



**IAEA**

*60 Years*

*Atoms for Peace and Development*

# **ARTEMIS**

## **An Integrated Peer Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation**

**Andrew Orrell**

**Section Head**

**Waste and Environmental Safety Section**

**EURADWASTE '19**

**Pitesti, Romania**



**Cooperation on  
Nuclear Safety**

# Outline

- IAEA Review Missions and Advisory Services
- ARTEMIS Peer Review Service
- The EC Waste Directive
- The Completed and Planned ARTEMIS Missions
- General Conclusions To Date

# IAEA Review Missions and Advisory Services



# IAEA offers Member States a wide array of review services

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• ImPACT (an integrated mission of PACT otherwise referred to as an imPACT Review)</li><li>• Operational Safety Review Team (OSART)</li><li>• International Physical Protection Advisory Service (IPPAS)</li><li>• Integrated Regulatory Review Service (IRRS)</li><li>• Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS)</li><li>• Safety Aspects of Long-Term Operation (SALTO)</li><li>• Integrated Nuclear Infrastructure Review (INIR)</li><li>• Quality Management Audits in Nuclear Medicine Practices (QUANUM)</li><li>• Occupational Radiation Protection Appraisals (ORPAS)</li><li>• Construction Readiness Review (CORR)</li><li>• Emergency Preparedness Review (EPREV) Service</li><li>• Integrated Safety Assessment of Research Reactors (INSARR)</li><li>• Site and External Events Design Review Service (SEED)</li><li>• Independent Safety Culture Assessment (ISCA)</li><li>• Knowledge Management Assist Visit (KMAV)</li><li>• Education and Training Appraisal (EduTA)</li></ul> | <ul style="list-style-type: none"><li>• Operation and Maintenance Assessment for Research Reactors (OMARR)</li><li>• Technical Safety Review (TSR)</li><li>• State Systems of Accounting for and Control of Nuclear Material mission (ISSAS)</li><li>• Quality Improvement Quality Assurance Team for Radiation Oncology (QUATRO)</li><li>• Safety Culture Continuous Improvement Process (SCCIP)</li><li>• Independent Engineering Review of I&amp;C Systems (IERICS)</li><li>• International Nuclear Security Advisory Service (INSServ)</li><li>• Quality Improvement Quality Assurance Audit for Diagnostic Radiology Improvement and Learning (QUAADRIL)</li><li>• Integrated Nuclear Infrastructure Review for Research Reactors (INIR-RR)</li><li>• Advisory Mission on Regulatory Infrastructure for Radiation Safety (AMRAS)</li><li>• Uranium Production Site Appraisal Team (UPSAT)</li><li>• Safety Evaluation of Fuel Cycle Facilities during Operation (SEDO)</li><li>• Transport Safety Appraisal Services (TranSAS)</li></ul> |
|--|---|

<https://www.iaea.org/services/review-missions/calendar>

# ARTEMIS Review Service

- Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS)



ARTEMIS

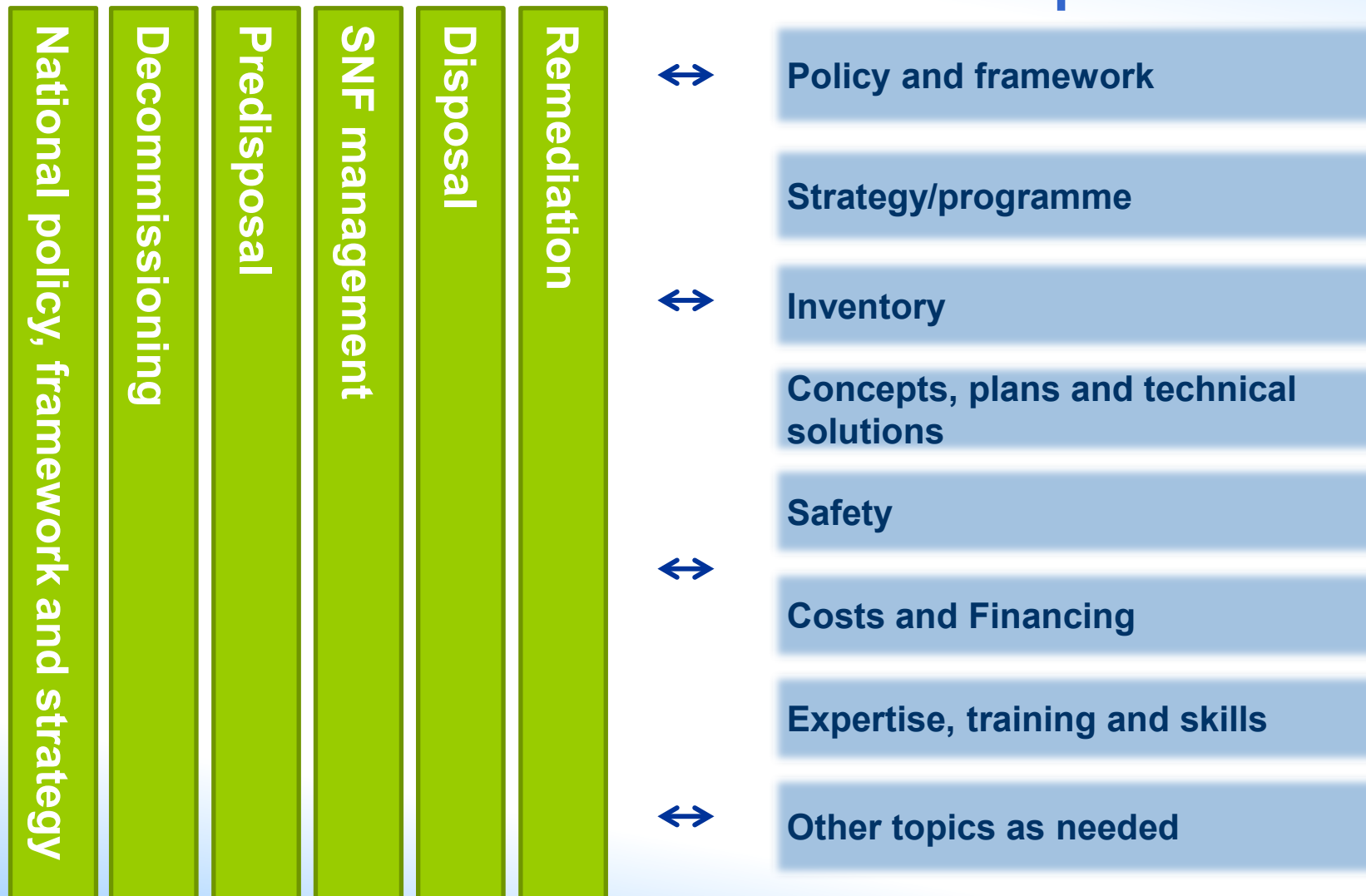
Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation



# Structure of ARTEMIS

## Peer Review Domains

## Topics



# ARTEMIS Review Process

- General process overview and familiarization
  - Objectives, principles, benefits, costs
  - Forming the request
- Planning Phase
  - **Terms of Reference agreed to**
  - Logistics, financing, Points of Contact, draft schedule
- Preparation Phase
  - Review Team – selection, organization, contracting
  - **Self-assessment**
  - **Reference material gathered and distributed**
  - Preparatory Meetings
  - Discussions with MS on self-assessment or expert questions
- Conduct the Review
  - Entrance Meeting
  - Review of mission specifics per the ToR
  - **Drafting the mission report**
  - **Exit Meeting**
- Reporting
  - **Final report provided**
  - Follow-up as requested
  - **Release to public as permitted**


# Definitions


- *Recommendations*
  - Recommendations are proposed where aspects relative to the IAEA Safety Requirements and additional supporting documents agreed as basis for review such as other IAEA documents, Conventions, Code of Conduct or other supporting documentation are missing, incomplete, or inadequately implemented. ... In the case of peer review in relation to the obligations under the European Council Directive 2011/70/EURATOM to review the national programmes and frameworks, the review and recommendations made should also be based on this Directive.
- *Suggestions*
  - Reviewers may identify opportunities for improvement not directly related to inadequate conformance with IAEA Safety Requirements, but which should be shared with the host country (e.g. a more efficient way of utilizing staff resources). Suggestions are means of achieving improvements. ... In general, suggestions should stimulate the management and staff to consider new or different approaches to technical, regulatory and policy issues that may enhance performance. ... Each suggestion shall have a basis either in IAEA Safety Requirements, Safety Guides or other relevant IAEA documents or international commitments (e.g., Codes of Conduct, Conventions, etc.).
- *Good Practices*
  - A good practice is identified in recognition of an outstanding organization, arrangement, programme or performance superior to those generally observed elsewhere. A good practice goes beyond the fulfilment of current requirements or expectations. It will be worthy of the attention of other organizations or entities as a model in the general drive for excellence.



# ARTEMIS on GNSSN Platform

IAEA NUCLEUS

 **IAEA** | **GNSSN** Global Nuclear Safety and Security Network

Search this site 

ARTEMIS About ARTEMIS ▾ Review Process ▾ Upcoming Events Documents & References ▾ EC-IAEA Cooperation Past Events Review Missions ▾

Contact Us



The IAEA offers Member States numerous expert review services related to the peaceful uses of nuclear science and technology. Building on many years of experience in conducting peer reviews in the field of radioactive waste management, the IAEA has developed an integrated review service for radioactive waste and spent fuel management, decommissioning and remediation programmes, referred to as ARTEMIS. Based on the IAEA safety standards, technical guidance and international good practices, ARTEMIS aims to assist in improving organizational performance relating to the issues under review in Member States and to contribute to increased national and international confidence in their activities.

ARTEMIS is the IAEA's new integrated expert peer review service for radioactive waste and spent fuel management, decommissioning and remediation programmes. Based on IAEA safety standards and technical guidance, as well as on international good practices, ARTEMIS is available for Member State organizations, facilities and activities involving radioactive waste or spent fuel management, radiological impact assessments for human health and the environment, the management of residues arising from uranium production as well as the decommissioning and remediation of sites contaminated by radioactive materials.

For queries related to ARTEMIS, please contact: [ARTEMIS Contact Point](#)

## <https://gnssn.iaea.org/main/ARTEMIS>

### Related Resources


[IAEA Waste Technology Section](#)

[IAEA Waste and Environmental Safety Section](#)

[IAEA Nuclear Fuel Cycle & Materials Section](#)

### Upcoming Events

There are no items to show in this view of the "Events" list. To add a new item, click "New".

 > [GNSSN](#) > [ARTEMIS](#)

International Atomic Energy Agency (IAEA)

Vienna International Centre, PO Box 100, A-1400 Vienna, Austria

Telephone: (+431) 2600-0, Facsimile: (+431) 2600-7, E-mail: [Official Mail](#)

[About NUCLEUS](#) [Contact Us](#) [Disclaimer](#)  
Copyright © 2016 International Atomic Energy Agency (IAEA). All rights reserved.

# The EC Waste Directive



# The EC Waste Directive

- Article 14, Item 3, Reporting of the EC 2011 ‘Waste Directive’:
  - Member States shall periodically, and at least every 10 years, *arrange for self-assessments* of their national framework, competent regulatory authority, national programme and its implementation, *and invite international peer review of their national framework, competent regulatory authority and/or national programme with the aim of ensuring that high safety standards are achieved* in the safe management of spent fuel and radioactive waste. The *outcomes of any peer review shall be reported to the Commission and the other Member States, and may be made available to the public* where there is no conflict with security and proprietary information.

# Article 5 National framework

1. Member States shall establish and maintain a **national legislative, regulatory and organisational framework** ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:

- (a) a national programme for the implementation of spent fuel and radioactive waste management policy;
- (b) national arrangements for the safety of spent fuel and radioactive waste management. The determination of how those arrangements are to be adopted and through which instrument they are to be applied rests within the competence of the Member States;
- (c) a system of licensing of spent fuel and radioactive waste management activities, facilities or both, including the prohibition of spent fuel or radioactive waste management activities, of the operation of a spent fuel or radioactive waste management facility without a licence or both and, if appropriate, prescribing conditions for further management of the activity, facility or both;
- (d) a system of appropriate control, a management system, regulatory inspections, documentation and reporting obligations for radioactive waste and spent fuel management activities, facilities or both, including appropriate measures for the post-closure periods of disposal facilities;
- (e) enforcement actions, including the suspension of activities and the modification, expiration or revocation of a licence together with requirements, if appropriate, for alternative solutions that lead to improved safety;
- (f) the allocation of responsibility to the bodies involved in the different steps of spent fuel and radioactive waste management; in particular, the national framework shall give primary responsibility for the spent fuel and radioactive waste to their generators or, under specific circumstances, to a licence holder to whom this responsibility has been entrusted by competent bodies;
- (g) national requirements for public information and participation;
- (h) the financing scheme(s) for spent fuel and radioactive waste management in accordance with Article 9.EN 2.8.2011 Official Journal of the European Union L 199/53

# Article 6 Competent regulatory authority

1. Each Member State shall establish and maintain a competent regulatory authority in the field of safety of spent fuel and radioactive waste management.
2. Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function.
3. Member States shall ensure that the competent regulatory authority is given the legal powers and human and financial resources necessary to fulfil its obligations in connection with the national framework as described in Article 5(1)(b), (c), (d) and (e).

# Article 11 & 12 National Programmes

1. Each Member State shall ensure the implementation of its national programme for the management of spent fuel and radioactive waste ('national programme'), covering all types of spent fuel and radioactive waste under its jurisdiction and all stages of spent fuel and radioactive waste management from generation to disposal.
2. Each Member State shall regularly review and update its national programme, taking into account technical and scientific progress as appropriate as well as recommendations, lessons learned and good practices from peer reviews.

## Contents of national programmes

1. The national programmes shall set out how the Member States intend to implement their national policies referred to in Article 4 for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and shall include all of the following:

- (a) the overall objectives of the Member State's national policy in respect of spent fuel and radioactive waste management;
- (b) the significant milestones and clear timeframes for the achievement of those milestones in light of the over-arching objectives of the national programme;
- (c) an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;
- (d) the concepts or plans and technical solutions for spent fuel and radioactive waste management from generation to disposal;
- (e) 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 knowledge of that facility in the longer term;
- (f) the research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste;
- (g) The responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation;
- (h) an assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must include a profile over time;
- (i) the financing scheme(s) in force;
- (j) a transparency policy or process as referred to in Article 10;
- (k) if any, the agreement(s) concluded with a Member State or a third country on management of spent fuel or radioactive waste, including on the use of disposal facilities.

2. The national programme together with the national policy may be contained in a single document or in a number of documents.



# ARTEMIS Reviews Status

Mission	Member State	Date
ARTEMIS Mission to SOGIN	Italy	3-Jul-17
ARTEMIS Mission to Poland	Poland	1-Oct-17
ARTEMIS Mission to France	France	14-Jan-18
ARTEMIS Mission to Bulgaria	Bulgaria	10-Jun-18
ARTEMIS Mission to SOGIN	Italy	24-Jun-18
ARTEMIS Mission to Luxembourg	Luxembourg	24-Sep-18
ARTEMIS Mission to Eletronuclear	Brazil	1-Oct-18
ARTEMIS Mission to Spain	Spain	14-Oct-18
ARTEMIS Mission to Estonia	Estonia	24-Mar-19
ARTEMIS Mission to Germany	Germany	22-Sep-19
ARTEMIS Mission to Latvia	Latvia	3-Dec-19
ARTEMIS Mission to Denmark	Denmark	7-Jun-20
ARTEMIS Mission to Romania	Romania	2019 Q4*
ARTEMIS Mission to Cyprus	Cyprus	2020 Q4*
ARTEMIS Mission to Slovenia	Slovenia	2021 Q1*
ARTEMIS Mission to Hungary	Hungary	2021 Q2*
ARTEMIS Mission to Lithuania	Lithuania	2021 Q2*
ARTEMIS Mission to Croatia	Croatia	2021 Q3*
ARTEMIS Mission to Ireland	Ireland	2021 Q3*
ARTEMIS Mission to Sweden	Sweden	2022 Q1*
ARTEMIS Mission to Finland	Finland	2022 Q1*
ARTEMIS Mission to Greece	Greece	2023 Q1*
ARTEMIS Mission to the Netherlands	Netherlands	2023 Q1*
ARTEMIS Mission to the Czech Republic	Czech Republic	2023 Q3*

Requested combined IRRS and Artemis:

- Slovenia 2021
- Sweden 2022
- The Netherlands 2023 (tbc)

# General Conclusions



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

### MISSION TO FRANCE

PARIS, FRANCE

14 to 24 January 2018

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY  
DEPARTMENT OF NUCLEAR ENERGY



### CONTENTS

EXECUTIVE SUMMARY .....	1
I. INTRODUCTION .....	4
II. OBJECTIVE AND SCOPE .....	5
III. BASIS FOR THE REVIEW .....	6
1. NATIONAL POLICY AND FRAMEWORK FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT .....	8
1.1. NATIONAL POLICY .....	8
1.2. LEGAL, REGULATORY AND ORGANIZATIONAL FRAMEWORK .....	12
2. NATIONAL STRATEGY FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT .....	21
2.1. SCOPE .....	21
2.2. MILESTONES AND TIMEFRAMES .....	24
2.3. PROGRESS INDICATORS .....	25
3. INVENTORY OF SPENT FUEL AND RADIOACTIVE WASTE .....	26
4. CONCEPTS, PLANS AND TECHNICAL SOLUTIONS FOR SPENT FUEL AND RADIOACTIVE WASTE MANAGEMENT .....	29
5. SAFETY CASE AND SAFETY ASSESSMENT OF RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT ACTIVITIES AND FACILITIES .....	38
6. COST ESTIMATES AND FINANCING OF RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT .....	40
7. CAPACITY BUILDING FOR RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT – EXPERTISE, TRAINING AND SKILLS .....	47
APPENDIX A: TERMS OF REFERENCE .....	A-1
APPENDIX B: MISSION PROGRAMME .....	B-1
APPENDIX C: RECOMMENDATIONS AND SUGGESTIONS .....	C-1
APPENDIX D: IAEA REFERENCE MATERIAL USED FOR THE REVIEW .....	D-1



IAEA

*60 Years*

*Atoms for Peace and Development*

*Thank you!*

ARTEMIS.Contact-Point@iaea.org