactive Waste". No funding for radioactive waste management comes from the budget allocated to the Commission.

The Government provides the financial resources required for the functioning of the Commission through the Commission's annual budget. Article 61(1) of the Act states that the Commission and the Secretariat shall be provided with adequate financial and human resources through the national budget to fulfil their responsibilities under the Act and applicable regulations. The Commission was allocated €320,000 for 2022.

Regulation 8 of the Waste Regulations stipulates that all licence holders are responsible for the financing of the management of their radioactive waste and may be charged for the storage and disposal of radioactive waste. Also, Article 38 of the Nuclear Safety and Radiation Protection Act states that the licensee who is in possession of the radioactive waste shall be responsible for financing the disposal of the waste. Each DSRS owner will need to pay a fee for disposal to the Government. The Government will meet any shortfall between expenses and income.

All three components of the policy area specific action on financing the radioactive waste management in Malta, thus a) providing funding for the Commission; b) funding the operation of the CSF; and c) providing funding for disposal, appear ongoing. The most significant component of the RWMP is the setting up of the CSF and the possible export of waste to appropriate receivers abroad. Thus, the main current expense is the annual fee of €32,000 (plus VAT), paid by the Government to the private company managing the CSF.

The cost estimations for the various RWMP options explored are analyzed in Section 7 of the RWMP. The most recent cost projections for radioactive waste management were produced in 2019, as summarized in Table 3.

No.	Option	Total 10-year cost
1	Waste preparation by TSO and immediate export	€75,400
2	Governmental Waste Management company to manage facility and contract work out to TSO, export after 10 years (using indicative export quote)	€113,480
3	Storage and waste preparation by private entity, export after 10 years (using indicative export quote)	€432,800
4	Storage of waste at Government site waste refurbished by private contractor who manages site, export after 10 years (using indicative export quote)	€122,800
5	Waste preparation by TSO borehole disposal (IAEA methodology), disposal after 10 years Bore hole disposal estimate 1 million dollars (€850,000)	€901,200
6	Deep Geological (Using existing old oil well holes)	Unknown

Table 3: Cost estimates for the NWRP implementation (2019)

The projections are provided on a 10-year estimation basis. The current main expense is the annual fee for managing the CSF. This expense is being met by the Ministry for Inclusion, Voluntary Organisations and Consumer Rights responsible for the Commission, and the fee does not come from the Commission funds. Options 1 to 4 in Table 3 include a €69,000 component (plus an assumed margin for the private operator) as an export estimate for Am-241 sources. The Commission recognizes that currently, no known overseas entity will be willing to accept all radioactive material and that there may only be export options available for Am-241 lightning rods and other Am-241 DSRS. Also, the Commission is aware that the cost of borehole disposal may be substantially less than anticipated in 2019, claiming that the recent relevant IAEA publication on Underground Disposal Concepts for Small Inventories of Intermediate and High-Level Radioactive Waste (TECDOC-1934), issued in 2020, quotes an estimated cost of a few hundred thousands US dollars, but this excludes regulatory and approval costs.

ARTEMIS observation

The review team noted that while provisions are in place requiring the undertakings who use radioactive material to provide sufficient funds for the management of the waste they produce, this is not happening in practice, as no financial guarantees are required for importing and using long-lived SRS in Malta. The only expenses that need to be covered are those associated with sending back the DSRS to a supplier, mainly Selenium-75 sources used in NDT. Consequently, the Commission does not feel that there should be a process to be followed to determine what the appropriate funds are and how the regulator could verify the appropriateness, availability and timely release of funds once needed. The review team was informed that the only entity importing such sources is the Government. The Commission does not consider it appropriate to require the Government to have in place funding provisions for managing the sources it uses.

A policy statement in the RWMP states that each source owner will need to pay a fee to the Government for its disposal. However, in practice, no fees are set for transferring a DSRS to the CSF, and it is not the intention of the Commission to require the determination and collection of fees by the facility's operator. The Commission explained that the main waste producer is the Government, and that most of the sources at the CSF were used in the past in Governmental buildings. Hence, the Commission does not consider it appropriate to set fees for the DSRS transferred at the CSF or require any other means of financial assurance. The

review team does not see how the "polluter pays" principle is being implemented and how the costs of disposal of the DSRS transferred to CSF are taken into account. Another point to consider is that, in case that in future a decision is made to determine fees, the contract of the current operator of the CSF might not be renewed beyond 2024. The same will most probably happen with the operator of the CSF for the period up to 2029. Setting fees to be collected by an entity that might not be the operator of the facility when the disposal activities will be implemented does not seem to be the most appropriate way to handle these issues of contracting and disposal costs.

Further reflecting on the application of the "polluter pays" principle, the review team observed that the policy states that "the Government will meet any short-fall between the expenses and the income" might compromise the consistency in applying the polluter-pays principle and might contradict another principle set in the Maltese policy, i.e. that the owner of the waste will be responsible for financing its management. The review team also noted that the provision in Article 38 of the Nuclear Safety and Radiation Protection Act, stating that "the licensee who is in possession of the radioactive waste shall be responsible for financing the disposal of the waste" does not have any practical significance in terms of implementation.

The review team observed that the technical solution implemented as concerns the CSF (Solution No. 3, page 18 of the RWMP) is the most expensive of all options evaluated back in 2019. The Commission explained that they first sought to identify a Governmental entity, such as the army, that could host and operate the CSF, however they were unsuccessful. The solution to proceed with a private operating organization for the CSF was the only pragmatic option at that time.

The Maltese self-assessment states that "Orphan sources discovered in Malta (excluding in ports of entry) will go to CSF". The review team was informed that it would again be the Government responsible for covering the associated cost. Therefore, there is no need for the Commission to ensure that the appropriate funds are available and releasable when needed.

The Commission produced various budget estimates for different storage and disposal scenarios to assess the costs of the whole programme over time. Initial cost estimates were included in the RWMP in 2014, and some further indicative cost estimates were provided in 2019. The Commission intends to prepare updated cost estimates for different options for managing DSRS in the long term (e.g. disposal or export), using external expertise to be provided through the IAEA's Technical Cooperation Programme, and present them to the Government by the end of 2023. The Government will then assess the various options and associated costs to decide on future management options and how the programme will be financed over time.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Malta has not decided yet on what will be an appropriate long term management solution for waste and disused sealed radioactive sources and the cost estimates in the Radioactive Waste Management Programme (RWMP) established in 2014 and revised in 2019 have not been updated. In accordance with the RWMP, the Commission has scheduled getting external expert assistance, to present to the government by the end of 2023 various long term management solutions (e.g. disposal/export options) and associated cost estimates, however, associated activities have not started yet. The government will make a decision on appropriate future long term management options.*	
(1)	**BASIS: GSR Part 1 (rev. 1), para. 2.33 states that** *"Appropriate financial provision shall be made for: ....* *(b) Management of radioactive waste, including its storage and disposal;* *(c) Management of disused radioactive sources and radiation generators; ...*
(2)	**BASIS: GSG-16, para. 2.8 states that** *"The long term nature of radioactive waste management, and particularly of radioactive waste disposal, also means that particular attention should be paid to the following: ...* *(c) Estimating costs and establishing the funding arrangements that will be necessary to continue to monitor and control the radioactive waste using the management system until active institutional control ceases. ...* **BASIS: GSG-16, para. 3.8 states that** *"The senior management of an organization that manages radioactive waste is required to provide adequate resources to ensure that the organization manages the radioactive waste safely ... The senior management of such an organization should include in the management system provisions to deal with funding challenges, such as cost increases over time, cost uncertainties and risks, the availability of public and private funds, and unplanned events.* **BASIS: GSG-16, para. 5.84 states that** *"Responsibilities, mechanisms and schedules for providing the funds necessary for radioactive waste management should be established in advance, before the funds are needed.*
R7	**Recommendation: The government should ensure that appropriate financial provision for the management of radioactive waste and disused sealed radioactive sources, including disposal, is made available on a timely basis.**
S4	**Suggestion: The regulatory body should consider preparing updated cost estimates for the potential long term management solutions, taking into account the associated risks and uncertainties, and integrate them to the RWMP accordingly.**

7. CAPACITY BUILDING FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT – EXPERTISE, TRAINING AND SKILLS

Maltese position

The policy declared in the RWMP in the field of education and training is that persons involved in the handling, transport, storage and possible future disposal shall be sufficiently trained. Also, one of the guiding principles governing the management of radioactive waste in Malta is the need to identify the competencies required for achieving the goals for radioactive waste management in Malta and that all stakeholders are adequately trained as part of the prime responsibility residing with the radioactive waste producers. The relevant KPIs set in the RWMP are a) to educate staff involved in handling, storage, and disposal and to maintain ongoing training; and b) the Commission to have reviewed training for organizations holding waste. Progress monitoring through the two relevant KPIs set, i.e. having adequately trained staff in waste management and keeping oversight of undertakings' training, showed that these activities are ongoing.

Regulation 13 of the Waste Regulations provides that the Commission is tasked to ensure that the members of its Secretariat have a sufficient understanding of the safety and security aspects related to the management of radioactive waste, ensuring in particular that the members of the Secretariat participate in ongoing training. Moreover, during the licensing process by the Commission, the Secretariat requires that potential license holders have undertaken arrangements for education and training.

Two out of four of the Commission's Secretariat staff count a substantial number of years of experience in regulatory control, whilst the two staff members joined the Secretariat within the last year. The Commission has identified the need for newcomers to undergo different training and learning activities. The Commission follows a procedure that deals with the requirements for staff development and maintaining skills. The Secretariat invests in providing training to the new staff members through knowledge transfer from experienced Commission staff to new staff members. Examples of this knowledge transfer approach to sharing information are weekly meetings to discuss work performed in the previous week and quarterly performance reviews when management and staff can identify any issues, including training needs. Also, the Secretariat's staff have attended several training activities through IAEA, both virtual and in person, and benefited from knowledge exchange from expert missions received by Malta. For example, potential concerns of siting CSF, assisting in preparing documentation for CSF, and conditioning Category 3-5 sources. Efforts are underway to train the junior staff members in all the regulatory aspects. These staff members have undergone in-house training in radiation protection and regulatory functions, e-learning courses, and attendance at international workshops.

The Commission also follows a procedure that outlines the basic qualifications that an applicant is required to show to the Commission before obtaining a license for the storage of radioactive waste. One main item of this procedure is the provision of training certificates for the facility's staff. This shall include training in dismantling and conditioning of DSRS. The operator of CSF is required to have the necessary experience and expertise, and they are required to have available more than five years of experience in handling and use of radioactive material. The staff are trained in dismantling and conditioning radioactive sources; services are received by a Radiation Protection Expert (RPE) / Qualified Expert with appropriate knowledge level in relevant industrial SRS, and the drivers hold a Class 7 dangerous goods licence. The operator of the CSF shows competency by providing Continuous Professional Development and on-the-

job training through the certification of the RPE process that the operator hires for this purpose. The contractor implements their training procedure. A staff member from the company managing the CSF attended a hands-on training on the management of Category 3-5 DSRS. The RPE has attended a four-hour legal course on Maltese radiation protection legislation. Also, a member of the CSF staff is planning to observe waste management techniques in 2023 through a scientific visit to be organized through the IAEA's Technical Cooperation Programme.

The Commission targets through several scientific visits and expert missions for the staff of the Commission and the operator of CSF, to be organized in 2023 under the IAEA's Technical Cooperation project MAT9009 to further strengthen the national capacity, skills, and expertise of staff in the field of radioactive waste management. The expert missions that are planned concern a) the review of borehole disposal technology in connection with the disposal feasibility study; b) preparation of the feasibility study, to i) assess the disposal needs for future waste needs and technical capabilities and resources within Malta, and ii) discuss initial disposal options; c) presentation of initial proposals options to Commission and refine feasibility study; and d) participation in final consultations meeting and discuss and finalized draft feasibility study including options with the Commission and other relevant stakeholders and summarize options. The expert missions will also need to consider the possibility that DSRS could be exported. A member of the Commission is also expected through a scientific visit to observe the regulatory aspects of radioactive waste management.

ARTEMIS observation

The review team observed that the Maltese policy on education and training broadly sets the scene as it pertains to this issue, providing that a) persons involved in the handling, transport, storage, and possible future disposal shall be sufficiently trained; and b) the Commission to enforce the requirements stipulated in the Waste Regulations that their staff have adequately trained. On the inquiry of the review team into how the terms "sufficiently" and "adequately" are interpreted in the national context on a practical level, the Commission explained that, in the absence of a dedicated training centre on radiation safety issues in Malta, various other activities are implemented to enhance to the greatest extent possible the competence of the staff that needs to be trained.

The review team was informed that the Commission provides some training on regulations, mainly focused on the radiation protection experts (qualified experts) and medical physics experts. Moreover, the Commission has a sub-committee, which looks at different training syllabi that could be provided in Malta, for example, in the medical field. For NDT, relevant training is carried out overseas, mainly in the UK. The University of Malta conducts a continuous professional education course in the medical field. Additionally, people are sent to workshops and conferences abroad. The licensees are responsible for identifying appropriate training for their staff, but there are no approved courses by the Commission for this purpose. In assessing the qualifications and experience gained for individuals for which recognition from the Commission is sought, the Commission does not get into details on what kind of training such an individual has received or the quality of the training. Typically, workers in the field of NDT seek ISO certification, although the Commission does not require this specific certification.

The review team had an open discussion with the Commission who felt that external training opportunities, such as IAEA-initiated training events, provide a good way out for small Member States with limited capacity for education and training to meet part of their capacity building needs. However, the review team noted that these trainings represent only occasional

opportunities which can be taken as the need arises and might not be exactly tailored to the specialized needs of the country.

As a result of the discussions described above, the review team understands that the Commission does not apply a systematic capacity building programme for its personnel or provide provisions for personnel employed by the operators with responsibilities related to the safety of radioactive waste management.

The review team noted that several IAEA expert mission activities were carried out in the past and that several other missions are planned for 2023. The review team shared its concern with the Commission that, although acknowledging the associated challenges, Malta should explore options to reduce to the extent possible its reliance on external support and to increase internal know-how and expertise gradually. For instance, Malta relied on external support to prepare the safety case for the CSF and there is a need for the Commission to ensure that adequate internal technical capacity will be available when needed to be able to carry out its regulatory functions, for instance, to review and assess the resepctive safety cases and to authorize and inspect such facilities, as well as to act proactively for activities that are already foreseen in the RWMP, such as evaluating possible future steps in the management of radioactive waste and DSRS.

The Commission explained that, as they see it, the actual issue is the need first to allocate sufficient human resources to the regulatory body, and then initiating activities to establish and build the required competence. Knowledge has certainly been gained internally from IAEA expert missions. If the need arises, the Commission could hire services from Technical Support Organizations (TSO), including from abroad. Moreover, the Commission has made a new proposal for a national Technical Cooperation project for 2024-25, which has a component in building capacity and expertise for the Commission's staff. The review team noted that, in this way, the Commission will continue to rely on external support.

The review team took note of the Recommendation 4 from the 2015 IRRS Mission in Malta and that this has been considered as closed by the 2020 IRRS follow-up mission on the basis of progress made and confidence in effective completion of related activities in due time, however, adequate arrangements for the Commission to establish and maintain appropriate competence was considered as still outstanding.

RECOMMENDATIONS, SUGGESTIONS AND GOOD PRACTICES	
Observation: *Malta has demonstrated a commitment to the safe and secure management and control of radioactive sources and radioactive waste, but needs additional human and financial resources to strengthen safety, security, and sustainability.*	
(1)	**BASIS: SF-1, para 3.10 states that** *"The regulatory body must:* *— Have adequate legal authority, technical and managerial competence, and human and financial resources to fulfil its responsibilities; …* **BASIS: SF-1, para 3.6 states that** *"The licensee is responsible for:* *— Establishing and maintaining the necessary competences;* *— Providing adequate training and information…"*
(2)	**BASIS: GSR Part 1 (rev. 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 1 (rev. 1), Requirement 11, para. 2.36 states that** *"The government:* *(a) Shall stipulate a necessary level of competence for persons with responsibilities in relation to the safety of facilities and activities;* *(b) Shall make provision for adequate arrangements for the regulatory body and its support organizations to build and maintain expertise in the disciplines necessary for discharge of the regulatory body's responsibilities in relation to safety;* *(c) Shall make provision for adequate arrangements for increasing, maintaining and regularly verifying the technical competence of persons working for authorized parties.*
(3)	**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."*
R8	**Recommendation: The government should ensure that sufficient human and financial resources, are available for the regulatory body to acquire and maintain appropriate competence to be able to perform its regulatory functions, ensuring the unimpeded implementation of the Radioactive Waste Management Programme (RWMP).**

APPENDIX A: TERMS OF REFERENCE

ARTEMIS Review
of the National Radioactive Waste Management Programme
of Malta

Terms of Reference

1. Introduction

On 21 June 2019, the Commission for the Protection from Ionising and Non-Ionising Radiation of Malta, requested the International Atomic Energy Agency (IAEA) to organize and carry out, in mid to late 2022, an Integrated Review Service for Radioactive Waste and Spent Fuel, Decommissioning and Remediation (ARTEMIS) review. Malta requested the ARTEMIS review to satisfy its obligations under Article 14(3) of the European Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (hereinafter the EU Waste Directive).

The review will be organized by the Department of Nuclear Safety and Security and the Department of Nuclear Energy of IAEA. It will be performed by an independent, international peer review team selected by the IAEA.

2. Objective

The ARTEMIS review will provide an independent, international evaluation of Maltese national framework for safe management of radioactive waste, and the competent regulatory authority, national programme and its implementation in this field.

The review will be performed by an international peer review team selected by the IAEA.

3. Scope

The ARTEMIS review will evaluate the Maltese national framework, competent regulatory authority, national programme and its implementation for safe management of radioactive waste.

Malta has expressed interest in discussion of the following topics:

- Challenges faced for the disposal of small volume and activity of radioactive waste.
- The repratrition of radioactive material detected in transhipment through Malta.

It was agreed to exclude:

- The transport of radioactive material or safeguards or nuclear security.
- NORM.
- Remediation.
- Decommissioning.

Results from the IAEA Integrated Regulatory Review Service (IRRS) Follow-up mission to Malta conducted in 2020 will be taken into account, where relevant and appropriate to avoid unnecessary duplication.

4. Basis for the review

The ARTEMIS review will be based on the relevant IAEA Safety Standards and proven international practice and experiences, following the guidelines of the ARTEMIS review service.

5. Reference material

The review will cover all documentation submitted by National Counterpart for the considered scope of the review, including the results of a national self-assessment, which should be based on the ARTEMIS self assessment questionnaire provided by the IAEA.

All documents for the purpose of the ARTEMIS review shall be submitted in English.

Reference material for the purpose of the ARTEMIS review shall be submitted to the ARTEMIS mission webpage on the Global Nuclear Safety and Security Network (GNSSN) of the IAEA.

6. Modus operandi

The working language of the mission will be English.

The National Counterpart is the Commission for the Protection from Ionising and Non-Ionising Radiation of Malta. The National Counterpart Liaison Officer for the review is Mr Paul Brejza.

The ARTEMIS review mission will be conducted from **16 to 21 October 2022** in St Julian's, Malta. The provisional schedule for the review mission is provided in **Annex 2**.

The timeline for the key steps of the review process is provided below:

- Self-assessment questionnaire: available to Malta as of **May 2021**
- Preparatory Meeting: **23 March 2022** (WebEx meeting)
- Notification by IAEA to the Counterparts on the review team composition: by **23 March 2022**
- Submission of reference material: by **15 August 2022** (including the completed self-assessment and, if desired, a preliminary national action plan)
- Submission of questions from the review team to the Counterpart based on preliminary review of the reference material (and in accordance with the graded approach): by **30 September 2022.** The questions can be discussed during the Review Mission.

7. International peer review team

The IAEA will convene a team of international experts to perform the ARTEMIS review according to the ARTEMIS Guidelines and these Terms of Reference. The team will consist of:

- Two qualified and recognized international experts from Government authorities, regulatory bodies, waste management organizations, or technical support organizations with experience in the safe management of radioactive waste;
- Two IAEA staff to coordinate the mission. The Coordinator of the ARTEMIS review is Mr David Bennett from the Waste and Environmental Safety Section of the Department of Nuclear Safety and Security of IAEA. The Deputy Coordinator is Mr John Zarling from the Waste Technology Section of the Department of Nuclear Energy of IAEA;
- One IAEA staff for administrative support.

A senior staff member from the Department of Nuclear Safety and Security of IAEA will oversee the closure of the review.

The peer review team will be led by a Team Leader from the review team. The IAEA will inform the National Counterpart regarding the composition of the proposed review team as defined under Section 6. Modus operandi. The review mission may include the presence of up to two observers, including an observer from the EC. The National Counterpart will be notified of any proposed observers; the presence of any observers must be agreed in advance of the mission.

8. Reporting

The findings of the peer review will be documented in a final report that will summarize the proceedings of the review and contain any recommendations, suggestions and good practices. The report will reflect the collective views of the review team members and not necessarily those of their respective organization or Member State or the IAEA.

Prior to its finalization, the ARTEMIS Review Report will be delivered to the National Counterpart for fact-checking, being the Commission for the Protection from Ionising and Non-Ionising Radiation.

9. Funding of the ARTEMIS review

The costs for the services will be limited to the travel costs and per diem of the peer review team (external experts and IAEA staff) in line with IAEA Financial Regulations and Rules.

The cost of the ARTEMIS review is estimated to the amount of 16 000 EUR, to be paid to the IAEA as voluntary contribution before the start of the mission. Malta is aware that the review cost includes 7% programme support costs.

If the actual cost of the ARTEMIS review exceeds the estimated voluntary contribution, Malta agrees to cover such additional cost to the IAEA. Similarly, if the actual cost is less than the estimated voluntary contribution, any excess will be refunded to Malta through the Counterpart.

These Terms of Reference were agreed on 23 March 2022 between the IAEA and the Commission for the Protection from Ionising and Non-ionising Radiation, on behalf of the Government of Malta, during the preparatory meeting held on-line.

Annex 1: List of reference material

- Responses to the ARTEMIS Self-assessment Questionnaire
- Laws, regulations and regulatory guidelines (including waste classification, concept of clearance, radiation sources categorization)
- Article 14 Report 2021 for Waste Directive
- BSS Regulations 585.01
- Joint Convention report for the 7th Review Meeting
- Malta IRRS Follow up report 2020
- Malta IRRS Report 2015
- Malta presentation info meeting 28 July 2021
- Malta presentation preparatory meeting 23 Mars 2022
- National Framework for Radioactive Waste Management
- Nuclear Safety and Radiation Protection Act Cap 585
- Questions with answers 7 Review Meeting of Joint Convention
- Radioactive Waste Regulations 585.03
- RPC Annual Report 2021
- Report from the Convention on Nuclear Safety to be submitted to IAEA by August 2022
- Country Review Report from the Joint Convention (JC) on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (expected to be available early July 2022).

APPENDIX B: MISSION PROGRAMME

<table>
<tr><th>Time</th><th>Sun, 16 Oct</th><th>Mon, 17 Oct</th><th>Tue, 18 Oct</th><th>Wed, 19 Oct</th><th>Thur, 20 Oct</th><th>Fri, 21 Oct</th><th>Sat, 22 Oct</th></tr>
<tr><td rowspan="3">9:00- 10:30</td><td rowspan="10">Arrival of the ARTEMIS review team members</td><td rowspan="3">Opening Presentations as desired from Ministry and Counterparts

Group photo</td><td>5. Safety Case and Safety Assessment</td><td rowspan="3">Drafting of Review Findings and Report</td><td rowspan="3">Drafting of Report</td><td>9:00 Opening Remarks
Ms Lourdes Farrugia, Chairperson, Commission for the Protection from Ionising and Non-Ionising Radiation</td><td rowspan="10">Departure of the Team Members</td></tr>
<tr><td rowspan="2">6. Cost Estimates and Financing</td><td>9:15 Presentation of key findings
Michael Tzortzis, ARTEMIS Team Leader</td></tr>
<tr><td>9:45 Malta - Lessons Learned, Experience Gained and the way forward
Paul Brejza, Executive Secretary</td></tr>
<tr><td>10:30-11:00</td><td>Coffee break</td><td>Coffee break</td><td>Coffee break</td><td>Coffee break</td><td>10:00 Coffee break</td></tr>
<tr><td>11:00-12:00</td><td>1. National Policy and Framework</td><td>7. Capacity Building - Expertise, Training, Skills</td><td rowspan="2">Finalization of draft Review Findings</td><td rowspan="2">Draft report to be sent to the Counterparts</td><td>10:30 Closing remarks on behalf of IAEA
Mr Peter Johnston, Director NSRW</td></tr>
<tr><td>12:00-13:00</td><td>2. National Programme (strategy)</td><td>Discussion</td><td>10:45 Closing remarks on behalf of Malta, Ms Nancy Caruana, Permanent Secretary</td></tr>
<tr><td>13:00-14:00</td><td>Lunch</td><td>Lunch</td><td>Lunch</td><td>Lunch</td><td>Lunch</td></tr>
<tr><td>14:00-15:00</td><td>3. Inventory</td><td>Discussion or Drafting of Review Findings and Report</td><td>Presentation of draft Review Findings to the Counterparts and Discussion</td><td>Counterparts review the draft report</td><td rowspan="4">Departure of the Team Members, if convenient</td></tr>
<tr><td>15:00-15:30</td><td>Coffee break</td><td>Coffee break</td><td>Coffee break</td><td>Coffee break</td></tr>
<tr><td>15:30-16:30</td><td>4. Concepts, Plans and Technical Solutions</td><td>Discussion or Drafting of Review Findings and Report</td><td>Discussion or Drafting of Report</td><td rowspan="2">Discussions with the Counterparts on the draft report</td></tr>
<tr><td>17:30</td><td>ARTEMIS team meeting at hotel</td><td>ARTEMIS team meeting at hotel</td><td>ARTEMIS team meeting at hotel</td><td>ARTEMIS team meeting at hotel</td></tr>
<tr><td>18:00</td><td></td><td>Drafting</td><td>Drafting</td><td>Drafting</td><td>(19:30) Official Dinner</td></tr>
</table>

APPENDIX C: RECOMMENDATIONS AND SUGGESTIONS

Area		R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
1.	NATIONAL POLICY AND FRAMEWORK FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT	R1	The government should demonstrate its intent and commitment to the effective management and control of radioactive waste and disused sealed radioactive sources by approving the policy at the government's level.
2.	NATIONAL STRATEGY FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT	R2	The regulatory body should ensure that: — The RWMP is systematically reviewed, updated, or revised, as appropriate, including incorporating and monitoring on a systematic basis the SMART KPIs, to enable the regulatory body to effectively evaluate the progress against the milestones in the RWMP. — Clear timeframes and KPIs are defined for all policy areas in the RWMP, to provide effective means to prevent and mitigate the consequences of potential delays, omissions, failures and deviations.
3.	INVENTORY OF SPENT FUEL AND RADIOACTIVE WASTE	R3	The regulatory body should ensure that regulatory provisions are in place for characterization of sources and waste at the CSF in order to: — facilitate planned predisposal waste management activities. — verify compliance with acceptance criteria. — ensure that the inventory of the CSF fully reflects waste volumes and properties.
		S1	The regulatory body should consider including in the national inventory current and anticipated radioactive waste streams.
4.	CONCEPTS, PLANS AND TECHNICAL	R4	The government should continue to explore and evaluate options for safe, secure and sustainable long term management solutions for radioactive waste.

Area		R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
	SOLUTIONS FOR SPENT FUEL AND RADIOACTIVE WASTE MANAGEMENT	S2	The regulatory body should consider establishing requirements to ensure that, when return to a supplier is the selected option for a disused source, the user is required, prior to the acquisition of a radioactive source, to have an agreement with the supplier for its return that includes binding provisions on: — A specified time period within the supplier undertakes to take the DSRS. — The initial estimation, periodic revision, if needed, and allocation of the costs of return between the user and the supplier.
		S3	The regulatory body should consider establishing requirements to ensure that for the acquisition and use of a radioactive source: — Adequate financial provisions are in place to cover the costs of management once the radioactive source becomes disused. — Provisions are in place for unforeseen circumstances that may require the management of the source, such as abandonment of the source or bankruptcy of the user.
5.	SAFETY CASE AND SAFETY ASSESSMENT OF RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT ACTIVITIES AND FACILITIES	R5	The government should provide for a clear allocation of responsibility for safety throughout the entire waste management process, in particular with respect to the Centralized Storage Facility (CSF) and the transfer of responsibility between operating organizations.
		R6	The regulatory body should establish requirements for decommissioning of the Centralized Storage Facility (CSF), including provisions for an initial

Area		R: Recommendations S: Suggestions G: Good Practices	Recommendations, Suggestions or Good Practices
			decommissioning plan to be submitted by the operating organization for authorization.
6.	**COST ESTIMATES AND FINANCING OF RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT**	**R7**	**The government should ensure that appropriate financial provision for the management of radioactive waste and disused sealed radioactive sources, including disposal, is made available on a timely basis.**
		S4	**The regulatory body should consider preparing updated cost estimates for the potential long term management solutions, taking into account the associated risks and uncertainties, and integrate them to the RWMP accordingly.**
7.	**CAPACITY BUILDING FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT – EXPERTISE, TRAINING AND SKILLS**	**R8**	**The government should ensure that sufficient human and financial resources, are available for the regulatory body to acquire and maintain appropriate competence to be able to perform its regulatory functions, ensuring the unimpeded implementation of the Radioactive Waste Management Programme (RWMP).**

APPENDIX D: LIST OF ACRONYMS USED IN THE TEXT

ARTEMIS – Integrated Review Service for Radioactive Waste and Spent Fuel, Decommissioning and Remediation

CSF – Centralized Storage Facility

DSRS – Disused Sealed Radioactive Sources

IAEA – International Atomic Energy Agency

IRRS – Integrated Regulatory Review Service

NDT – Non-Destructive Testing

NFRWM – National Framework for Radioactive Waste Management

RWMP – Radioactive Waste Management Programme

SRS – Sealed Radioactive Sources

APPENDIX E: IAEA REFERENCE MATERIAL USED FOR THE REVIEW

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

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

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

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 4, IAEA, Vienna (2009).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste, IAEA Safety Standards Series No. GSR Part 5, IAEA, Vienna (2009).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2014).

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

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. NS-R-5 Rev. 1, IAEA, Vienna (2014).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Energy Basic Principles, Nuclear Energy Series, NE-BP, Vienna (2008).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Radioactive Waste Management and Decommissioning Objectives, Nuclear Energy Series, NW-O, Vienna (2011).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Fuel Cycle Objectives, Nuclear Energy Series, NF-O, Vienna (2013).

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, Policies and Strategies for Radioactive Waste Management, IAEA Nuclear Energy Series No. NW-G-1.1, IAEA, Vienna (2009).

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Policies and Strategies for the Decommissioning of Nuclear and Radiological Facilities, IAEA Nuclear Energy Series No. NW-G-2.1, IAEA, Vienna (2012).

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, Policy and Strategies for Environmental Remediation, IAEA Nuclear Energy Series No. NW-G-3.1, IAEA, Vienna (2015).

[16] INTERNATIONAL ATOMIC ENERGY AGENCY, Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, IAEA International Law Series No. 1, IAEA, Vienna (2006).

[17] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Glossary – Terminology used in Nuclear Safety and Radiological Protection, IAEA, Vienna (2018).

[18] Official Journal of the European Union No. L 199/48 from 2nd Aug 2011, COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, Brussels (2011).