NES Series under preparation – February 2025

Part I: NES publications under preparation*

for more information scroll down or click on a title

1. Technology Roadmap for Small Modular Reactor Deployment (Rev.1)
2. Decommissioning of NORM related facilities
3. INPRO Methodology for Sustainability Assessments of Nuclear Energy Systems: Proliferation Resistance
4. Going Underground at a Potential DGR Site
5. Valorisation of NORM Residues in Line with the Circular Economy Principles
6. Management of Category 1-2 Disused Sealed Radioactive Sources. Approaches and practical experiences
7. Conditioning of Category 3-5 Disused Sealed Radioactive Sources. Approaches and practical experiences
8. Establishing and Managing a Radioactive Waste Management Organization with Responsibility for Repository Development
9. Contracting and Partnering in Decommissioning and Environmental Remediation
10. Lifecycle Management and Sustainability for Environmental Remediation
11. Design Control in Nuclear Power Plants and Projects: a Structured Process for the Development, Review and Approval of Design and Design Modifications
12. Strengthening Organizational Resilience in the Nuclear Organization
13. Guidance for Preparing Generic User Requirements and Criteria Documents for Small Modular Reactors and their Applications
14. Considerations for closure of near surface repositories
15. Model Curriculum on Strategic Planning for Sustainable Nuclear Energy Development
16. Preparing a Request for Information on Nuclear Power Reactors
17. Stakeholder Engagement in a New Nuclear Power Programme
18. The use of Controls for Contaminated Land Management
19. Leadership in Nuclear Organizations
20. Nuclear Hydrogen Business Case – Evaluation of Factors for Deployment
21. Local Stakeholder Involvement in Nuclear Programmes
22. Methodology for Nuclear Energy Cost Analysis
23. Costs Assessment Methodologies for the Back End of the Fuel Cycle
24. Financing NPP in the Liberalised Market (Reference Report)
25. Existing and Advanced Nuclear Fuel Cycle Technical Options for Waste Burden Minimization
26. Development of waste acceptance criteria for low and intermediate level waste
27. Industrial Involvement to Support a National Nuclear Power Programme (Rev.1)
28. Nuclear Power Plant Project Engineering
29. Processing options for the management of hazardous waste arising from the operation and decommissioning of nuclear facilities
30. Legal and Institutional Issues of Prospective Deployment of Fusion Facilities. Final report of an Interdisciplinary Collaborative Project “INPRO Fusion Study”
31. Implementation of Equipment Reliability Programmes in Nuclear Power Plants: Guidelines, Good Practices and Lessons Learned

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** Manuscripts approved in their final form and awaiting production

NES Series under preparation – February 2025

32. Hydrogen Production Using Nuclear Energy (Rev. 1)

33. Specific Considerations and Milestones for a Research Reactor Project (Rev. 1)

34. Establishing site selection criteria and their application for the siting process of a deep geological disposal facility

35. Electric Grid Reliability and Interface with Nuclear Power Plants (Rev.1)

36. The Management of Knowledge, Competence, and Human Resources, for Effective Long-Term Operations

37. Site characterisation of radioactively contaminated land

38. Opportunities for Nuclear Desalination

39. Stakeholder Engagement in Decommissioning; Pathways to Nuclear Site Repurposing (Rev.1)

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** Manuscripts approved in their final form and awaiting production

NES Series under preparation – February 2025

Part II: NES publications in final form**

40. Preparation of a Feasibility Study for New Nuclear Power Projects (Rev.1)
41. Instrumentation and control and advanced digital technologies for the support of plant performance
42. Reliability and Resilience of Electrical Grid for and with Nuclear Power plant
43. Roadmap for the Commercial Deployment of Nuclear Hydrogen Production
44. Synergies in Technology Development between Nuclear Fission and Fusion for Energy Production
45. International Safeguards in the Design of Radioactive Waste Management Programmes
46. Status and Trends in Spent Fuel and Radioactive Waste Management (Rev.2)
47. Managing Environmental Impact Assessment for Construction and Operation in New Nuclear Power Programmes (Rev. 1)
48. Policy and Strategy for NORM Residue and Waste Management
49. Evaluation, Management and Remediation of Trenches containing Historic Radioactive Wastes: Legacy Trench Sites
50. Guidelines for Conducting Strategic Environmental Assessment for a Nuclear Power Programme
51. Knowledge Organization System for VVER Water-Cooled Water-Moderated Power Reactors
52. Knowledge Management and its Implementation in Nuclear Organizations
53. Milestones in the Development of National Infrastructure for the Uranium Production Cycle
54. Organization and Technical Options for Radioactive Waste Minimization during Operation and Maintenance of Nuclear Facilities
55. Transition Management from Operation to Decommissioning in Nuclear Power Plants

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

Title	Information

* Manuscripts in the process of being drafted (open to contributions)

1. Technology Roadmap for Small Modular Reactor Deployment (Rev.1)	The objective is to update the IAEA NE Series NR-T-1.18 on Technology Roadmap for Small Modular Reactor Deployment by discussing major technology gaps in order to advocate longer term insights associated with readiness, with readiness of the technology, fuel cycle, and deployment models. The scope of the technology roadmap described in this report is the deployment of SMRs of all major types for electricity production and nonelectric applications, and their integration with other energy resources. The emphasis here is on the activities of vendors and end-user perspectives, regulatory bodies and owners/operating organizations, who drive the demand and requirements for reactor designs. This report also provides a methodology for developing a technology roadmap for reactors with account on fuel cycle options.
2. Decommissioning of NORM related facilities	With the above in mind, the overarching objective of this publication is to collect experience with the management of decommissioning of NORM-related facilities (with a special focus on O&G infrastructure) and disseminate this experience within the IAEA Member States. The activities to be dealt with in the publication will be centred on the management of NORM waste and NORM affected land including the intertidal and benthic zones of the marine environment associated with the decommissioning of O&G platforms. Other aspects of decommissioning that are not related to NORM will be out of the scope of the activities of this group Although there are different industrial operations and associated infrastructure that may generate NORM impacted materials, this publication will dedicate special focus on decommissioning of oil and gas operations and infrastructure including: 1. Wells- onshore, offshore, subsea 2. Oil and gas offshore platforms 3. Onshore oil and gas exploration and production infrastructure 4. Floating production and storage facilities and vessels (FPSO, FLNG, FSU, etc.) 5. Sub sea infrastructure e.g., oil and gas pipelines, 6. Produced water treatment facilities including evaporation ponds 7. Midstream and downstream infrastructures- e.g., refineries, terminals, petrochemical facilities etc.

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3. INPRO Methodology for Sustainability Assessments of Nuclear Energy Systems: Proliferation Resistance	The principal objective of this publication is to provide an updated INPRO methodology for a sustainability assessment of nuclear energy systems (NES) in the area of proliferation resistance (PR). The assessment of an innovative NES in the area of PR is for a country that is planning to develop a nuclear power program or maintain or enlarge an existing system. The PR assessment covers proliferation by a non-nuclear weapon State (NNWS) party to the NPT with a safeguards agreement in force through the diversion of declared nuclear material from peaceful nuclear activities and undeclared production or processing of nuclear material at declared nuclear facilities. A sustainability assessment in PR regards the attractiveness of nuclear material and nuclear technology in evolutionary and innovative nuclear systems for use in a nuclear weapon or a nuclear explosive device, and covers the lifecycle of the NES from inception, through construction, operation, and decommissioning. It regards intrinsic features in a nuclear fuel cycle and the application of extrinsic measures, such as international safeguards, in combination with essential measures, such as export controls on sensitive technologies (enrichment and reprocessing) over the lifetime of the NES to provide more effective and resource efficient proliferation resistance. An assessment using the INPRO methodology may confirm that the NES meets requirements, and thus achieved adequate sustainability in PR; or another output from a NESA is the identification of areas where a given NES does not meet requirements and needs improvement. The INPRO methodology for a sustainability assessment should identify NES components that are most vulnerable from a PR point of view. The INPRO assessment may identify gaps in the PR of the NES, areas where the NES does not meet requirements, which gives an opportunity for a State or designer to address them and improve PR of the NES. Furthermore, the assessment may identify vulnerable components that could benefit from research and development (R&D), which could lead to improvements in PR of future NES. In addition to national R&D activities, international options for PR enhancement could be considered (or recommended). Additionally, there should be an estimation of the cost for such PR enhancements, because the NES needs to be economically viable. The NES needs to meet criteria in all areas to be sustainable. The sustainability assessment using the INPRO PR manual does not render a PR score. The assessor is assumed to be an expert or a team of experts in non-proliferation (or PR), that may be using the support of qualified organizations with relevant experience in nuclear safeguards implementation. It is strongly recommended that INPRO PR assessments be done with participation from the IAEA INPRO section and the IAEA Department of Safeguards. This updated INPRO manual for PR is in the same standard format of recent updates to INPRO manuals in other assessment areas, to make it easier for assessors using the INPRO methodology. INPRO encourages users of this manual to study the INPRO overview volume and introductory publication to become familiar with the general goals of INPRO and the assessment methodology; these are the “Guidance for the Application of an Assessment Methodology for

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	Innovative Nuclear Energy Systems, INPRO Manual–Overview of the Methodology, Vol. 1" and "Introduction to the Use of the INPRO Methodology in a Nuclear Energy System Assessment", which are currently being updated. The sustainability in PR covers proliferation by State actors in diversion of nuclear material and misuse of nuclear facilities. It does not cover activities by non-State actors, such as terrorists, specifically regarding theft of nuclear material and sabotage of nuclear facilities. Theft and sabotage are specific areas associated with nuclear security and physical protection of nuclear facilities.

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4. Going Underground at a Potential DGR Site	The objective of the publication is to gather experiences gained and summarize these into a publication that can serve Member States (MSs) as a reference handbook in planning their initial excavations at a DGR site. To this end the publication will draw upon experience from both successful and unsuccessful attempts to go underground as part of a DGR programme. The document will further define key inputs and constraints to assist MSs in their planning activities, including associated potential programmatic and technical risks. The publication will incorporate case studies as examples of good practices and lessons learned upon which the discussion and conclusions will be based. This publication focuses on the technical and programmatic issues that need to be considered in planning the first underground facilities at a potential DGR site. This planning includes preparation of a site descriptive model, repository design, repository monitoring programme, and similar. It will present examples from similar facilities, such as URFs, constructed in various host formations as well as current planning and previous attempts at going underground at potential DGR sites by MSs. The scope will be limited to radioactive waste management programmes that are, or will be, planning for the disposal of HLW, including spent nuclear fuel when classified as waste and the construction of the initial underground facilities. It will not discuss the operational or closure phases of the DGR.
5. Valorisation of NORM Residues in Line with the Circular Economy Principles	This practical publication, aimed particularly to help implementers, complements the other reports produced in the context of the Environet NORM project and will provide an overview and inventory of case studies, success stories and pitfalls and lessons learned concerning of the international state-of-the-art residue and waste valorisation technologies relevant to NORM. It will also offer different stakeholders such as industry, regulators and policy makers, and academia with the evidence-based tools and good practices conducting multi criteria analysis of the sustainable recovery, re-use, and recycling of NORM, including social and environmental management and monitoring plans. Finally, it is envisioned that the publication will contribute to enhance the capabilities of MS in reaching and maintaining consensus among both relevant stakeholders about risks and benefits of NORM residues and waste valorisation options within the circular economy transition. This publication will examine the valorisation of NORM residues associated with the following industrial operations: extraction of rare earth elements; production and use of thorium and its compounds; production of niobium and ferroniobium; mining of ores (other than uranium ore); the zircon and zirconia industries; manufacture of titanium dioxide pigment; the fertilizer (phosphate) industry; production of iron and steel, tin, copper, aluminium, zinc and lead; combustion of coal; production of oil and gas; water treatment. Radioactive wastes generated by operations related to the nuclear fuel cycle will not be dealt with by this publication that will not cover either operation of any type involving artificial radionuclides.

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6. Management of Category 1-2 Disused Sealed Radioactive Sources. Approaches and practical experiences	The document is expected to provide MSs with relevant information and practical experiences on how Category 1-2 disused sealed radioactive sources are properly managed. Taking account of the international experiences, the publication aims to identify the latest developments, technical options and key activities to be taken to ensure that disused sealed radioactive sources are safely and securely managed. The report will cover a wide range of aspects of the life cycle of Category 1-2 sealed radioactive sources, including manufacturing, applications, management options, national strategy for the disused sources, etc. This document will take into consideration the content of the IAEA Code of Conduct on the Safety and Security of Radioactive Sources, which describes how States can safely and securely manage category 1-2 sealed radioactive sources. The report is in line with the IAEA supplementary Guidance on the Management of Disused Radioactive Sources, which advises States on the available management options for disused sealed radioactive sources.
7. Conditioning of Category 3-5 Disused Sealed Radioactive Sources. Approaches and practical experiences	This publication is intended to present information on experiences with and lessons learned from the conditioning of DSRS. Based on this information, the publication will provide the administrative, management and technical guidance for conditioning of DSRS, including the dismantlement of nuclear gauge and devices. This publication will provide the necessary information for regulators and operators in Member States to thoroughly assess and implement the conditioning operations for the safe and secure storage and/or disposal of DSRS. This publication will cover all technical and organizational aspects related to effectively implement the conditioning of DSRS. These operations should be part of the national overall DSRS management strategy in all Member States. The publication will summarize on various completed and ongoing international experiences on the conditioning operations for DSRS. Lessons learned from both good and bad practices will also be addressed.

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8. 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. 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)

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	Case histories (Annex)

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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. Design Control in Nuclear Power Plants and Projects: a Structured Process for the Development, Review and Approval of Design and Design Modifications	This publication will aim to provide a generic implementation level guidance, based on the experience and current knowledge, for design control, i.e. for developing, establishing, implementing, assessing, and continually improving a structured preparation, review, acceptance, approval and modification of NPP project and plant designs and associated responsibilities, including the cases of new NPP designs, changes to the existing NPP designs and redesign of NPPs. It will address relevant aspects of performing effective design (and the modifications to it) development, review and approval in support of decision making on nuclear project/plant safety and performance by providing a common understanding of the design activities and their implementation throughout the NPP lifecycle. It may also serve as a roadmap towards capacity building in countries embarking on nuclear power programmes by describing forthcoming design development acceptance, control and maintenance activities and associated skills. The publication intends to disseminate the observations gained, the lessons learned and the conclusions drawn from good practices for defining and maintaining fundamental elements, roles, responsibilities and interfacing requirements for NPP owner/operating organizations and nuclear power plant/project entities concerning the acceptance and utilisation of initial facility design (and the changes to it thereafter). As such, it provides a set of descriptive and practiced processes that integrate safety, performance and economical aspects to achieve safe, reliable, and efficient nuclear electricity and energy generation with an emphasis on strengthening the design decision making capabilities supported by adequate and timely maintenance and control of the NPP design. This publication will describe the specific design process stages, elements and associated design control activities and roles that are applied throughout NPP lifecycle by the decision makers of a NPP or a NPP project. In order to provide guidance for a structured and rigorous design control process, this publication will develop an understanding of fundamental and specific definitions, phases and techniques, interfaces and assessment methods of the design control process towards design decision making capabilities on the NPP design at various stages of its lifetime to maintain the design integrity. The scope will not include the design control process during the development of a technology (e.g. design of a generic/standard reactor design) that is performed by the technology owners, i.e. nuclear steam supply system (NSSS) vendors/responsible designers. However, the publication will discuss necessary actions by the purchaser of the technology to ensure that the technology owner/designer has an established and appropriate design control and assurance processes.

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12. Strengthening Organizational Resilience in the Nuclear Organization	This publication is intended to offer guidance on how to elicit and strengthen resilient performance at the individual, group, and institutional levels to optimize nuclear safety, security, and performance and create institutional strength in depth. This document will cover the following content: - Cognitive and behavioural agility - Adaptive capacity - Decision-making, both risk-based and naturalistic (e.g., emergent) - Navigating in complex and complicated environments - Risk analysis and success path formation.

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13. Guidance for Preparing Generic User Requirements and Criteria Documents for Small Modular Reactors and their Applications	To serve as a guidance document that provides a framework to cover any near-term deployable SMR designs, basing on identify identified specific requirements and criteria associated with the need of SMR technologies for various energy market niches, by considering key technology attributes of SMRs and Member States' specific needs and conditions, with feedbacks from Member States by conducting exchange of information, sharing experience and expertise, and discussions on the development of guidance on preparing generic user requirements and top-tier criteria for small modular reactor technology for near term deployment. The scope of Guidance for Preparing Generic User Requirements and Criteria Documents for Small Modular Reactors and their Applications herein is for developing a comprehensive statement which reflects key policy of a Member State on the expectations of its user/owner/operator on SMR technology. This publication places emphasis on the standing points of users/owners/operators who drive the demand and requirements for the reactor designs. It also provides a basis for designers/developers to offer a licensed SMR product that addresses/incorporates specific needs of embarking countries, and for strong investor confidence that risks associated with the initial investment to complete and operate the first SMR can be minimized. The publication is divided into three parts: **Part I** is to establish the background, objective, scope and structure of the guidance for preparing GURC documents for SMR and their applications. **Part II** is to introduce GURC and to provide a generic structure and main contents that need to be addressed for the GURC document. The generic structure includes national nuclear energy programme, national scenario of energy for electricity and other applications, overall safety performance objectives, technical considerations, general plant performance, economic requirements, deployment scenario, infrastructure development, considerations on deployment models, safeguards, proliferation resistance, security, and microreactors options. **Part III** is to summarise and give a set of recommendations. The Appendix A shows the status of SMRs for near-term deployment. The Appendix B lists the IAEA's Safety Standards for readers' reference. The Annex provides an example of GURC Document respectively of an embarking country and of an expanding country, only on the aspect of top-tier requirements.

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14. Considerations for closure of near surface repositories	The objective of the publication is to summarize information on approaches to ensuring adequate closure of near surface disposal facilities, specifically in consideration of the period of institutional control common to these types of facilities. To this end the publication will examine current best practices based on facilities which have been designed and licensed by IAEA Member States in developing sufficiently passive closure systems, which provide for minimal maintenance or intervention needs throughout the period of institutional control. The document will further capture best practices and considerations for designing and monitoring cover systems; planning and preparedness for potential incidents, which may occur that could affect the capping systems performance during the closure period; consideration of future land usage; financial planning responsibilities for closure over the period of institutional control; and records retention aspects related to closure of near surface repositories. The publication will incorporate case studies in way of examples and lessons learned upon which the discussion and conclusions will be based. This publication focuses on near surface disposal facilities and discusses mainly technical and some socio-economic issues that need to be considered in the planning and implementation of repository closure. It will present examples from licensed facilities in Member States on both operational, technical and social- economic aspects of repository closure. The scope will be limited to radioactive waste management aspects of near surface disposal of low level waste (LLW). The document will not discuss aspects of radioactive waste disposal specific to the disposal of Intermediate Level Waste (ILW), High Level Waste (HLW) and/or spent nuclear fuel (SNF) when classified as waste.

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15. Model Curriculum on Strategic Planning for Sustainable Nuclear Energy Development	This publication is intended to provide a model curriculum for a master's degree course covering topics related to the strategic planning for sustainable nuclear energy development. The publication can be used and or adopted by university curriculum developers as well as faculty and instructors from academic and other educational institutions, including centres of excellence and vocational education, that are implementing or considering educational programmes on the long-term planning for sustainable nuclear energy development. The objectives of such a course of study is to update students on the current status of electricity generation in the world with emphasis on pros and cons of all possible industrial energy sources non-renewable including nuclear power as well as renewable, provide independent overview of current status and future developments in nuclear-power industry of the world including advanced large power-reactors, SMR concepts, and Generation-IV reactor concepts, and corresponding to that nuclear power plants of today and of tomorrow and deliver assessment capabilities of the INPRO methodologies, which can be applied to all reactors and nuclear power plants. They will learn about the context of these approaches, why they were developed and how they can be useful to Member States and key organizations in Member States to reach informed decisions on nuclear. The course is structured to provide sufficient breadth and depth so that students can utilize the inform on INPRO but provide the context and guidance so they can explore INPRO methodologies in more detail. It will be a basis for them to ultimately become specialists and even subject matter experts for roles they may have in their careers. The course aims to support capacity building and national human resource development in the nuclear energy sector and intended for Master level students of Nuclear Science, Nuclear Technology and Nuclear Engineering. This publication offers a framework for a master's degree course in strategic planning for sustainable nuclear energy development. Prerequisite for the proposed course is a bachelor's degree in nuclear sciences or engineering. It is recommended that the course be included in the master programme, when a basic or intermediate level of nuclear knowledge has been acquired. At this point the student should be able to comprehend the value of managing this knowledge as asset. More specifically the prerequisites are discussed for each module of the syllabus. The scope of this publication covers the following topics: - Planning and energy strategies for sustainable development. - Planning for nuclear energy sustainability.

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	- Innovations in nuclear energy sector in meeting sustainable energy development challenges. - IAEA INPRO methodology and tools for sustainability assessment of nuclear energy system. - Methods and tools for planning sustainable energy development. - Methods and tools for modelling and analysis of nuclear energy systems. - Practical application of tools for planning and assessment of energy systems.

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16. Preparing a Request for Information on Nuclear Power Reactors	The objective is to give member states a clear guide to structure their RFI and conduct the process flawlesslyso that they can better understand what the vendors can offer and how it fits their needs. The guidance should go beyond listing criteria and focus instead on the process itself, drawing on the experience of Member States which actually conducted an RFI in the last few years. The objective is to allow Members States to gather useful information, applicable to their countries and helpful in implementing their nuclear power programmes, with the aim to enter negotiation at the end of Phase 2 of the Milestone Approach. This publication places emphasis on the standing points of users/owners/operators who drive the demand as well as on the requirements for the reactor designs and support services (operation, maintenance, training, fuel supply, etc.). It also provides the Member States with a basis for getting relevant information from technology providers, which allows them to further define their nuclear power programme, considering what is available on the market.

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17. Stakeholder Engagement in a New Nuclear Power Programme	The publication will provide guidance on stakeholder engagement for each phase of the IAEA Milestones Approach, providing examples of activities relevant for each phase of nuclear infrastructure development. The roles and responsibilities of the key organizations in nuclear power programme development will also be discussed in the context of the phased approach. The publication will include operations-level examples on the contents and modalities of stakeholder engagement, including public communication, in the context of newcomer states planning and implementing a new nuclear power programme. The guidance may also be useful to those states intending to expand their existing power programmes. The guidance will link closely stakeholder engagement activities to the development of the nuclear power programme/project, highlighting some of the options that countries face in the different phases. The publication will provide countries considering nuclear power with ideas for activities to foster stakeholder engagement and communication taking into account the lack of resources and budget that is often observed in the initial phase. The publication will then guide organizations moving forward with the programme to scale up their activities and capacities to fit the next phases. The document is not intended as prescriptive guidance, but as a starting point to support countries develop their own strategies and plans. The publication will describe good practices in a new nuclear power programme, highlighting the options available in the area of stakeholder engagement and communication to countries considering, planning or implementing new nuclear power programmes/projects. The document will follow the Milestones Approach and provide and discuss examples in the framework of the three phases, including how stakeholder engagement relates to other nuclear infrastructure development issues. The publication will not provide: - Information on stakeholder engagement in non-nuclear power facility activities. - Information on stakeholder engagement in other life cycle phases (i.e. operation, decommissioning) though it will emphasize why effective stakeholder engagement during nuclear infrastructure development builds an important foundation, including for emergency planning (one of the 19 infrastructure issues). - Wording for key messages, which are to be developed at national or organizational levels.

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18. The use of Controls for Contaminated Land Management	The objective of the report is to document the key principles, concepts, and Member State experience in the use of controls for contaminated land sites. This will include recording the types of controls that can be used with their benefits and detriments. The publication will present Member State case studies and highlight the good practices, successes, and challenges. All sites where land contamination is present (e.g. NNP, fuel cycle sites, research sites, mining and mineral processing, NORM, former weapons and defence, etc. All sites planning controls or under controls prior or following remedial activities to address land contamination.
19. Leadership in Nuclear Organizations	This publication is intended to gather and disseminate good leadership strategies and practices for its establishment and development in Member States to: • Raise the awareness of the positive impact of leadership development and strong organizational cultures for safety, security, safeguards, environment, human health and the organizational economics performance; • Benefit future leadership and organizational culture development programmes to be launched or ongoing across Member States; together with its evaluation processes; • Disseminate an understanding of the needs of nuclear leadership in the pursuit of nuclear energy sustainability. This publication provides an insight on the best guidance to address leadership, its development programmes, phases and organisational aspects, and the evaluations within the nuclear facilities and activities; in line with previous IAEA publications related to the topic, together with the experience and good practices from IAEA Member States and international leadership practitioners.

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20. Nuclear Hydrogen Business Case – Evaluation of Factors for Deployment	Given the variables which decision-making will have to consider as well as their correlation, it would be of great interest to identify the factors seen by the utilities as crucial for the business case of nuclear hydrogen production and the market circumstances in which they are selected. This could be of great help to Member States considering an expanded role of nuclear power, especially in the context of effective economy decarbonization. Equally important, and of great interest to Utilities, it could highlight the potential for improved economics of nuclear power by developing additional revenue streams. More specifically, this publication will include case studies and discuss among other (1) how to build the business case, critical components, (2) the rationale for nuclear hydrogen production, (3) the specific market conditions, (4) the preferred technologies such as low or high temperature electrolysis, thermochemical cycles, steam reforming etc. as well as relevant context, (5) competing and long-term alternatives, (5) the approaches for optimizing the revenues, and (6) need for environmental premiums. These are the factors that influence the business case for nuclear hydrogen, though their importance can vary in specific market conditions. Correctly assessing the business case, the elements of which are discussed here, can lead to increased competitiveness of both, nuclear power and hydrogen generation. The scope of the publication encompasses Utility and user industry perspectives on what constitutes a sustainable business case for nuclear hydrogen production. It will therefore include Utility and user rationale for nuclear hydrogen production, technology considerations with relevant licensing and cost implications, supply chains, markets and relevant incentives as well as business case optimization approaches.
21. Local Stakeholder Involvement in Nuclear Programmes	To provide practical guidance relevant to stakeholder engagement at the local level for all nuclear facilities and activities. Practical guidance for stakeholder involvement at the local level concerning all nuclear facilities and activities, except for topics relevant to communication with the public in a nuclear or radiological emergency; and details relevant to specific types of nuclear facilities or activities.

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22. Methodology for Nuclear Energy Cost Analysis	The main objective of the publication is to address nuclear newcomer countries needs in terms of approaches for cost estimation and management of cost estimates. Nuclear newcomers are interested primarily in infrastructure development and on the construction – and operation – of their first nuclear power plant. The report is intended to be periodically updated (e.g., every 2-4 years) to update information and accommodate additional topics of interest to IAEA Member States. The first release of this publication will focus on activities such as infrastructure development (both "soft" and physical infrastructure), reactor construction and operation (the focus will be on the present generation of nuclear reactors (Generation III and III+) and on the Small Modular Reactor (SMR) likely to be deployed within the next 10-20 years), reactor decommissioning, and management of spent nuclear fuel and radioactive waste. Estimating the costs attached to each activity, identifying their drivers, and exploring ways to reduce them, will be the main topics to be developed. The cost estimating techniques used in the conventional power industry derive from existing practices in large infrastructure projects and the process (chemical and petrochemical) industry. These approaches, described, for example, in AACEI's publications (AACEI stands for *Association for the Advancement of Cost Engineering International*), can be adjusted to the nuclear industry. Other potential references, and starting points, to frame cost estimating for nuclear plants, could be the US GOA *Cost Estimating and Assessment Guide*, the UK HM Treasury *Green Book (Appraisal and Evaluation in Central Government)*, the US NASA *Cost Estimating Handbook*, and the US DOE *Advanced Fuel Cycle Cost Basis* report. The *table of contents*, in Annex, suggests an outline for the publication. The outline of the report is designed so that future report revisions can provide updated content and include additional cost areas (e.g., innovative nuclear power and fuel cycle technologies).
23. Costs Assessment Methodologies for the Back End of the Fuel Cycle	The objective is to develop a **guidance** document on developing the back end of the fuel cycle (BEFC) cost elements. It is proposed to structure the document in a manner whereby it can be readily updated. The main body of the document will be generic high level guidance and the appendices will contain reference information which will evolve with time. Reference information to include tools for making decisions (matrix, map) including: risks and uncertainties valuation; approach/methodology for comparing options; and case studies and appropriate use of base data.

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24. Financing NPP in the Liberalised Market (Reference Report)	Provides case-by-case information on the financial models and contract approaches used or proposed by vendors/ host countries for building NPPs. The objective is to provide examples, therefore it's a financial cases database/ reference book Ensures practical application of financial approaches (cases and examples) and help Member States with practical understanding of financing theories (what was used, how it was used, what's the outcomes, what's the challenges). Covers all the world's cases (all cases of building and planning NPPs) – the uniqueness of the report is pulling all the cases together. • Provides information about financing of the most cases of NPP construction (if the information is available from public sources). Includes the update on market reforms for the countries which have, build (in process), or propose (plan) to build NPPs, and the impact of the market reform on the model. • Also includes information about government incentives and subsidies for supporting nuclear (current and under construction) in the liberalized market.
25. Existing and Advanced Nuclear Fuel Cycle Technical Options for Waste Burden Minimization	The document aims at providing policy and decision makers with information about how different Fuel Cycle strategies can minimise the burden of generated waste in order to help them to make informed decisions. The objective is to write a high-level document, "easy to read", for policy and decision makers using the detailed information already existing in the literature, not duplicating this effort. The document aims at reviewing and updating the technological developments in current and advanced fuel cycles leading to minimization of waste burden at disposal as well as to identify key issues related to hydro and pyro processing technologies for waste burden reduction. To provide full spectrum of available and/or future options for Spent Nuclear Fuel Management, with emphasis on waste burden minimisation, structured in an increasing order of sophistication and performances. The spectrum can provide appropriate options for Member States having different environmental and safety constraints.

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26. Development of waste acceptance criteria for low and intermediate level waste	The objective of the document is to provide background information and advice on the development, implementation and use of radioactive waste acceptance criteria in all stages of the radioactive waste management. The quantitative or qualitative requirements shall be identified, associated operational parameters proposed and relevant testing or measuring procedures described. Non-conformity procedures shall be outlined and adequate formal and technical action explained. The document will provide a brief specification of typical waste package types and relevant handling, transportation, storage and disposal systems for low and intermediate level waste. With respect to this, needs for waste acceptance procedures will be determined and principles for their application explained. Waste acceptance criteria for interfaces among particular waste management operations (transport, storage and disposal) will be listed and characterised respecting their division in the safety, technical and administrative categories. Information regarding each criterion will include bases for its formulation/development, parameter(s) suitable for its quantification, suitable measuring method(s) and control procedures during takeover of a waste package. Specific features of different waste packages will be respected. Specific space will be devoted to the problem of determination of preliminary waste acceptance criteria for countries without disposal system: potential approaches and solutions will be discussed. Finally, the document will deal with management of non-conformities. In particular, relevant procedures, decision making, potential actions and principles for their selecting will be described.

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27. Industrial Involvement to Support a National Nuclear Power Programme (Rev.1)	The objective of this revised publication is to update the current IAEA publication “Industrial Involvement to Support a National Nuclear Power Programme (IAEA NE Series No. NG-T-3.4)” by providing comprehensive guidance on the industrial involvement in respective phases of the Milestones Approach. It will include updates of current trends in the area and incorporate case studies with good examples from Member States as well as the relations between industrial involvement and SMRs. Industrial involvement of the recipient country can contribute to the macro-economic impact of the project and prepare the country in the long run to localize some elements of the supply chain or services associated to the project. This publication is to facilitate better understanding of overall industrial involvement and its core topics crucial for deployment of nuclear power plants by identifying specific actions necessary to achieve milestones in respective phases and providing live experience in the real world, whether it is good or not good, with Member States in reference to countries that successfully deployed nuclear power plants.
	The objective of this revised publication is to update the current IAEA publication “Industrial Involvement to Support a National Nuclear Power Programme (IAEA NE Series No. NG-T-3.4)” by providing comprehensive guidance on the industrial involvement in respective phases of the Milestones Approach. It will include updates of current trends in the area and incorporate case studies with good examples from Member States as well as the relations between industrial involvement and SMRs. Industrial involvement of the recipient country can contribute to the macro-economic impact of the project and prepare the country in the long run to localize some elements of the supply chain or services associated to the project. This publication is to facilitate better understanding of overall industrial involvement and its core topics crucial for deployment of nuclear power plants by identifying specific actions necessary to achieve milestones in respective phases and providing live experience in the real world, whether it is good or not good, with Member States in reference to countries that successfully deployed nuclear power plants.

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28. Nuclear Power Plant Project Engineering	Several organizations internationally offer engineering management knowledge basis; however, the specifics requirements of nuclear projects may not be reflected completely within existing resources. The objective of this publication is to develop guidance on engineering management for the nuclear power plant projects to: • Support owners for preparation and implementation of nuclear power plant construction and subsequent operation. • Help owners develop their technical support organization (TSO). • Centralize (vs site specific) engineering management. • Share good practices and present experiences related to engineering management. • Build a knowledge base for nuclear power plant project engineering management. This publication is intended primarily for providing practical information about various management approaches necessary to manage nuclear project engineering activities during nuclear power plant construction, commissioning and operation. A coordinated approach is presented, facilitating compliance with national and major international legislative and regulatory requirements and standards. IAEA publications are referred to, where appropriate, for more detailed information and guidance on specific aspects.
29. Processing options for the management of hazardous waste arising from the operation and decommissioning of nuclear facilities	The objective of this publication is to provide Member States with relevant information regarding processing of hazardous radioactive waste. This objective will be achieved by reviewing the implementation of the waste management principles, together with the regulatory, technical and financial factors influencing waste minimization practices. This publication describes and provides guidance on various methodologies, practices, and approaches for processing of hazardous radioactive waste arises from nuclear facilities. The information it provides could also facilitate the planning of new facilities and decommissioning activities. Waste minimization by processing technologies of non-hazardous waste during operation and decommission, as well as other non-radioactive operational waste arisings (as described in various IAEA publications) are excluded from this publication.

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30. Legal and Institutional Issues of Prospective Deployment of Fusion Facilities. Final report of an Interdisciplinary Collaborative Project "INPRO Fusion Study"	International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) initiated a Collaborative Project (CP) to perform an Interdisciplinary Study on "Legal and Institutional Issues of Prospective Deployment of Fusion Facilities" to support interested Member States in planning to license, construct and operate First-of-a-kind (FOAK) commercial fusion powered facilities and integrated fusion-fission systems within the next decades. The study's aim is to contribute to the synergies in technology development between nuclear fission and fusion for energy production with a focus on non-technical aspects for sustainable deployment. INPRO's cross cutting work in advanced nuclear system analysis and evaluation provides a framework to accelerate the deployment of fusion power plants. The overall objective of the INPRO Fusion Study on "Legal and Institutional Issues of Prospective Deployment of Fusion Facilities" is to support the fusion community in its effort to accelerate the development and implementation of fusion based facilities and integrated fusion-fission systems within the next decades, with the early identification of possible gaps in long-term sustainability and needed capabilities utilizing INPRO assessments and analyses. Achievement of the overall objective will be through cooperative work on cross cutting issues performed by the IAEA and INPRO Member States along with inter-departmental IAEA cooperation. The following are the specific objectives, and the scope of work was set in the Terms of Reference (TOR) for the INPRO Fusion Study. 1. Review and critical analysis of previous experience in the development of national legislation and infrastructure, including not just for power generation but also facilities with analogous technical and operational aspects to fusion (e.g., particle accelerators, target irradiation for isotope production, etc.) 2. Engage with those pioneering new fusion concepts to understand what they see as key risks to deployment and exploring what new regulatory concepts can address those risks while still providing assurances in the areas of public safety and security. *(In line with two TECDOCs being developed by the NSNI that explore regulatory concepts that will ultimately influence the future development of safety requirements for fusion facilities. Related references will be provided).* 3. Discuss the long-term sustainability issues for prospective deployment of fusion based facilities with a focus on non-technical aspects. 4. Consider application of INPRO methodology and approaches for long-term sustainability assessment of overall elements of innovative energy systems with fusion based facilities. 5. Review legal and institutional issues, factors, and challenges, then identify gaps considering the current international instruments and national nuclear legislation and regulations. These issues may include: 5.1. Nuclear safety issues, including specific issues covered as part of the synergies in the Nuclear Power and Technology Development Section (NPTDS), options for new regulatory concepts that may apply to fusion, covering the lifecycle of a fusion facility, taking into consideration ongoing works already

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	covered by the IAEA departments on Nuclear Safety and Security (NS), Nuclear Sciences and Applications (NA) and OLA. 5.2. Legal aspects including liability (international conventions, national legislation and regulations) 5.3. Nuclear security issues 5.4. Safeguards and non-proliferation issues 5.5. Key export/import concerns 5.6. Comprehensive infrastructure issues 6. Identify the main drivers and impediments to the implementation of fusion based facilities. 6.1. Fusion potential for nuclear waste transmutation 6.2. Potential for manufacturing efficiencies via “Gigafactory” production of fusion facilities 6.3. Need to address climate change 6.4. Capacity building 6.5. Human resources development 6.6. Licensing timelines 6.7. Insurance challenge 6.8. Describe for documentation of the state of the technology the various fusion designs, including current public-sector and more recent private sector design concepts 7. Analysis of the results to include the following items: 7.1. Analysis and conclusions regarding gaps in legal and institutional aspects of the prospective deployment of fusion based facilities, and new capabilities to be explored and developed. 7.2. Analysis of various experiences in the development of legislation, (including liability,) regulatory framework, key export/import issues, safeguards considerations, nuclear security concerns, nuclear safety and licensing 7.3. Analysis of the infrastructure of planned fusion facilities and the drivers and implementation existing, e.g., in the areas of economics, human resources development, capacity building, etc.

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31. Implementation of Equipment Reliability Programmes in Nuclear Power Plants: Guidelines, Good Practices and Lessons Learned	The primary objective is to produce a NE series publication that provides generic guidance on how to structure, manage and implement Equipment Reliability Programmes (ERP) in Nuclear Power Plants while comparing existing models of ERP and assessing the lessons learned from their implementation. This will help new operators but also well-established operators designing or improving an ERP to suit their specific situation and adapt to changes in their business environment. The publication is also intended to provide consistent technical outlines ("a minimum basis") for all SSCs to be covered by an ERP and thus to supplement / be overarching to the existing IAEA detailed technical publications dealing with specific components. An objective of the publication is therefore to include generic lists of SSCs subjected to an ERP for PWR, BWR and PHWR and to identify in principles which technical parameters should be monitored with which technology for those SSCs, referring to existing standards and approaches when relevant. Another key objective is to share good practices and lessons learned from implementation of ER programmes and discuss the up-to-date innovative approaches to be applied, such as e.g. the use of innovative technologies, Artificial Intelligence and digital twins of equipment, as well as process and procedure innovation, to support an effective life management of NPPs. The topics to be covered in the document will be as follows: • Guidance for structuring, implementing and managing an Equipment Reliability Programme (ERP) at Nuclear Power Plants (incl. recommendations for establishing committees and setting up reports, such as system heath reports or function health reports) • Generic list of systems, structures and, components to be covered by an ERP for PWRs, BWRs and PHWRs (this list will be consistent with similar lists in existing Agency publications as appropriate) • Guidance for evaluating the effectiveness of an ERP (incl. comparison of different Equipment Reliability Index) • Good practices from implementation of ERP throughout the Industry (incl. typical technical/physical parameters to be monitored and the corresponding technologies / inspection techniques / periodicity for key SSCs – references to existing IAEA publications will be made where appropriate) • Major Challenges and solutions for Equipment Reliability, incl. innovative approaches from the nuclear power industrial sector • Appendix: Examples of ERP implementation (Canada, China, UK, USA, France, Russia, etc.).

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32. Hydrogen Production Using Nuclear Energy (Rev. 1)	The publication will be a revision of the IAEA publication Hydrogen Production Using Nuclear Energy, IAEA Nuclear Energy Series No. NP-T-4.2 (2012). The objective of this publication is to address the recommendations received by Member States representative with the occasion on topical technical meetings on hydrogen production using heat derived from nuclear energy and collect the state of the art in the high temperature processes for hydrogen production using nuclear energy, alongside identifying options for using existing reactor fleet for hydrogen production at high temperatures, coupling hydrogen production facilities with high temperature reactors, using heat upgrades and the associated challenges of each of the options. The publication will provide an overview on the latest developments and options of using nuclear energy to support hydrogen production at high temperatures, and is destined to specialists on the topic, decision makers, hydrogen strategists and other stakeholders interested to get up to date knowledge on the capitalization of nuclear heat for hydrogen production. The publication will cover the theoretical aspects of high temperature efficiencies based on thermodynamics, an overview of the high temperature hydrogen production technologies (including high temperature steam electrolysis, thermochemical cycles, steam methane reforming, gasification of coal and biomass, methane pyrolysis, co-electrolysis), aspects of nuclear reactor technology coupling with high and low temperature processes heat for hydrogen production, as well as aspects of water requirements for hydrogen production.

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33. Specific Considerations and Milestones for a Research Reactor Project (Rev. 1)	The main objective of the revision is to incorporate the recent experience of newcomers and advanced embarking countries, taking into account typical challenges illuminated during INIR-RR missions. This publication will provide a discussion of the mechanisms for justification of a research reactor, and for building stakeholder support. It also will present a framework of milestones in the development of a national nuclear infrastructure for research reactors, such that the Member State can confirm that it has: 1. A justified need for a research reactor; 2. Comprehensively recognized and identified the national and international commitments and obligations associated with the construction of a research reactor; 3. Established and adequately prepared the national infrastructure prerequisite to the construction of a research reactor; 4. Established all the competences and capabilities necessary to regulate and operate a research reactor safely, securely and economically over its lifetime, and to regulate and manage the ensuing radioactive waste; 5. Established adequate funding and review mechanisms adequate for the research reactor project throughout its life cycle. The scope of the publication includes both the 'hard' (facilities) and 'soft' (legislative, regulatory, training, etc.) infrastructure items needed for a research reactor, and the evolution of infrastructure needs from the time a Member State first considers a research reactor and its associated facilities, through the stages of planning, bid preparation, construction, startup, and preparation for commissioning. The subsequent stages of operation, decommissioning, spent fuel and waste management issues are addressed in this publication to the degree necessary for appropriate planning prior to research reactor commissioning. The information presented in this publication will be based on the nowadays experience and good practices of countries with research reactors and will be not intended to impose standards on those contemplating a new research reactor.

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34. Establishing site selection criteria and their application for the siting process of a deep geological disposal facility	Experience from the several more advanced geological disposal facility (GDF) programmes has shown that the siting process is an endeavour that can span one or more decades, is often complex and requires close attention to be paid to communication and to the needs of stakeholders. As is often the case in the realm of radioactive waste management, much can be learnt from international experience and this document brings together learning and good practice from those national programmes that have successfully applied a repository site selection process, have one in progress or are actively preparing for one. The focus of this document will be on the siting process itself: on the development of site selection criteria, their use in different stages of site selection, techniques for screening-out (and potentially screening-in) and ultimately for comparing alternative and possibly competing, sites. Moreover, the role of safety assessment, environmental impact assessment and socio-economic factors will be presented as they inform the more complex and comparative decision making between potential sites, as a pre-requisite for successful site selection. The generic guidance developed based on international experiences will be illustrated by examples of good practices and lessons learnt. It aims to become an important component of the knowledge base supporting current and future programmes as they develop their siting process. It is not intended, however, to become a prescriptive manual how to find the site. The publication will discuss the development and use of site selection criteria as an important component of the siting process for a deep geological disposal facility. The requirements- driven site investigation and site selection process provide the basis and general framework to establish these site selection criteria for each stage of the siting process. Furthermore, methodologies of using criteria will be described, based namely on examples of advanced programmes. Finally, the role of safety assessment, environmental assessment and socio-economic and political factors will be presented in a structured manner illustrating the complexity of site selection as a part of disposal programme and all its elements. The generic guidance will be illustrated by examples taken from advanced programmes that either succeeded on selecting the GDF site (France, Finland, Sweden) or are in various stages of the selection process (Switzerland, Canada, Czech Republic, China, Germany).

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35. Electric Grid Reliability and Interface with Nuclear Power Plants (Rev.1)	The revision is to provide additional information on practical examples or design considerations with technical details on the Electric Grid Reliability and Interface with Small Modular Reactors and Renewable Energy Sources. The scope of the revised sections mainly focuses on electrical grid interface with Small Modular Reactors and Renewable Energy Sources in the following areas: • Design features of electrical power systems at SMRs • Analysis of electrical design features at SMRs • Special considerations for SMRs in Site Choice and Assessment • Special considerations for SMRs in connection to the electrical grid • Interactions between electrical grid with renewable energy sources
36. The Management of Knowledge, Competence, and Human Resources, for Effective Long-Term Operations	The objective of this publication is to inform the climate change community (negotiators, their advisors, government officials, energy and climate policy makers, experts, NGOs and media representatives) about the potential role of nuclear energy in mitigating climate change, and to highlight both challenges and best practices in how to finance nuclear projects, as observed by IAEA Member States. The publication discusses practical applications of financing approaches, including what approaches are used, their outcomes and challenges to implementation. The document covers a range of global cases, from new build considerations to financing practices for LTO, financing a series of SMRS and additional considerations for embarking countries. This publication captures the evolving financing landscape for nuclear energy projects which reflects a shift towards broader acceptance and support for nuclear energy financing, bolstered by innovative financing mechanisms and a growing recognition of nuclear energy's crucial role in achieving global climate targets. The publication provides practical information on financing NPPs, from the construction of both large reactors and SMRs to financing the entire nuclear fuel cycle. It includes information about the role of government incentives and subsidies for supporting nuclear projects, in addition to how these policies may inform and drive private sector investment, including avenues such as green bonds and ESG frameworks, among others. The publication also includes additional considerations for bridging the financing gap and accelerating the clean energy transition in Emerging Markets and Developing Economies.

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37. Site characterisation of radioactively contaminated land	The objective of the report is to document the key principles, methodologies, techniques, technologies and Member State experience for the characterisation of contaminated land sites. The publication will present Member State case studies and highlight the good practices, successes, and challenges. All sites where land contamination is present (e.g see list in section 2 above). The report will cover the practical methodologies, techniques, technologies for site characterisation. It will not cover risk or safety assessment or environmental modelling.
38. Opportunities for Nuclear Desalination	This publication aims to provide an overview of advanced nuclear desalination technologies, provide insights from operational plants, and explore emerging applications of nuclear energy in water resource management. By presenting innovative developments and underexplored areas, it seeks to equip stakeholders with knowledge to advance sustainable practices and increase the effectiveness of nuclear energy for desalination. This publication will cover advanced nuclear desalination technologies, global trends in desalination, and operational insights from existing plants. It also explores emerging applications of nuclear energy, such as lithium mining and wastewater treatment, with a focus on underexplored areas and innovative advancements.
39. Stakeholder Engagement in Decommissioning; Pathways to Nuclear Site Repurposing (Rev.1)	The objective of the publication is to provide updated and practical guidance on addressing SE in nuclear decommissioning based on experiences and lessons learned, to support Member States in implementing decommissioning effectively, with a focus on nuclear site repurposing and alignment with recent IAEA publications (e.g., NG-G-5.1). The scope will cover SE in implementing decommissioning projects of nuclear facilities ranging from research reactors to nuclear power plants and nuclear fuel cycle facilities, incorporating repurposing of nuclear facilities. The consistency with a new publication (TECDOC under initial stage of development) on the application of circular economy principles to decommissioning will be fully considered in the development process.

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