

INPRO Dialogue Forum

Drivers and Impediments for Regional Cooperation on the Way to Sustainable Nuclear Energy Systems

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Regional Cooperation in the Area of Safety Assessment

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IAEA

International Atomic Energy Agency

Outline

- Global Safety Regime
- Overview of Safety Assessment
- Examples of Relevant Cooperation Initiatives
- Opportunities for Expanded Cooperation
- Drivers and Impediments

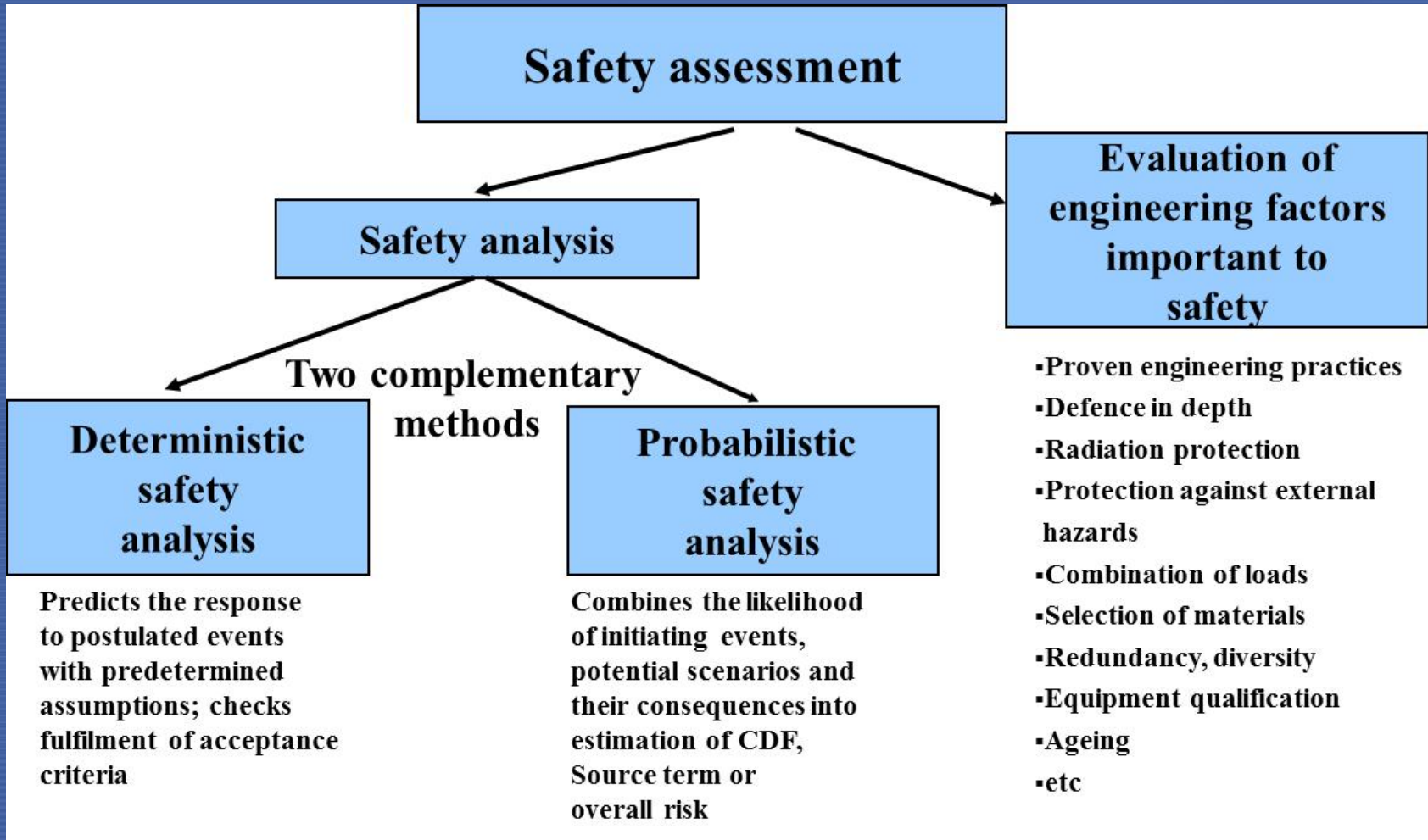
Global Safety Regime*

- International cooperation contributed to the development of a strong Global Safety Regime
 - International conventions: ***obligations and mechanisms*** for ensuring protection and safety
 - Codes of conduct to promote ***good practices***
 - Internationally agreed IAEA safety standards: promote development and application of ***internationally harmonized safety requirements, guides and practices***
 - International ***peer reviews*** of the regulatory control and safety of facilities and activities, and mutual learning by participating States
 - Multilateral and bilateral cooperation: enhance safety through ***harmonized approaches*** as well as ***increased quality and effectiveness of safety reviews and inspections***

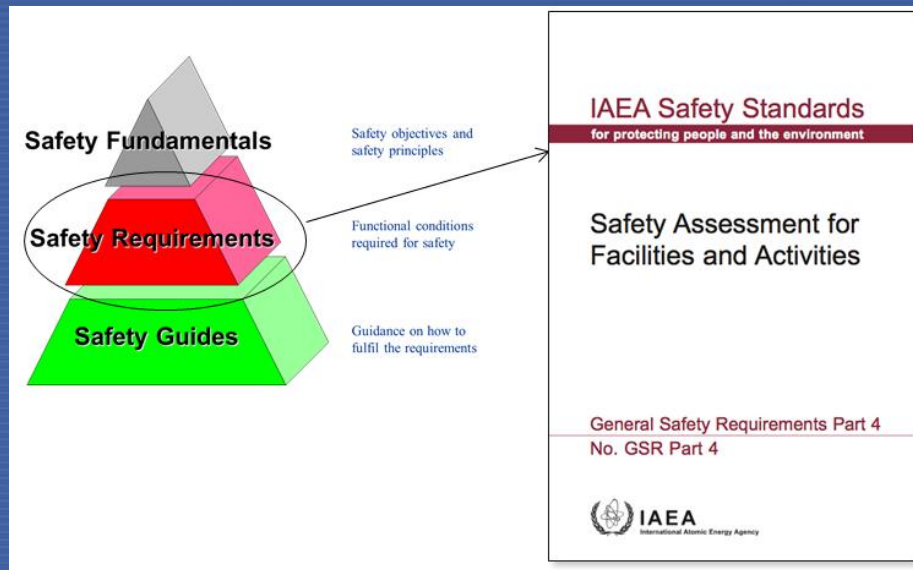
Safety Assessment (1)

- Safety assessment should be carried out to
 - Demonstrate that an adequate level of safety has been achieved
 - Determine if safety objectives and criteria (specified by plant designer, operator, and the regulatory body) are met
- Safety assessment is carried out systematically throughout the lifetime of a nuclear facility
 - Performed by operator
 - Reviewed and verified by regulator

Safety Assessment (2)



Requirements for Safety Assessment



- **Applicable to all facilities and activities**
- Facilities include: NPPs, research reactors, critical assemblies, fuel cycle facilities, irradiation facilities, etc.
- Activities include: Production, use, import and export of radiation sources, transport of radioactive material, decommissioning and dismantling of facilities, etc.

Safety Assessment for Facilities and Activities

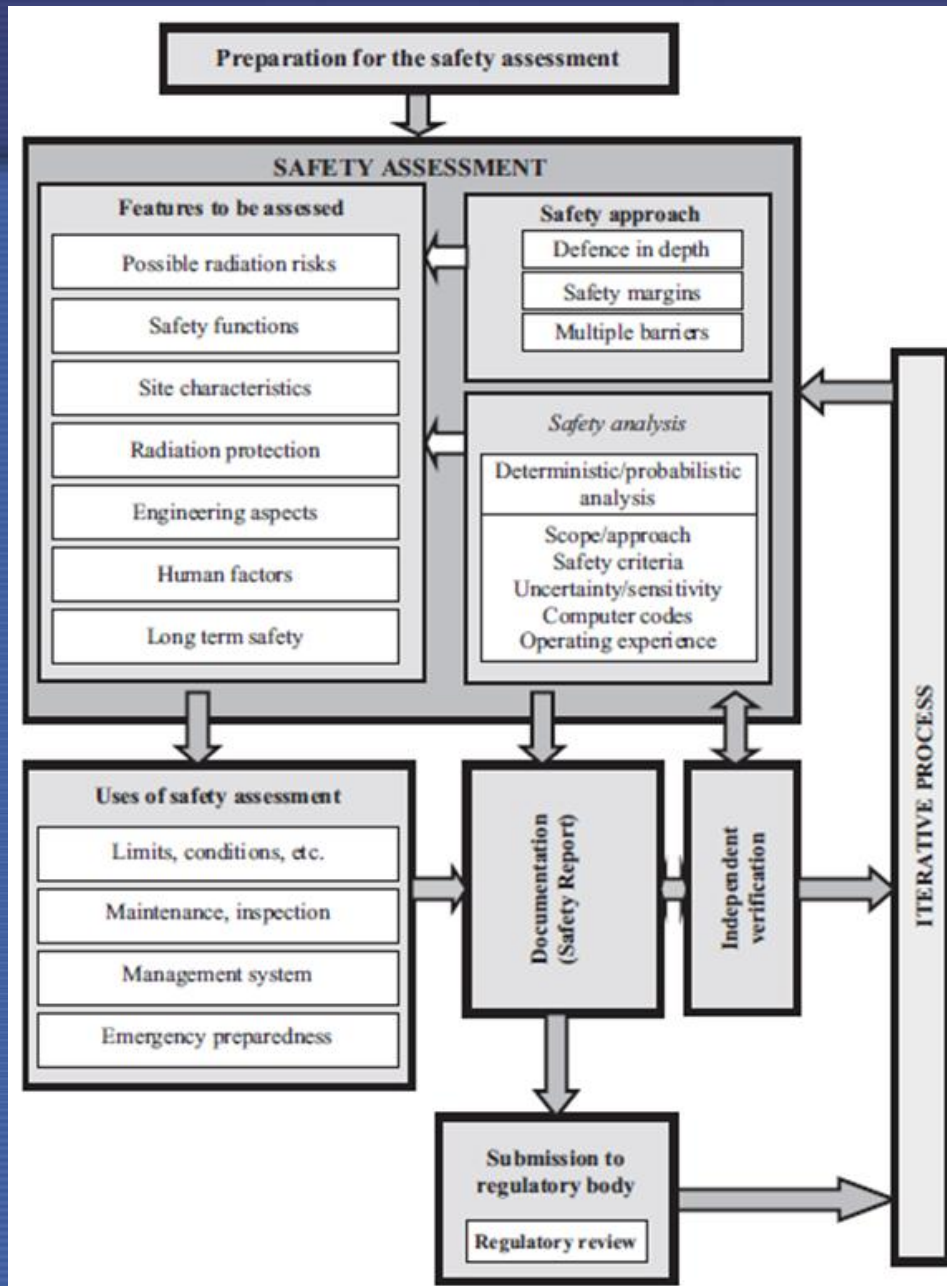
General Safety Requirements (1)

1. Graded approach
2. Scope of safety assessment
3. Responsibility for safety assessment
4. Purpose of the safety assessment
5. Preparation for the safety assessment
6. Assessment of the potential radiation risks
7. Assessment of safety functions
8. Assessment of site characteristics
9. Assessment of the provisions for radiation protection
10. Assessment of engineering aspects
11. Assessment of human factors
12. Assessment of safety over the lifetime of a facility or activity
13. Assessment of defence in depth

Safety Assessment for Facilities and Activities

General Safety Requirements (2)

14. Scope of the safety analysis
15. Deterministic and probabilistic approaches
16. Criteria for judging safety
17. Uncertainty and sensitivity analysis
18. Use of computer codes
19. Use of operating experience data
20. Documentation of the safety assessment
21. Independent verification
22. Management of the safety assessment
23. Use of the safety assessment
24. Maintenance of the safety assessment



Examples of Relevant Cooperation Initiatives

WENRA (Western European Nuclear Regulators' Association)

- Harmonization of regulatory approaches (licensing requirements)
- Harmonization Working Groups
 - Reactor Harmonisation Working Group (RHWG)
 - Working Group on Waste and Decommissioning (WGWD)
- Process (RHWG)
 - Formulation of Reference Levels (IAEA safety standards & national best practices)
 - National self-assessments of compliance with each Reference Level
 - Benchmarking: peer review of national self-assessments
 - Review benchmarking and revise Reference Levels, as needed
 - National Action Plans to modify national legal systems & practices according to benchmarking results

WENRA Safety Reference Levels

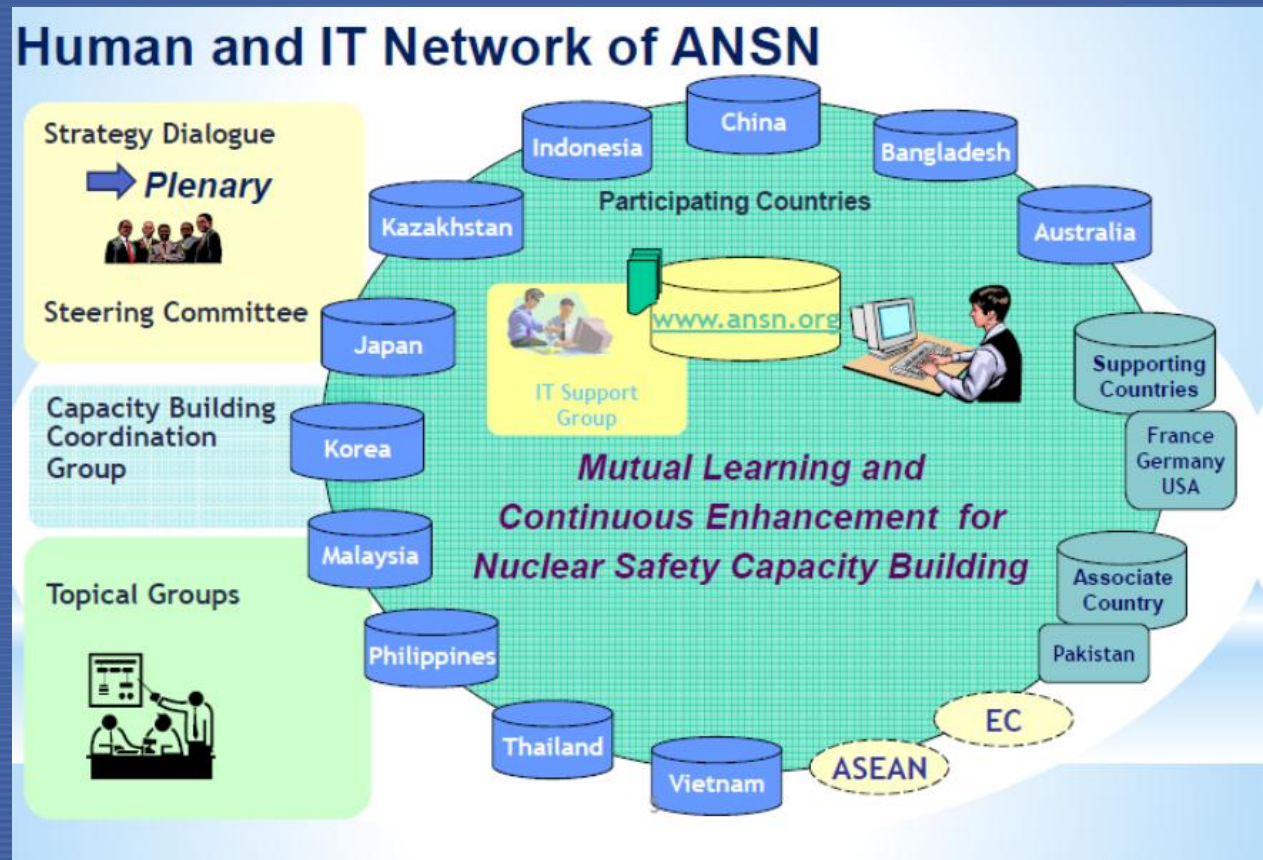
Developed for 5 main safety areas and 18 safety issues

Main Safety Area	Safety Issues
Safety Management	Safety Policy Operating Organisation Management System Training and Authorization of NPP staff
Design	Design Basis Envelope for Existing Reactors Design Extension of Existing Reactors Safety Classification of Structures, Systems and Components Operational Limits and Conditions
Operation	Ageing Management System for Investigation of Events and Operational Experience Feedback Maintenance, In-service inspection and Functional Testing Emergency Operating Procedures and Severe Accident Management Guidelines
Safety Verification	Contents and updating of Safety Analysis Report Probabilistic Safety Analysis Periodic Safety Review Plant Modifications
Emergency Preparedness	On-site Emergency Preparedness Protection against Internal Fires

Asian Nuclear Safety Network (ANSN)

- nuclear safety Capacity Building and Infrastructure Development in Asia (~40-50 workshops, training activities & expert missions)

www.ansn.org



Multinational Design Evaluation Programme (MDEP)

- An initiative by national regulatory safety authorities
 - Leverage resources and knowledge for new reactor design reviews
 - Explore harmonization possibilities
- Members: Canada, China, Finland, France, Japan, India, Rep. of Korea, Russian Federation, South Africa, UK, USA
 - Associate members: UAE, Vietnam, Turkey
- Design specific working groups (cooperation)
 - EPR, AP-1000, APR-1400, VVER (under consideration)
- Issue Specific working groups (harmonization)
 - Digital I&C Standards, Codes and Standards, Vendor Inspection

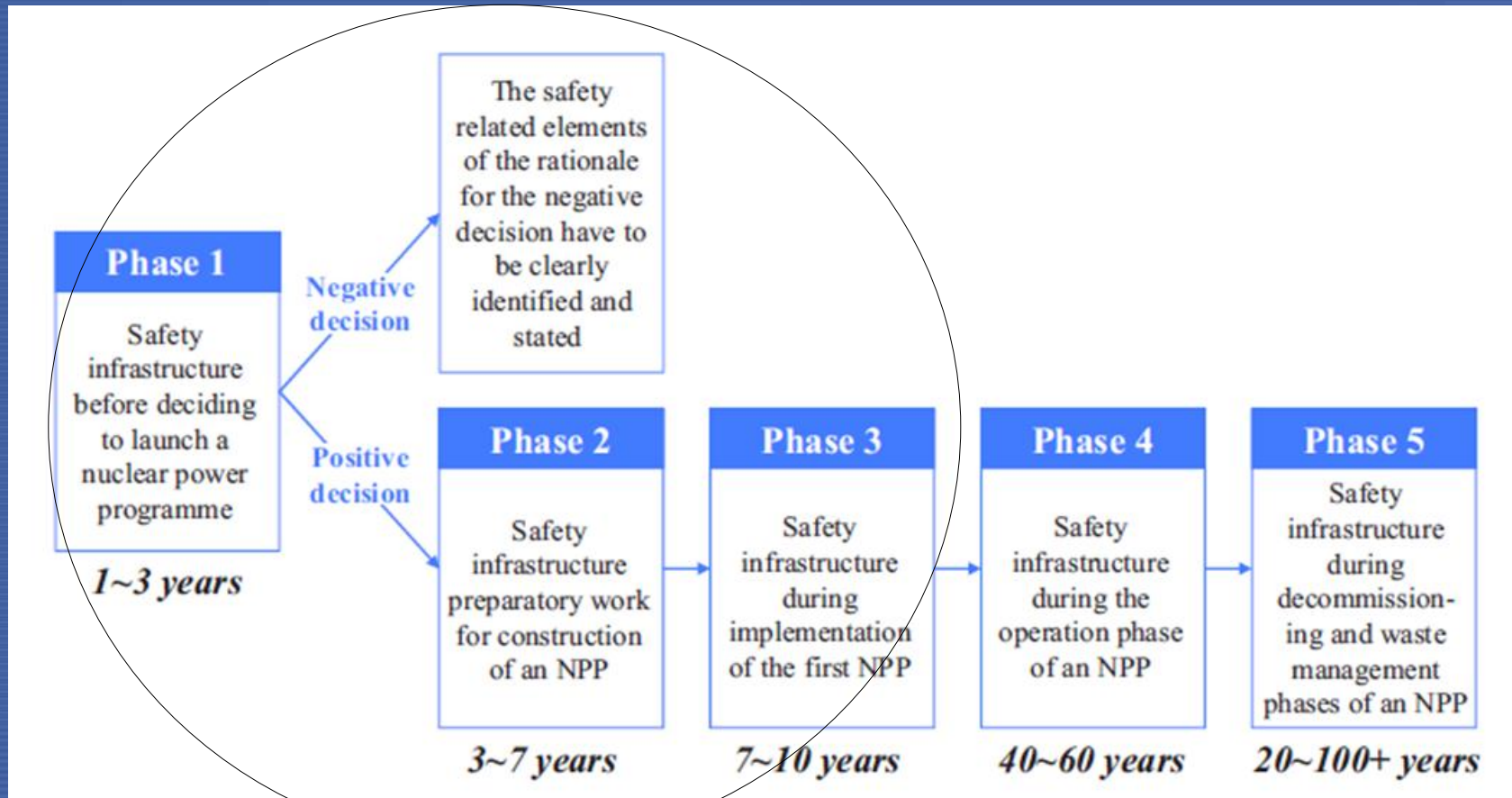
Cooperation in Reactor Design Evaluation and Licensing (CORDEL)

- A working group established by WNA
 - Involves nuclear industry and nuclear regulators
 - International standardization of design: internationally accepted standardized reactor designs can be widely deployed without major design changes (facilitated by “harmonization” initiatives)
- Benefits of standardization
 - Reduce engineering and construction time and cost
 - Minimize design changes for any design selected by any country
 - Supply of standard components: lower cost and higher quality
 - Enhance the stability of regulatory regimes
 - Facilitates sharing of methods and data from safety evaluations by regulators
 - Improved quality of inspection in construction and component manufacturing

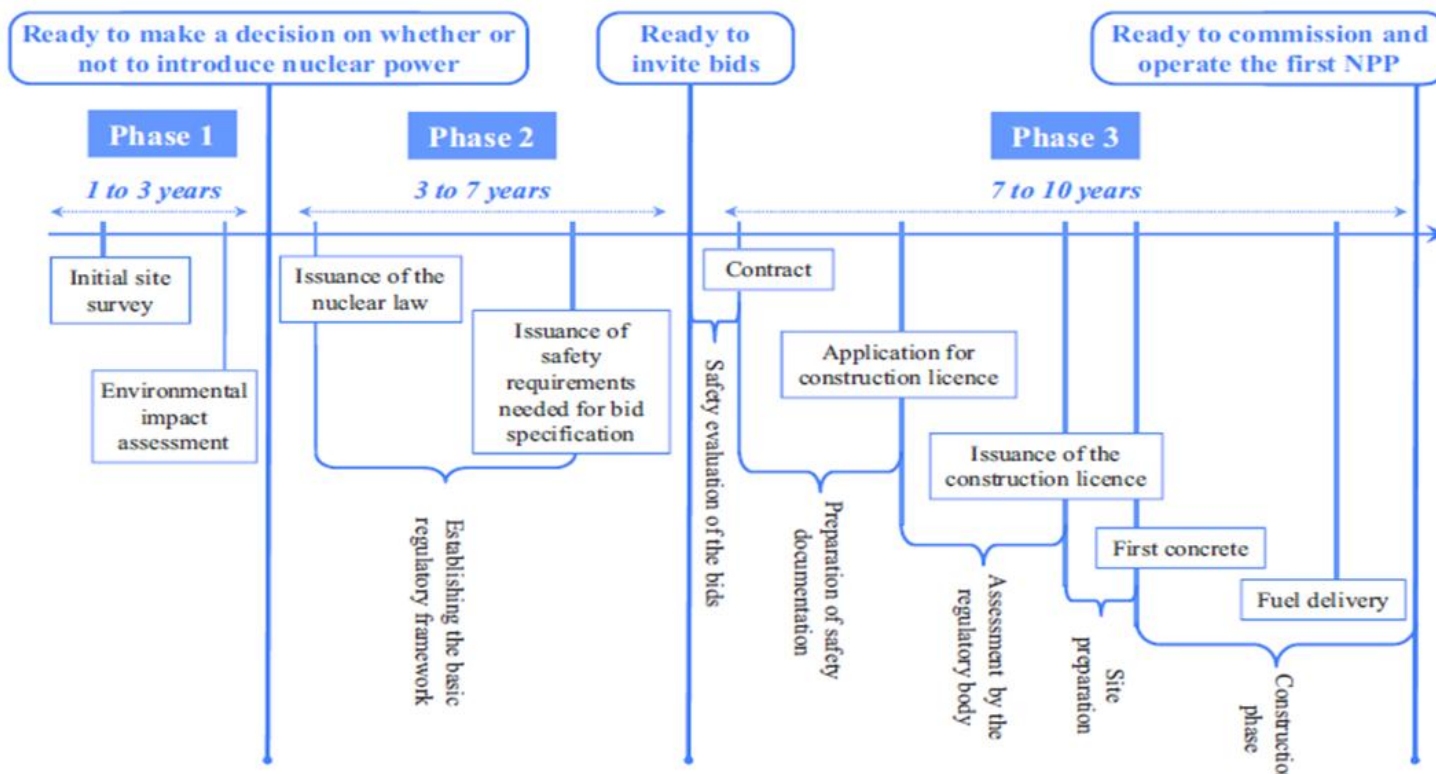
Opportunities for Expanded Cooperation

Capacity Building – Safety Infrastructure

SSG-16: Establishing the Safety Infrastructure for a Nuclear Power Programme (Phases 1-3)



ACTIONS 117–121: Safety Assessment



Action 117. Government to familiarize itself with the IAEA safety standards and with other States' practices to understand resources needed for safety assessment.

Action 118. Develop expertise to conduct/review safety assessments (operating organization, regulatory body and external support organizations).

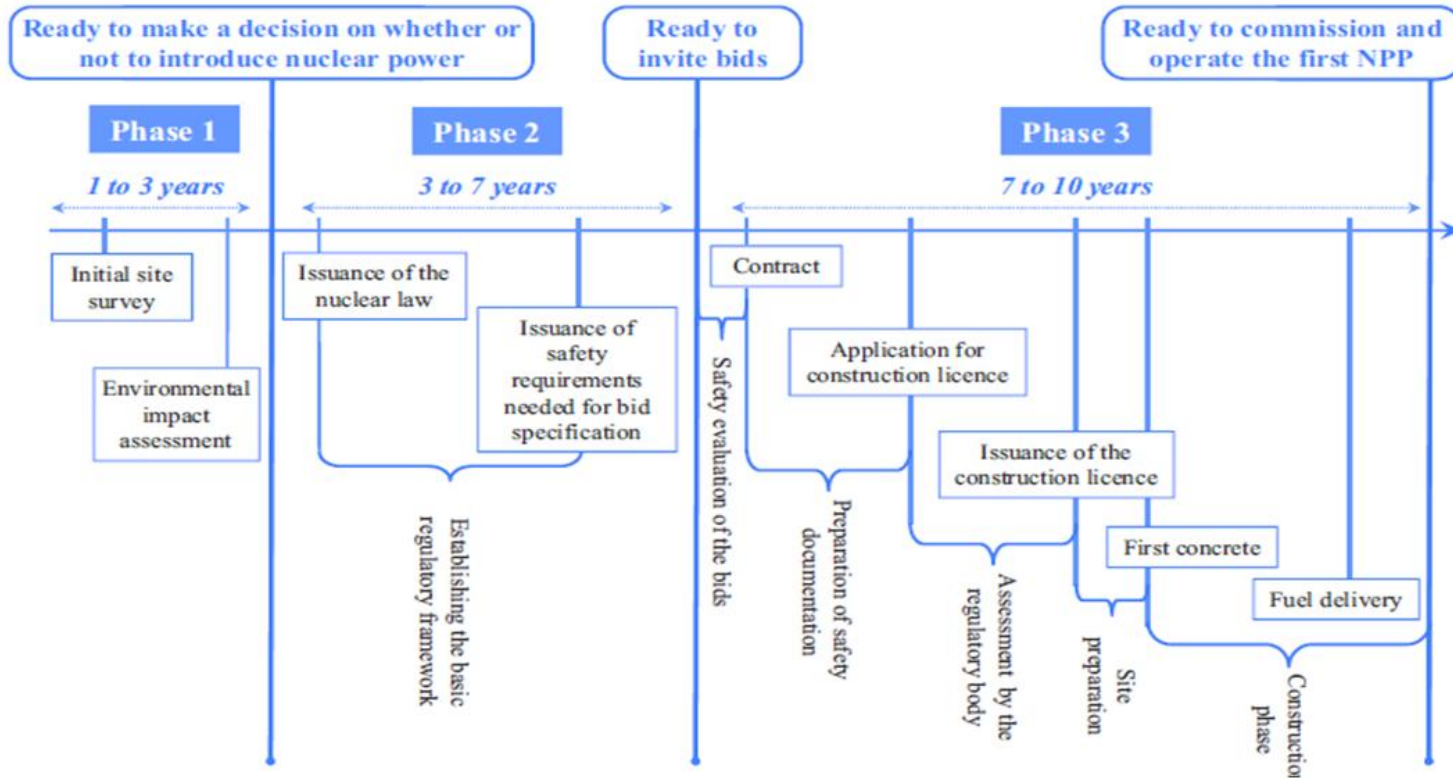
Action 119. Perform comprehensive safety assessments of the nuclear power plant and produce safety analysis reports (operating organization)

Action 120. Review and an independent verification of the safety analysis reports to verify compliance with the regulatory requirements (regulator)

Action 121. The operating organization and/or the regulatory body should obtain support from external support organizations, as necessary.



ACTIONS 99–104: Research for Safety and Regulatory Purposes



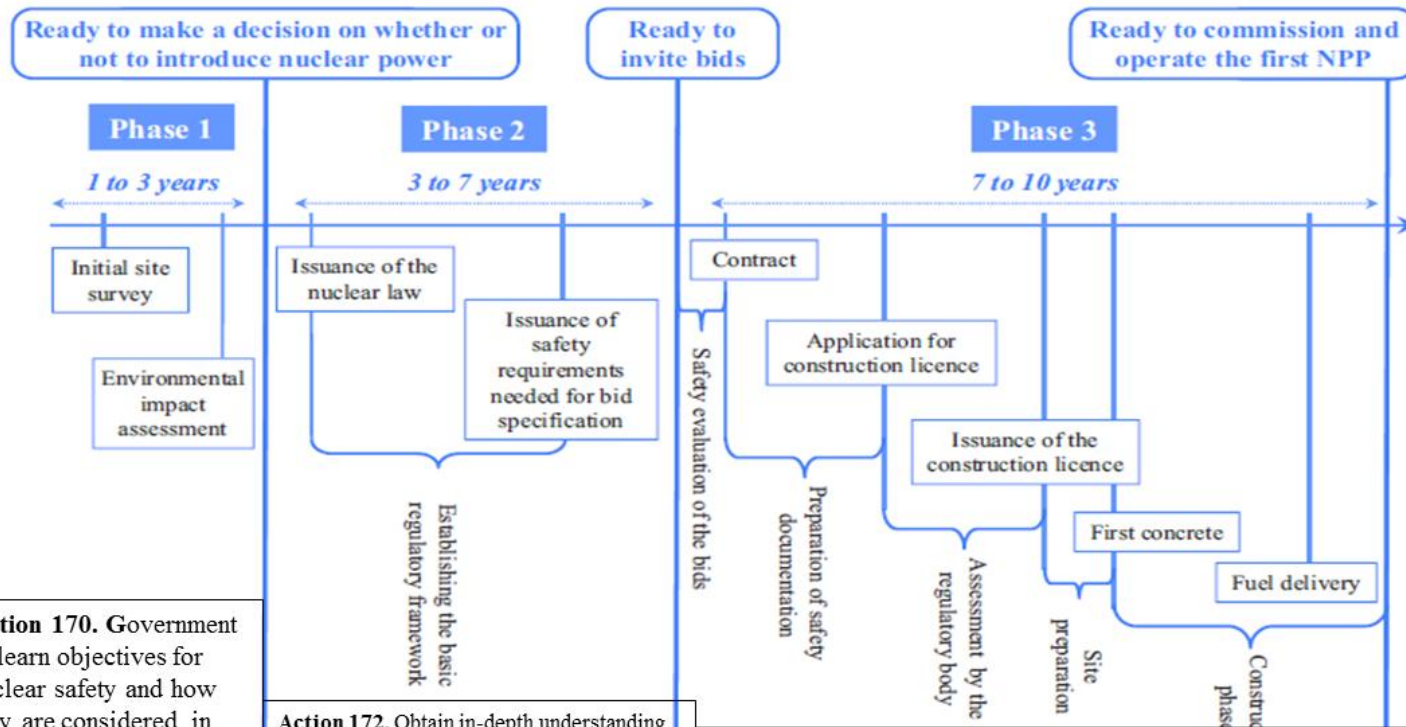
Action 99. Government to identify research areas and research centres
Action 100. Identify gaps in the capabilities of domestic research centres

Action 101. Operator and regulator to identify safety research areas.
Action 102. Government to implement plans for new research centres (if gaps identified in Phase 1).
Action 103. Research centres should begin conducting research

Action 104. Research centres and other relevant organizations should focus their research on the features and safety aspects of the nuclear power plant that will be constructed, including features and aspects specific to the actual plant site.



ACTIONS 170–184: Design Safety



Action 170. Government to learn objectives for nuclear safety and how they are considered in various designs.

Action 171. Government to consider availability of the technical and grid reliability and impacts of these on design requirements for plant safety.

Action 172. Obtain in-depth understanding of safety principles and requirements for design of a nuclear power plant (all organizations).

Action 173. Market survey of available technologies and their safety features (operator).

Action 174. Regulatory body prepare and enact national safety regulations on design (needed for bid specification).

Action 175. Start to implement plans for improving the national technical infrastructure.

Action 176. The operating organization should include in the bid specification all the safety and regulatory aspects

Action 177. Operating organization to establish a 'design entity' (knowledge of the safety design and its configuration management over the lifetime of the plant).

Action 178. Safety review of the designs proposed by the vendors in the submitted bids (operator)

Action 179. Establish proper interaction with the selected vendor for the preparation of the safety documents (operator).

Action 180. Completion of all the required improvements of the national technical infrastructure (government/operator)

Action 181. Submit safety documents required in the licensing process (operator).

Action 182. Review safety documents (regulator).

Action 183. Ensure the adequate validation and verification of the design of the nuclear power plant and its structures, systems and components (operator). Regulator to review.

Action 184. Operating organization and the regulatory body should implement their respective processes to address modifications made to the design during construction and afterwards.



Capacity Building for Embarking Countries

- Regional cooperation to facilitate application of SSG-16 recommended actions
 - ANSN can be used as model
 - Global Safety Assessment Network (GSAN) as resource (<http://nucleus.iaea.org/sites/gsan>)
- Areas of cooperation
 - Education and training
 - Safety research (develop in-depth expertise)
 - Design safety (start with existing technologies; progress to more advanced technologies)

Expansion of Multilateral Cooperation

- Current focus on large water-cooled reactors
- Expand to include advanced reactors
 - Other coolants
 - Small and medium size reactors (SMRs)
- Potential additional areas of cooperation (in addition to current activities by WENRA, MDEP, CORDEL)
 - Regulatory aspects – opportunity for harmonization at an early stage
 - Safety assessment tools/approaches for advanced reactors

Drivers and Impediments

To initiate the discussion!

- Drivers clear from presented material
 - Enhanced safety (e.g., harmonization and sharing of experiences)
 - Optimize resources/reduce cost, etc
- Impediments
 - More challenging to manage as number of partners increase
 - Funding arrangements (especially if facilities are involved)
 - National sovereignty (e.g., regulatory area)



Thank you for your attention

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