Part I: NES publications under preparation*

for more information scroll down or click on a title

1. Establishing and Managing a Radioactive Waste Management Organization with Responsibility for Repository Development
3. Cost-Benefit Analysis (CBA) of New Nuclear Power Projects
4. Techniques and Technologies for the Reduction of Radioactive Liquid and Gaseous Discharges from Nuclear Power Plants
5. Nuclear-Renewable Hybrid Energy Systems
6. Management of Ionization Smoke Detectors and their Associated Disused Sealed Radioactive Sources
7. Developing Roadmaps to Enhance Nuclear Energy Sustainability: Final Report of the INPRO Collaborative Project ROADMAPS
8. INPRO Methodology for Sustainability Assessment of Nuclear Energy Systems: Nuclear Security
9. Contracting and Partnering in Decommissioning and Environmental Remediation
10. Lifecycle Management and Sustainability for Environmental Remediation
11. Conditioning of Low and Intermediate Level Liquid and Solid Waste
12. Evaluation, Management and Remediation of Trenches containing Historic Radioactive Wastes: Legacy Trench Sites
13. Project Management in Construction of Research Reactors
14. Milestones in the Development of National Infrastructure for the Uranium Production Cycle
15. Introduction of Systems Engineering Principles for Nuclear Power Plant Instrumentation and Control
16. Integrated Life Cycle Risk Management for New Nuclear Power Plants
17. Reference Manual for a Management System for Low- Level Waste Processing and Storage Facilities

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** Manuscripts approved in their final form and awaiting production

Part II: NES publications in final form**

16. Summary Review on the Application of Computational Fluid Dynamics in NPP Design
17. Training and Human Resource Considerations for Nuclear Facility Decommissioning (NG-T-2.3, Rev. 1)
18. Stakeholder Engagement in Nuclear Programmes
19. Management of Disused Devices Containing Depleted Uranium (DU) Used for Radiation Shielding
20. Experience in the Management of Radioactive Wastes After Nuclear Accidents: A Basis for Pre-Planning
21. Evaluation of Status of National Nuclear Infrastructure Development (Rev.2)
22. Technology Roadmap for Small Modular Reactor Deployment
23. Integrated Approach to Decommissioning within a Multi-facility Site
24. Data Analysis and Collection for Costing of Research Reactor Decommissioning: Report of Phase 2 of the DACCORD Collaborative Project
25. Transition Management from Operation to Decommissioning in Nuclear Power Plants
26. Fatigue Assessment in Light Water Reactors for Long Term Operation: Good Practices and Lessons Learned
27. Practices for interim Storage of Research Reactor Spent Nuclear Fuel
28. Specific Considerations in the Assessment of the Status of the National Nuclear Infrastructure for a New Research Reactor Programme – Reference document for the INIR- RR Missions
29. Managing Nuclear Design Knowledge Over the Life Cycle – Stakeholder Perspectives, Challenges and Approaches
30. Scenario Analysis and Decision Support for Planning Enhanced Nuclear Energy Sustainability: An INPRO Service to Member States
31. Research Reactor Spent Fuel Management: Options and Support to Decision Making
32. Technical Approaches for the Management of Separated Civilian Plutonium
33. Post Irradiation Examination (PIE) for Research Reactor Fuels
34. Managing Human Resources in the Field of Nuclear Energy
35. Human Resource Management for New Nuclear Power Programmes (NG-T-3.10, Rev.1)
36. Status and Trends in Spent Fuel and Radioactive Waste Management (NW-T-1.14, Rev. 1)
37. Managing Siting Activities for Nuclear Power Plants (NG-T-3.7, Rev.1)
38. Guide to Knowledge Management Strategies and Approaches in Nuclear Organizations
39. Systematic Approach to Training for Nuclear Facility Personnel: Processes, Methodology and Practices
40. Exploring Semantic Technologies and their Application to Nuclear Knowledge Management
41. Terms for Describing Advanced Nuclear Power Plants
42. Reactor Technology Assessment for Near Term Deployment (NP-T-1.10, Rev. 1)
43. Determination of Environmental Remediation End States
44. Communication and Stakeholder Involvement in Radioactive Waste Disposal
45. Resource Requirements for Nuclear Power Infrastructure Development

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46. Organization and Technical Options for Radioactive Waste Minimization during Operation and Maintenance of Nuclear Facilities
47. Knowledge Organization System for VVER Water-Cooled Water-Moderated Power Reactors
48. Guidelines for Conducting Strategic Environmental Assessment for a Nuclear Power Programme

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Additional information for NES publications under preparation (as listed in Part I)

Title	Information
1. Establishing and Managing a Radioactive Waste Management Organization with Responsibility for Repository Development	The objective of the document is to advise on practical aspects of a repository development project, in particular on how to prepare, plan, launch, perform and manage it. Technical activities shall be performed taking into account the possible mutual interactions between cross-linked tasks and relevant interfaces among project components. It is intended to describe managerial processes rather than to specify detailed technical solutions. In this frame, the document should cover both near-surface and geological disposal programmes, with their varying duration, technical focus and intensity of site characterization and assessment, but highlighting similar decision-making processes, methodologies, public interaction, information/data management and sequencing of main activities. The document will be introduced by the consideration of prerequisites before starting a repository development project, followed by the overview of component's specifications, their relationships, and indicative sequence of key activities/stages. Based on experience from countries with advanced programmes, it will further include stepwise description of appropriate planning, managing, organizing, staffing and implementing repository development process that will be illustrated by country cases.
2. Decommissioning of Industrial and Research Gamma Irradiators and Management of Associated Radioactive Sources	This report is intended to collect information on experience and lessons learned from implementation of decommissioning projects for disused gamma irradiators and the management of their associated high activity sealed sources. Based on this information, the report will provide practical guidance for organizations that have a role in this process and will highlight typical issues and concerns in decommissioning irradiators.

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	This document will cover all technical and organizational aspects related with the decommissioning of industrial and research gamma irradiators and the management of the associated radioactive sources including decontamination operations associated with leaking sources. Radiotherapy equipment (Teletherapy, brachytherapy), industrial radiography equipment, nuclear logging equipment and industrial gauges are out of the scope of this document, because their dismantling requirements are comparatively simpler. Information will be provided on the various types of gamma irradiators in use at industrial facilities, or research centers, and how their design and construction features affect decommissioning. Practical guidance will be given on decommissioning strategies and technologies for the removal/recovery and management of the high activity sources. Reports on various gamma irradiators decommissioning projects that have been completed will be summarized. Lessons learned from both good and bad practices will be discussed. This report will address, among others, the following major issues: • Research and industrial gamma irradiators, types, number, construction and operational features • Estimated life and reasons for shutdown of gamma irradiators • Types and features of gamma irradiators and their influence on decommissioning • Radiological characterization of irradiators • Decontamination/dismantling strategies and their occupational / environmental impact • Removal and Management (handling, conditioning, packaging, transport, storage and disposal) of the high activity sources during and after decommissioning. Experiences • Organizational and managerial aspects of decommissioning (including costs) • Project description, experience and issues (Annex) • Case histories (Annex)

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3. Cost-Benefit Analysis (CBA) of New Nuclear Power Projects	The main objective of the publication is to provide practical guidance on how to conduct a Cost-Benefit Analysis (CBA) in the context of the feasibility study of new nuclear power projects. The scope of the publication is the "economic feasibility" chapter of the IAEA's publication on "Preparation of a Feasibility Study for New Nuclear Power Projects" (Nuclear Energy Series No. NG-T-3.3). The publication will develop the content of this chapter, providing a conceptual framework of a standard cost-benefit analysis, covering areas such as – demand and supply analysis; option analysis; financial analysis; economic analysis; and risk assessment –, and guiding the reader through the steps required to apply it to power generation projects.
4. Techniques and Technologies for the Reduction of Radioactive Liquid and Gaseous Discharges from Nuclear Power Plants	The objectives of this report are to (1) identify the typical liquid and gaseous annual effluent rates for the major power reactor types (PWR, WWER, CANDU, BWR); (2) evaluate the radiological impact to humans and the environment from these typical effluent releases; and (3) identify mechanisms and options which have been demonstrated as effective in reducing liquid and gaseous effluents.
5. Nuclear-Renewable Hybrid Energy Systems	This publication presents opportunities for N-R HESs that could be pursued in various member states as a part of their future energy mix. It describes motivation for and potential benefits of N-R HESs relative to independent nuclear and renewable generation that produce electricity alone. Considerations for implementation are outlined, including gaps that require additional technology and regulatory development. This document intends to equip decision makers and stakeholders with sufficient information to consider N-R HESs as an option within regional and national energy systems. The scope of this document includes fission systems traditionally designed for electricity generation, integration options for variable renewable technologies, summary of available case studies, high-level system configurations, stakeholder/public acceptance/regulatory/policy considerations, owner/vendor perspectives. Other considerations not included in this publication are technical design details, detailed analyses, systems integrated solely via the grid, etc.

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6. Management of Ionization Smoke Detectors and their Associated Disused Sealed Radioactive Sources	This report is intended to present information on experiences with and lessons learned from the centralized collection, dismantling and management of ionization chamber smoke detectors and the management of their associated DSRS and secondary wastes. Based on this information, the report will provide practical guidance for organizations that have a role in this process and will highlight typical issues and concerns when dismantling ICSD. This document will cover all technical and organizational aspects related to the collection and dismantling of ICSD and the safe management of their associated DSRS, including decontamination operations associated with sources. The report will specifically describe the general arrangement, highlight the quality management components, identify the manpower requirements and cover certain areas vital for the preparation for dismantling and source conditioning operations. Information will be provided on the various models of ICSD and how their design features affect the dismantling and source recovery operations. The document will describe the general layout of a typical workplan and give a model for the technical procedures. Reports on various ongoing operations will be summarized. Lessons learned from both good and bad practices will also be addressed. This report will address, among others, the following major issues: • Ionization chamber smoke detectors – types, models, main features, radioactive sources, safety aspects, use discontinuation • Risk associated with DSRS from ICSD • Local conditions, operational arrangements • Technical requirements and quality management • Manpower, personnel qualifications • Operational requirements, equipment, quality management • Technical guidelines – dismantling of different models of ICSD, conditioning, designation/preparation of operational areas and working places, equipment, tools, materials, instrumentation • Technical guidelines – preparation of the packages (for storage, for transportation, for disposal), radioactive source handling, encapsulation, capsule closing, leak test • Non-technical aspects affecting the safe management of ICSD and their DSRS • Radiation Protection aspects – general procedures, dealing with possible contamination (surface decontamination) • Record keeping • Technical procedures for ICSD dismantling (Appendix) • Case histories (Annex)

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7. Developing Roadmaps to Enhance Nuclear Energy Sustainability: Final Report of the INPRO Collaborative Project ROADMAPS	The document objectives are to present the major outputs of the INPRO collaborative project ROADMAPS, which are as follows: • The roadmap template representing a structured approach for globally enhancing nuclear energy sustainability, providing models for international cooperation and framework for documenting actions, scope of work, and timeframes for specific collaborative efforts by particular stakeholders • An approach for bottom-up integration of national roadmaps to derive a regional or a global projection of a pathway towards enhanced nuclear energy sustainability • The ROADMAPS Excel tool (ROADMAPS-ET) supporting practical application of the abovementioned approaches and the analysis/visualization of the results of such applications • Examples of a trial application of the roadmap template and the integration approach in a series of case studies performed by project participants. The report describes vision of road mapping towards enhanced nuclear energy sustainability developed over the course of several collaborative projects within the INPRO. The document focuses on sustainability issues associated with nuclear energy. Sustainability of non-nuclear energy systems was not within the scope of the ROADMAPS collaborative project. Specifically, the report presents the details of roadmaps template including several structural elements, interrelated by a common logic and allowing characterizing the current situation in nuclear energy sector and plans or projections for nuclear power development in the time perspective under consideration. The report also provides applications of the roadmap template to national, regional and global long-term nuclear energy planning. In particular, it presents the results of road mapping for technology holder, user and newcomer countries and an example of regional road mapping involving cooperation between a country with a large, well-established nuclear program that exports reactors and several countries with smaller programmes not including or that do not yet have nuclear energy.

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8. INPRO Methodology for Sustainability Assessment of Nuclear Energy Systems: Nuclear Security	In this manual guidance is provided in assessing a nuclear energy system (NES) in the area of physical protection. The manual does not, however, provide guidance on implementing a physical protection regime in a country. Rather, the intention is to check whether such activities are (or will be) implemented to meet the INPRO methodology criteria, and hence the user requirements and the basic principle for physical protection. Physical protection focuses on the prevention and detection of and response to theft (unauthorized removal), sabotage, unauthorized access, illegal transfer or other malicious acts involving or directed at nuclear material, other radioactive materials, associated facilities, or associated activities. The INPRO methodology in the area of physical protection consists of one basic principle and eight user requirements. These requirements, if met, will result in an effective and efficient physical protection regime for the full lifecycle of a NES, i.e. will lead to long term sustainability of the system. They address four general areas of a physical protection regime: • Legislative and regulatory framework • Siting, layout, and design of the NES facilities for physical protection • Design of the physical protection system; and • Contingency planning and consequence mitigation. The INPRO methodology user requirements were developed with due consideration of the Fundamental Principles of Physical Protection defined in the amendment to the Convention on the Physical Protection of Nuclear Material and Nuclear Facilities and the Essential Elements of a nuclear security regime (Nuclear Security Fundamentals, IAEA Nuclear Security Series No.20).

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9. Contracting and Partnering in Decommissioning and Environmental Remediation	This publication is aimed at making available practical guidance regarding safe, timely and cost-effective participation of contractors and partners in a decommissioning or environmental remediation project. The proposed task includes a study of experiences and lessons learned related to the role of and potential issues with contractors and partners in different cultures and working environments. This report will address, among others, the following major issues: - O&M during active phases of decommissioning or environmental remediation - O&M for the post-decommissioning or post-remediation phase of site reuse/redevelopment - Organization of the decommissioning or environmental remediation workforce, including roles, responsibilities, reporting lines, qualifications and training - In-house vs. contractors' approach - Management of contracted services (forms of contracts, administration, milestones, closure, payments etc.) - Interactions contractor - plant staff - Management of information - Partners and their involvement - National project description (Annex) - Case histories (Annex)
10. Lifecycle Management and Sustainability for Environmental Remediation	The objective of the document to be produced is to show how life-cycle assessment approach can be used to direct the development of technical activities according to environmental considerations with emphasis on the environmental remediation stage of the project. With this document Member States will have more elements to design their operations in other to maximize the environmental performance as to choose options that make sense if the whole Life-Cycle perspective of the operations is taken into account. In a very brief way, the scope of the document will cover in an integrated manner the production, processing, waste treatment and disposal, rehabilitation and aftercare stages are integrated. As it can be seen the scope of the document goes far beyond than simple waste management planning and remediation from the very start of a project.

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11. Conditioning of Low and Intermediate Level Liquid and Solid Waste	The handbook is expected to provide end-users in Member States with necessary knowledge and information to understand and effectively implement technologies for conditioning of low and intermediate level liquid, solidified and solid waste. This document will integrate safety and technical information on conditioning of low and intermediate level liquid, solidified and solid waste. The new publication will supersede the outdated IAEA technical documents, published in period from 1970 to 2007 into one consistent handbook on the subject matter for designers, operators and regulators.
12. Evaluation, Management and Remediation of Trenches containing Historic Radioactive Wastes: Legacy Trench Sites	The objective of the report is to record good practices and lessons learned in the approaches used in the characterisation, assessment, remediation and management of sites with buried wastes and to describe the key principles and processes necessary in managing the environmental impact of a legacy trench site[2]. The report will also document the types of legacy trench sites across Member States and record the specific experiences at some Member States through case studies. The scope of the report is discussing the management and remediation process in the context of legacy trench sites. The report will minimise the replication of generic information on the management and remediation of contaminated land but will focus on the specific requirements in the context of legacy trench sites. Where necessary brief discussions are given, and the reader is directed to other Agency publications. It is recognised however, that there are currently some gaps in the NE Series publications regarding the implementation of management and remediation of contaminated land sites. The scope is focused on the environmental impact of legacy trench sites. The characterization, retrieval and preconditioning of the trench wastes is outside the scope of this report. Where necessary brief discussions are given, and the reader is directed to other Agency publications.
13. Project Management in Construction of Research Reactors	The objective of this publication is to provide guidance on project management for the construction of a research reactor and for major modification projects in existing research reactors. It is recognised that details of the requirements for research reactor projects may vary between Member States due to differences in laws, Government policies, regulations, funding requirements, stakeholders, type and size of research reactor, utilization of the reactor and experience with operating nuclear facilities. This publication will provide guidance on project management for a research reactor project from when preparation for construction commences, through construction proper, which is defined as commencing at first concrete pour, and through the completion of construction which includes integrated systems testing. The publication includes consideration of both 'hard' (e.g. engineering, equipment, facilities) and 'soft' (e.g. legislative, regulatory, training) items and project management issues required to build the infrastructure and systems necessary for a safe and operational research reactor and associated facilities.

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14. Milestones in the Development of National Infrastructure for the Uranium Production Cycle	As part of the TC regional projects RAF3007 and RAF2011, a series of presentations have been presented in the various workshops undertaken. The broad concepts were also considered during the UPSAT (Uranium Production Site Appraisal Team) mission to Tanzania in 2013, supported by RAF3007. A structured 'milestones'-based approach was requested by Tanzania during the UPSAT review to help guide them in their development of a uranium production programme. Based on the 2013 UPSAT review meeting and two consultancy meetings held in 2016 and 2016 in Vienna the following sixteen (16) aspects were proposed for the milestones approach in the development of national infrastructure for the uranium production cycle. A discussion of each of these 16 aspects will be included within each of the four milestones. • National position • Legal and regulatory framework • Stakeholder engagement • Safety and radiation protection • Environmental protection • Protection/enhancement of cultural, tourism, farming, pastoral and similar interests • Management/coordination facilitation • Funding and financing • Safeguards • Security • Transportation/export route • Human resource development • Site and supporting facilities (infrastructure) • Contingency planning • Waste (including tailings) management and minimization • Industrial involvement including procurement Reference to the IAEA Safety Standards as well as international leading practice will be utilized for Member State guidance within these 16 aspects across the four milestones. The scope of the document is to first introduce the background of the uranium production cycle from exploration through to decommissioning and remediation. The objectives, scope, users and an overview of the structure will also be provided in the opening chapter. The second chapter introduces the milestones and provides an overview of the four milestones noted in Figure 1. Chapter 3 provides a detailed overview of the 16 aspects noted above including the conditions to be met within each aspect prior to a Member State advancing to the next milestone. The document will also include two relevant case studies – one case study for a newcomer African Member State to the uranium production cycle and the second case study for an African Member State with decades of uranium mining and processing experience.

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15. Introduction of Systems Engineering Principles for Nuclear Power Plant Instrumentation and Control	The objective is to produce a new NE Series (NES) report to assist Member States in understanding the philosophy and methodologies on SE in general (as introduced e.g. by INCOSE) and to promote the adoption of SE and its different applications for the overall engineering lifecycle of safety significant instrumentation and control (as described in IAEA SSG-39). The goal of the document is to provide an overview on the current knowledge, up to date best practices, experiences, benefits and challenges related to the subject approaches (listed under "Scope") on SE. The document is intended to be used by Member States to support the introduction of the SE methodology for all stakeholders involved in the engineering lifecycle of safety significant I&C for NPPs and to discuss how these activities can support the safe, reliable and long-term operation of nuclear power plants. The scope of the publication will cover the essential activities to be performed through the whole engineering lifecycle of safety I&C with the involvement of various disciplines. The tentative list of areas for the scope of this publication include: • Systems engineering overview • Use and value of systems engineering • The various components of systems engineering (e.g. managerial, logistical, technical) • Overall engineering lifecycle • Systems engineering for I&C design • Quality in the I&C life cycle • Regulatory/licensing aspects • Lessons learned from experience (previously completed projects, proven practices, etc.).

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16. Integrated Life Cycle Risk Management for New Nuclear Power Plants	The purpose of a new NES is to describe practical guidelines on various aspects of integrated risk management for NPP construction projects, and to share experiences among Member States regarding good practices in this area. It is planned to highlight the importance of having appropriate risk management policies, especially considering the various contractual and organizational arrangements that exist in different construction and operating organizations and Member States. Specifically, a new NES aims to share experiences from Member States related to risk management for NPP construction project, including refurbishment, and; share experiences related to the development and use of different tools and techniques for NPP construction project risk management. Phase approaches will be used to develop a new NES. Phase I: comprising the feasibility assessment and the project scoping Phase II: consisting of the detailed evaluation, the engineering and licensing application; and Phase III: encompassing the project implementation (construction, commissioning). The existing TECDOCs focused on operation to reduce the radiological, healthy and environmental risk, thus it is necessary to consider NPP construction project reflecting the environment change and the advanced technology development. The new NES will provide practical guidelines how to identify and build a successful risk management strategy focusing on NPP construction project with following issues • Understand the risk framework, and that it includes all relevant types of risk • Develop meaningful metrics for monitoring the effectiveness of risk management (see appendix 1 – example: risk category and main root cause) • Develop risk profile: identifies key risk areas (KRAs) to represent the main or critical areas in NPP project planning and implementation (see appendix 1 – example: Key risk area and mitigation); and • Develop the strategies and techniques to manage or mitigate risks such as reduction of risk, retention of risk, transfer of risk.
17. Reference Manual for a Management System for Low- Level Waste Processing and Storage Facilities	The objective of the task is to develop a technical document (TECDOC) which will suffice the purpose of a reference manual for the preparation of a quality management programme for small scale LLW processing and storage facilities in the latest approach, i.e. integrated management system. The document shall cover a generic quality management programme for small scale waste processing and storage facilities. The targeted practices and/or operations are receipt, pre-treatment (sorting, segregation, characterization), treatment, conditioning, internal relocation and storage of low-level radioactive waste, including disused sealed radioactive sources. The document is intended to be a standalone document so that policy makers and stakeholders can get insights to the quality management of a waste processing facility without the need to resort to other documents to comprehend the subject or comprehend concepts/processing connected to it.

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	The document does not cover facilities processing or storing radioactive waste from nuclear power plants or any other industrial fuel cycle facilities. Processing and storage facilities for high activity disused sealed sources and disposal faculties are also excluded.

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