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GENERAL CONSIDERATIONS ON NEEDED INFRASTRUCTURE

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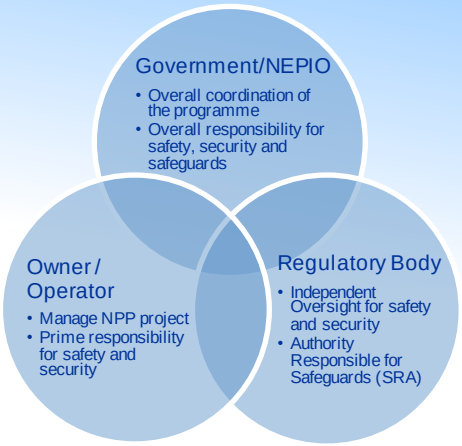
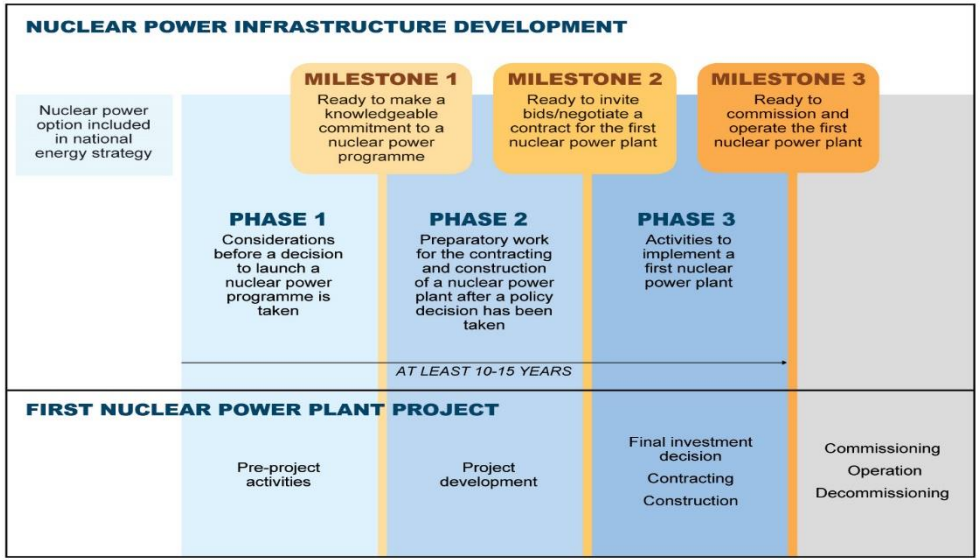
Background

- Large variety of SMRs are under development
  - Some of them are foreseen in the near future
- Increasing number of countries interested in SMRs
  - Size of the Grid
  - Modular deployment to match the demand
- Several initiatives by the IAEA: Revision of the Milestones Approach, Applicability of the Safety Standards
- Currently limited experience on infrastructure for Fusion

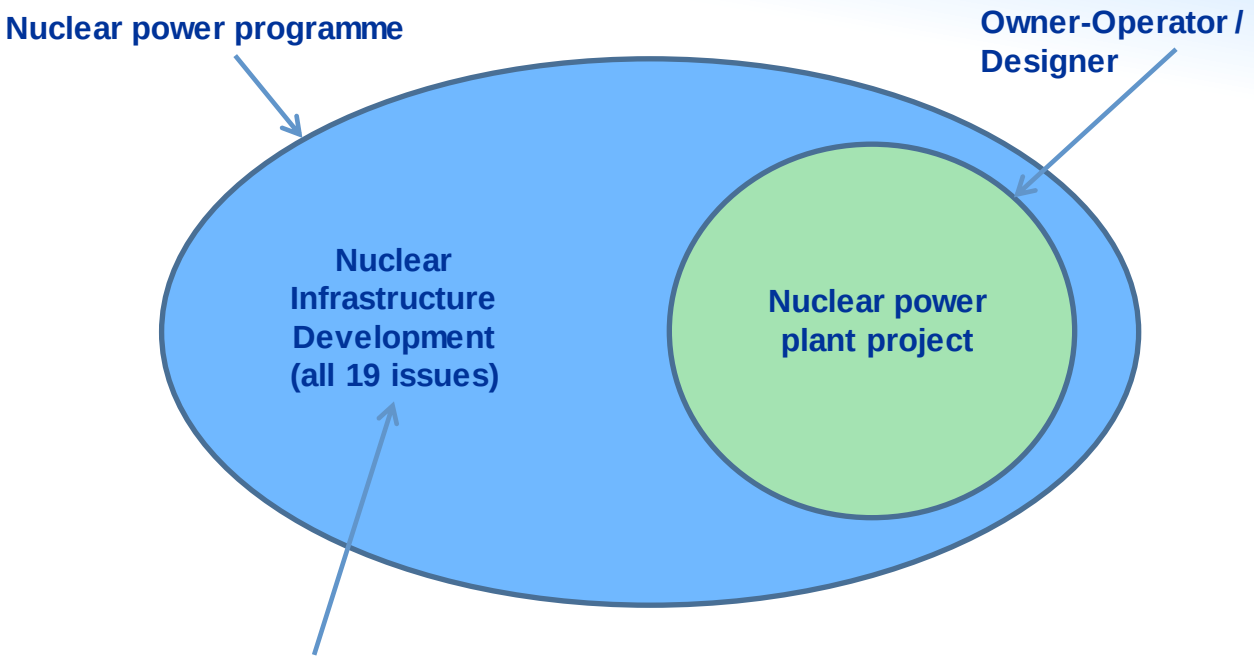
The IAEA Milestones Approach for Nuclear Power Infrastructure Development

- Phased
- Comprehensive
- Integrated



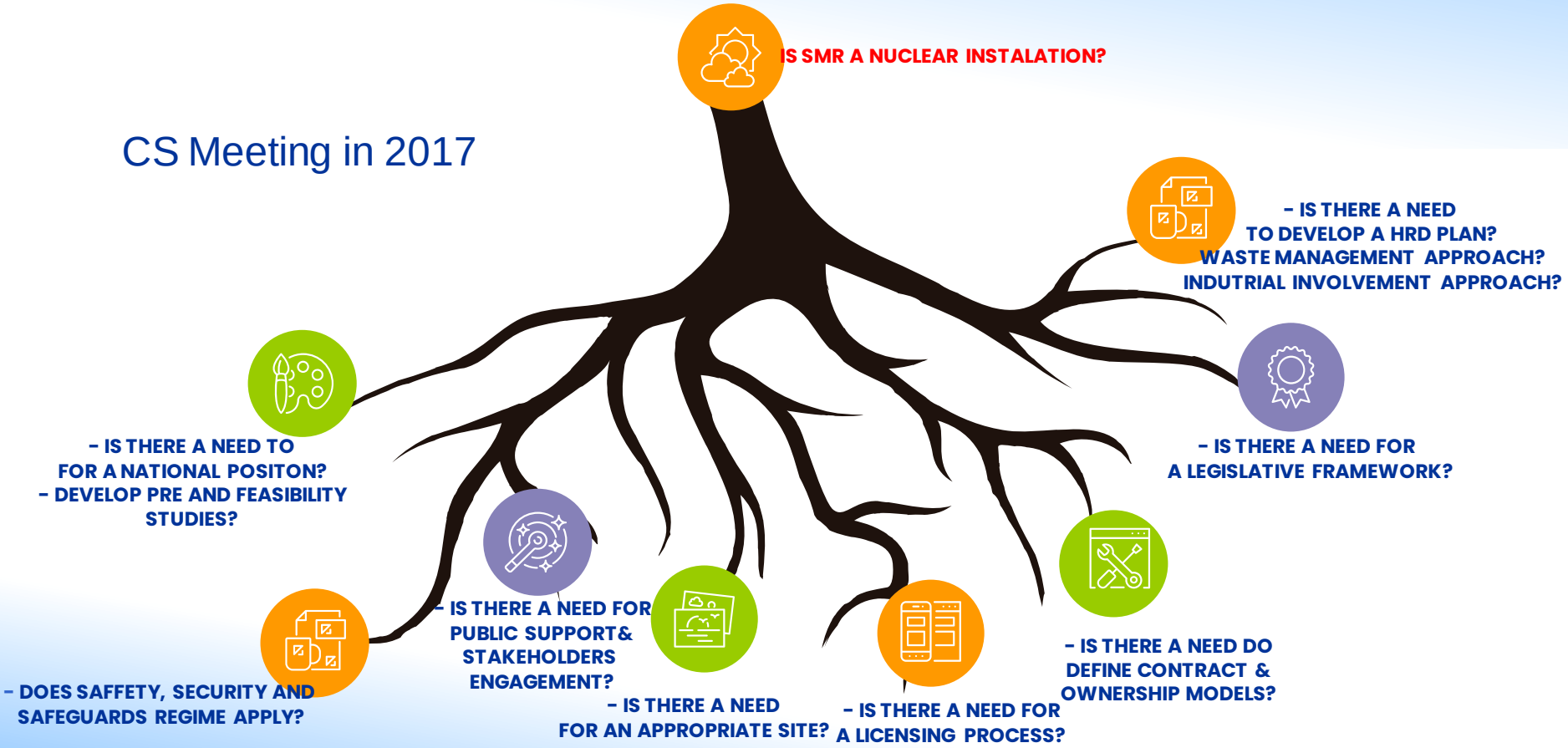


Programme versus Project

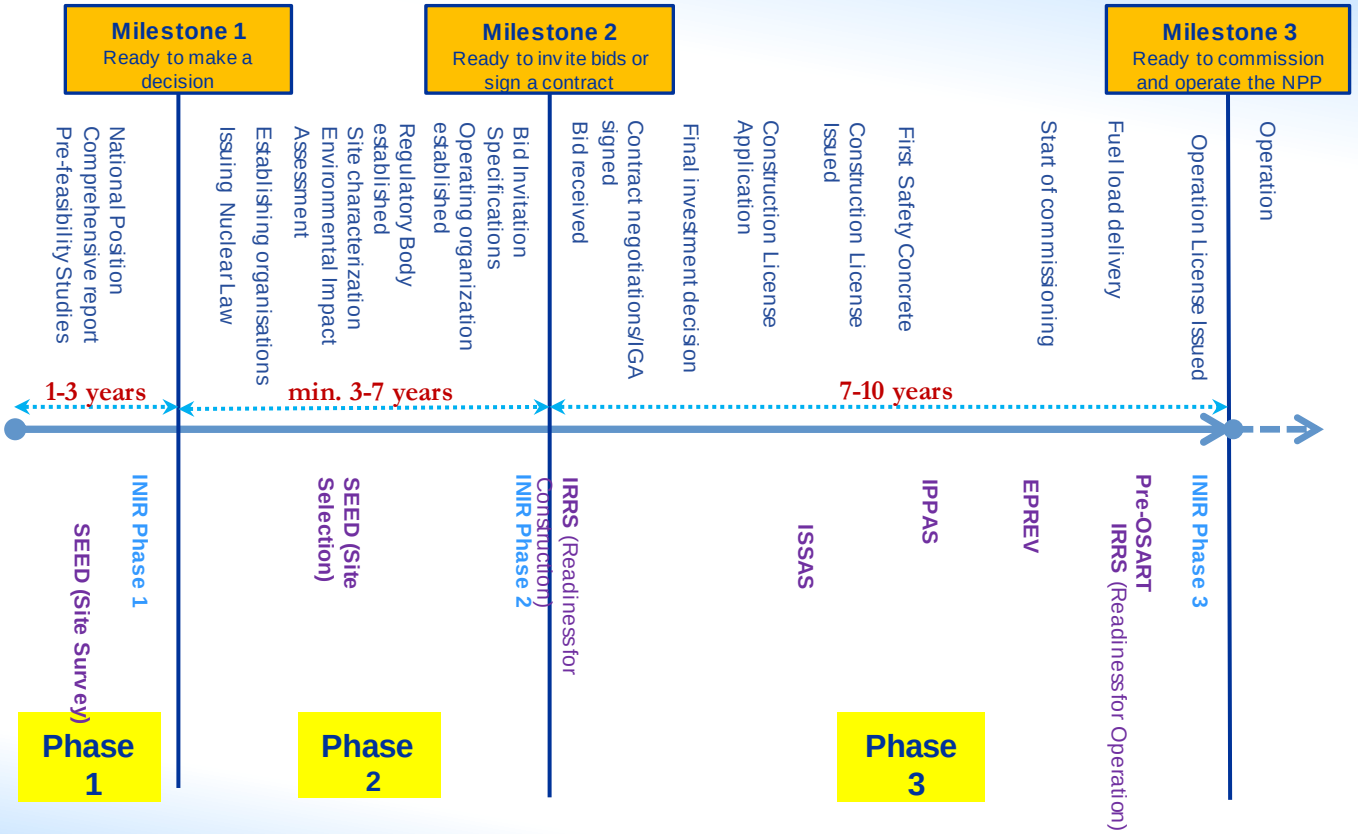


Is the Milestones Approach Applicable for SMRs?

CS Meeting in 2017



Nuclear Power Programme and key activities for large NPPs



How can this timeline be shortened for SMRs?

Is the Milestones Approach Applicable for SMRs?

Some Infrastructure Aspects of SMRs When Compared to a Large NPP:

- Management: Shorter construction times, 3 instead of 6-7 years for large PWRs;
- Financing: Lower initial capital cost; Phased financing;
- Grid: Smaller capacity; Better matching the demand growth; Other applications;
- Regulatory framework: Regulations and Guides for Licensing under Consideration, Graded approach application;
- Industrial Involvement: Standardization may lead to lower local industrial involvement
- Other demands on infrastructure can be downscaled

Is the Milestones Approach Applicable for SMRs?

Conclusions:

- To a large extent the IAEA Milestones Approach is applicable to SMRs, in particular for those analysed in the CS (near term deployment, which include iPWRs, HTGRs)

- The revision of the Milestones Approach document will include statements specific for SMRs pointing out, when applicable, the differences in the required infrastructure in relation to a large NPP (e.g. construction time, financing aspects, legal framework, regulatory framework, industrial involvement, etc.)

- An accompanying document, with prospective scenarios, will also be developed. This document will discuss new approaches to facilitate the deployment of SMRs. It will provide inputs for the next revision of the Milestones document and will include Micro Reactors.

Main Elements in the Legal and Regulatory Frameworks

Legal Framework

- Nuclear Law
- International Legal Instruments
- Non-nuclear laws impacting the programme
- Subsidiary Legislation

Regulatory Framework

- Independent Regulatory Body
- Licensing Process
- Licensing Basis
  - Regulations and Guides
- Oversight Construction

To which extent these elements are different for SMRs/Micro Reactors?

Legal Framework

- Conservative Scenario
  - The main elements will remain the same as the legal framework defines the responsibilities of all organizations necessary for any nuclear power programme.
  - Some SMR designs, such as those where a fuelled reactor is transported to or from the country of origin for refuelling or for maintenance may require some additional legislations and/or adherence to other international legal instruments, such as, the International Maritime Organisation (IMO) conventions.
- Innovative Scenarios
  - Some proponents of SMRs are proposing different and unique approaches to plant lifecycle that may pose challenges to the traditional views. This concern the ways current reactors are constructed, licensed, manage wastes, handle operation.
  - At the moment is not clear how these new approaches will evolve and will impact the legal framework

Regulatory Framework

- Conservative Scenario
  - Licensing process similar to those used for large NPPs
  - If modules can be added along the time, licensing considers maximum number of modules
  - Regulations and guides need to be developed or adapted to new designs. Considering the variety of designs, there is a tendency to consider technology neutral regulations
  - Manufacturing oversight may pose a problem if components important for safety are fabricated and tested before a licensee is identified
  - Factory fuelled reactors need to carefully consider safeguards requirements
  - Transport of fuelled reactors may be the subject of additional requirements by regulatory bodies

Regulatory Framework

- Innovative Scenarios
  - Standardization of regulatory requirements (international level)
  - Mutual recognition of regulatory decisions
  - Mutual recognition of inspections

What about Fusion?

- Recognizing that the Milestones approach looks from the perspective of a technology recipient country:

  Should an initiative be launched, similar to the one underway for SMRs?

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Thank you!