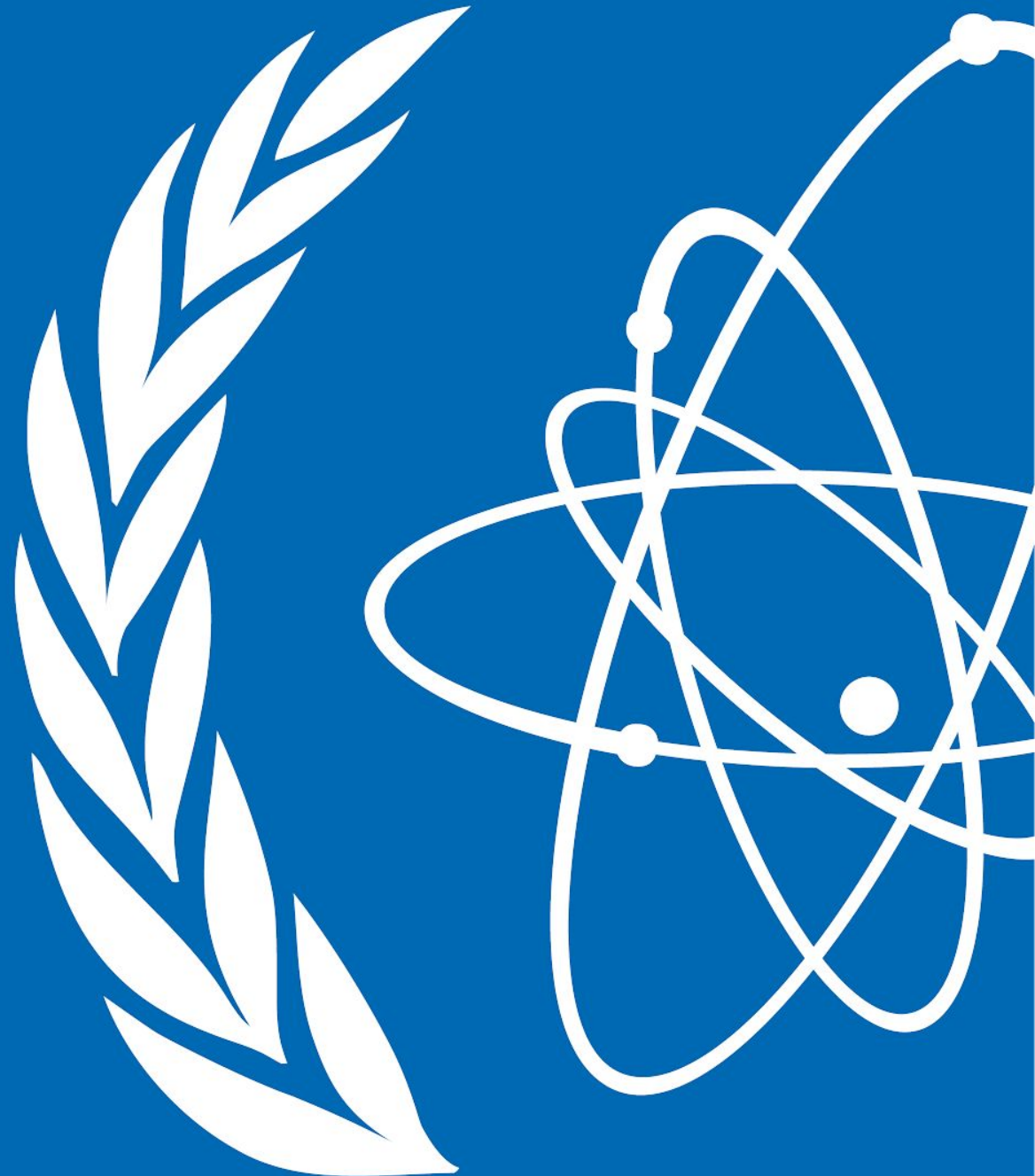


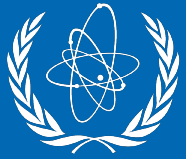
IAEA Presentation

ACEF 2026 Spotlight Session on The Emerging Role of Nuclear Energy in Achieving a Sustainable Energy Future for Asia and the Pacific

Dr Henri Paillere

Head, Planning and Economic Studies Section,
International Atomic Energy Agency



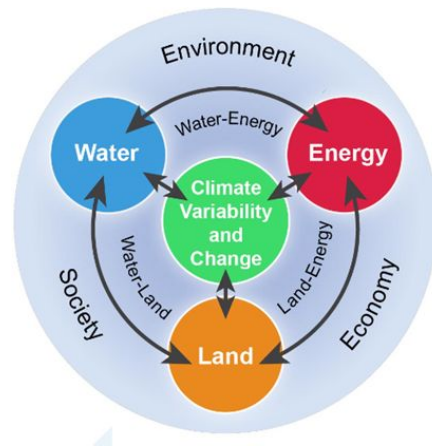


IAEA

Topic 1: From Scenarios to Solutions, Energy System Planning in Practice

Transitions towards sustainable and low-carbon secure energy systems

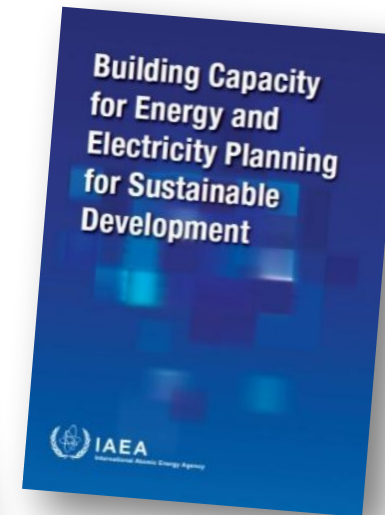
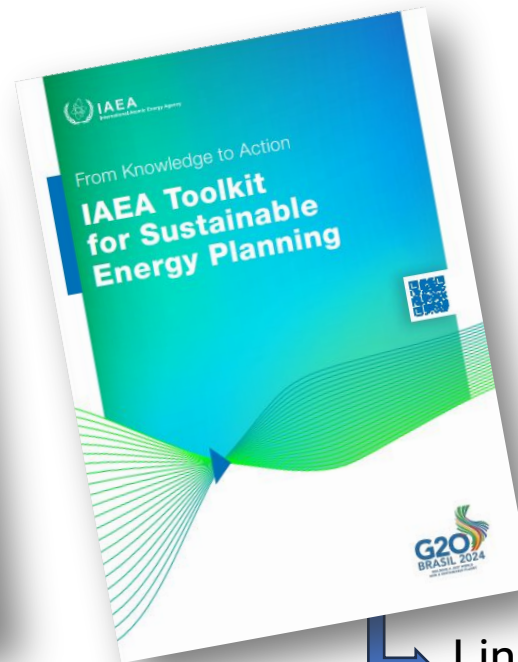
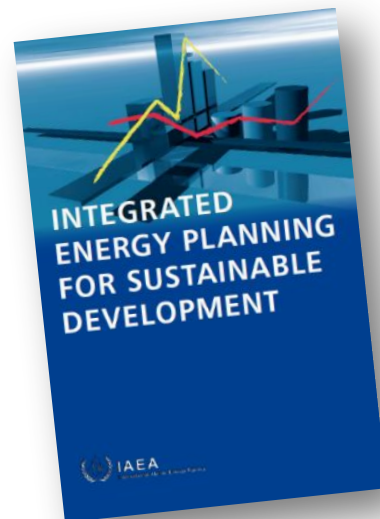
- Energy transitions that countries need to go through will be very complex, and will require **comprehensive energy planning to support evidence-based decision-making**,
- All low-carbon technologies will be needed, including renewables, abated fossil fuels, storage, grids, and, for some countries, nuclear.



- careful assessment of the benefits of each technology, how they complement each other, integrate within future energy systems, grid development and interconnections, etc
- Also, climate – land – water – and energy challenges are becoming increasingly linked – so this nexus needs to be accounted for, including to build climate-resilient systems

IAEA's Capacity Building for Energy Planning

- Energy planning is integral part of policy and investment decision-making in the energy sector
- IAEA has pioneered capacity building activities and has decades of experience in supporting Member States in energy planning.
- IAEA supports decision and policy making by assisting Member States to strengthen national capabilities in energy system analysis, so that countries can develop their own sustainable energy strategies
- National expertise is essential !



[Link to 2024 Outlook](#)

IAEA's Capacity Building Program for Energy Planning



Analytical Tools,
Training and Support



Information
Dissemination



Technical Assistance for
Energy Studies

COLLABORATION

National, regional and inter-regional projects, mostly implemented through IAEA's Technical Cooperation programme.

IAEA's Energy System Assessment Tools

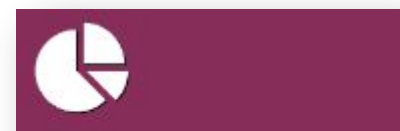


*Energy Statistics and
Energy Balance
compilation*



Training events in 2025:

training events: 58
professionals trained: 696
countries received support and training: 96



*Energy Scenario
Simulation Tool for
fast estimates*



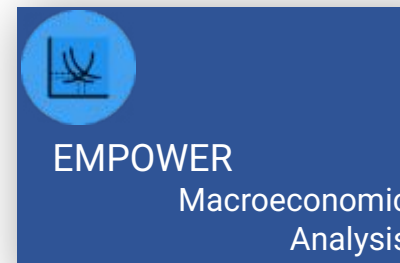
*Power Generation
Investments and
Expansion Planning*



*Analysis of Power
Plants Environmental
Impacts*



*Analysis of financial
viability of power
generation projects*




*Quantification of
macroeconomic
effects of strategies*

Frameworks for Energy System Assessments



ISED
Indicators of Sustainable
Energy Development

***Energy, Economy,
Environment and
Social interactions***



CLEW
Climate, Land,
Energy and Water Nexus

***Climate, Land and
Water use and Energy
Interactions***

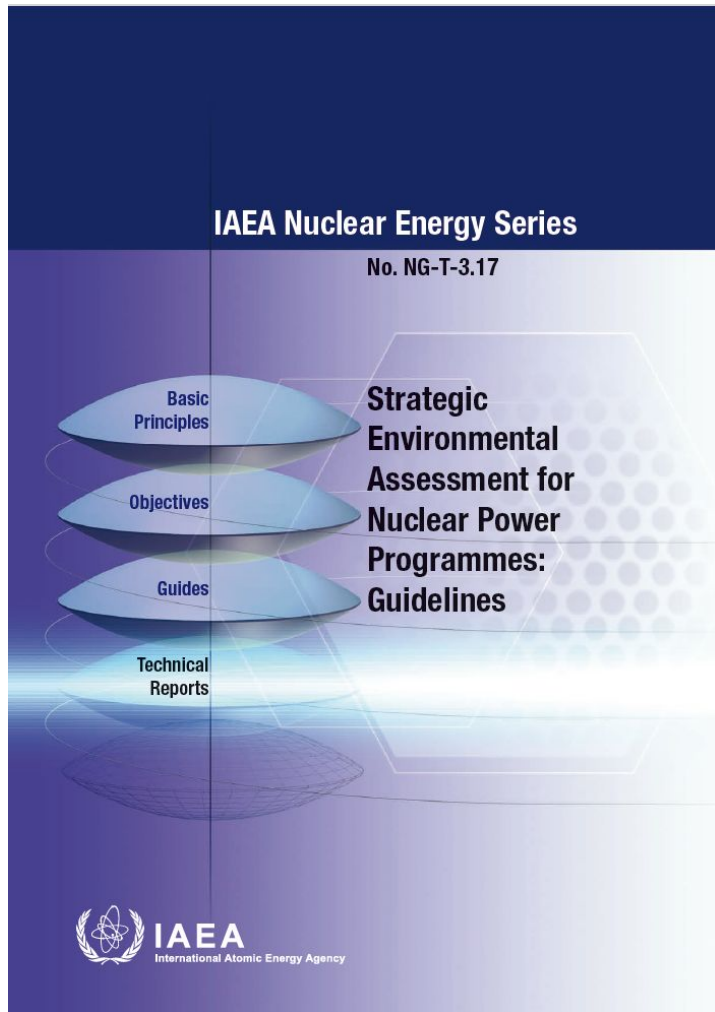


SEA
Strategic Environmental
Assessment (Nuclear)

***SEA of National
Nuclear Power
Program***

Concepts and sets of methodologies and approaches used to analyze various aspects of energy systems and interactions with other economic activities or elements

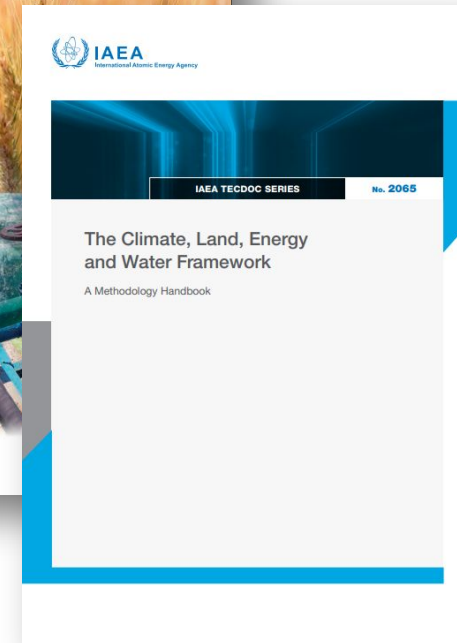
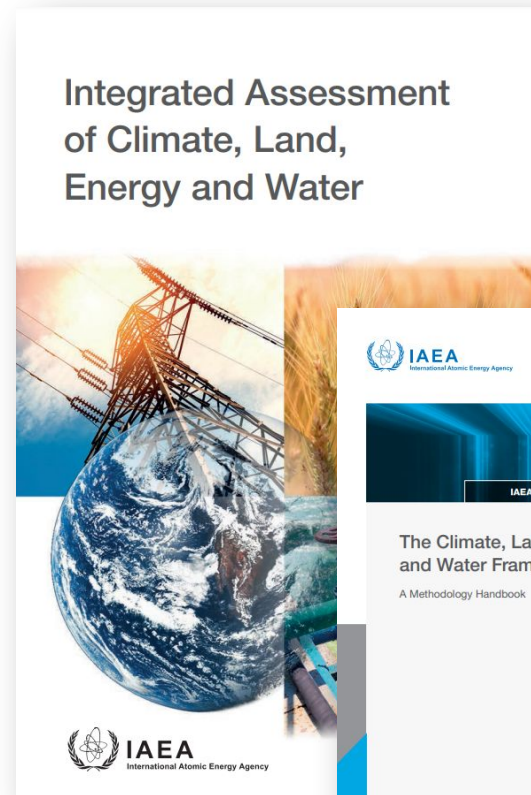
Strategic Environmental Assessment



- SEA = systematic process to integrate environmental considerations into the early stages of developing public policies, plans, and programmes, to promote sustainable development and ensure significant environmental effects are identified, mitigated, and monitored before projects are approved.
- [SEA Guidelines for nuclear programmes: Published in 2018](#)
- Update ongoing:
 - Nov 2025: Consultancy Meeting to update the SEA Guidelines
 - New TOC to include:
 - What is an SEA and why is it needed?
 - Environmental aspects (radiological and non-radiological)
 - Framing SEA with the sustainable framework
 - Appendices on SEAs for nuclear power – examples and good practices & typical questions and concerns during stakeholder engagement events

Training workshop in April 2026.

Long term planning within CLEW framework



TC Regional Project:

Supporting the
Development of
Comprehensive Energy
Plans Considering the
**Climate, Land, Energy and
Water** in Latin America
and the Caribbean

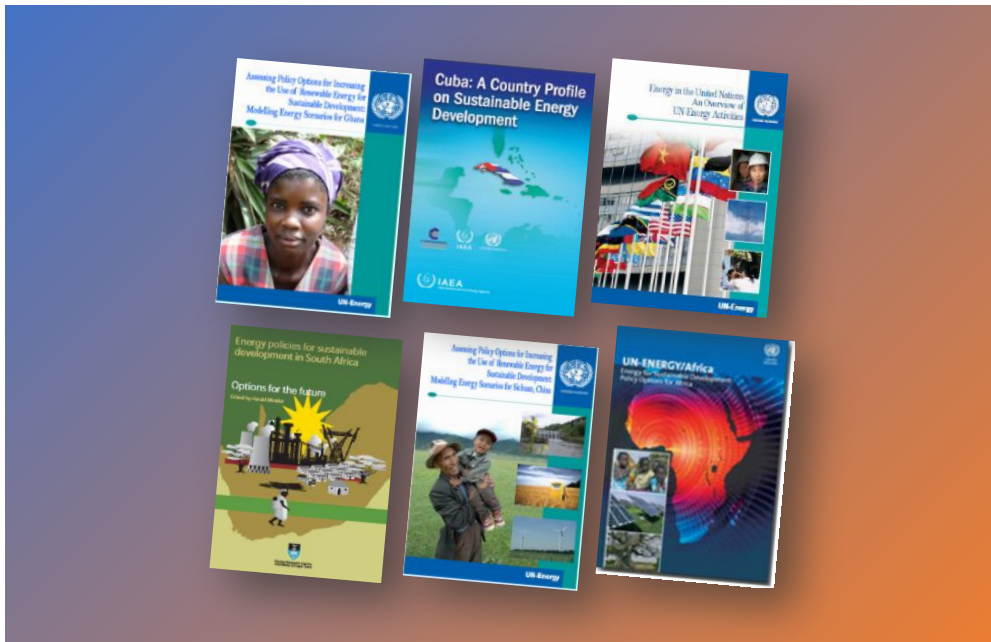
[Link: Methodology Handbook](#)

2024-2027

18 Countries

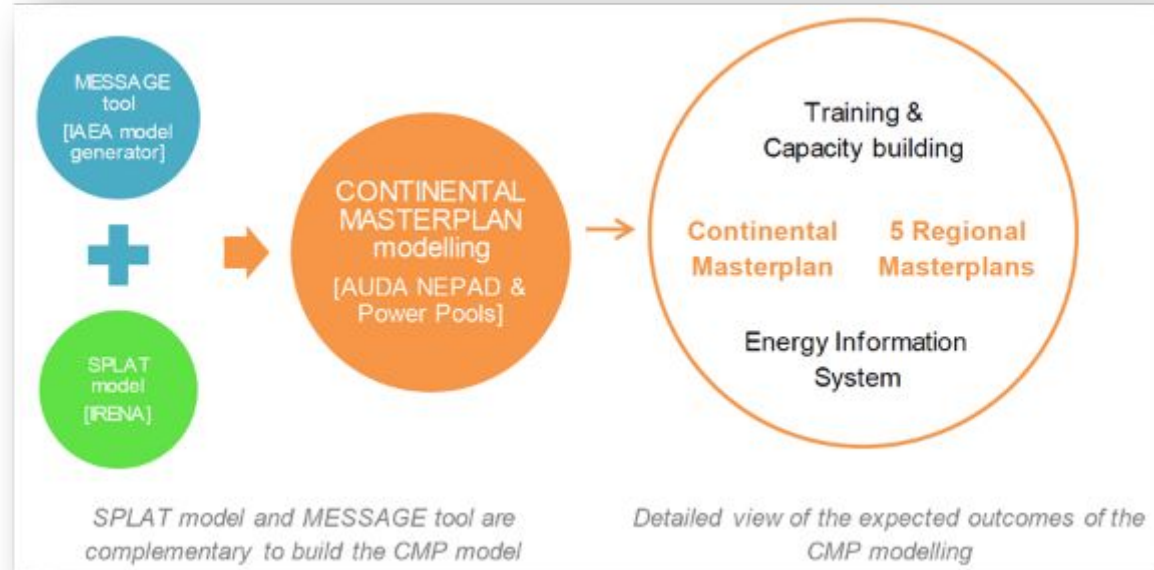
Examples of tool applications

- Long-term energy and electricity strategies
- Energy transition analysis
- Total cost of developing and operating energy systems
- Evaluation of NDCs
- Financial and environmental implications of energy strategies
- Regional/national markets development
- ...

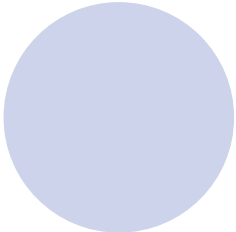


Example of tool applications

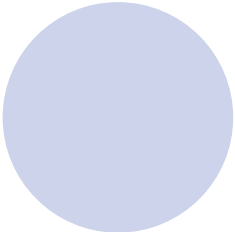
Supporting the development of Africa's **Continental Master Plan**: a roadmap for the integration of the continent through the establishment of a sustainable integrated continental power transmission network, in the context of the African Union's Agenda 2063.



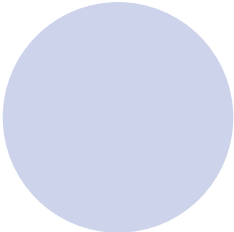
Cooperation – Collaborations – Partnerships



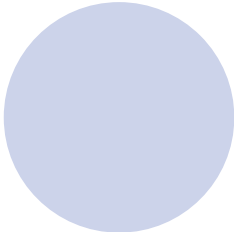
Provision of tools



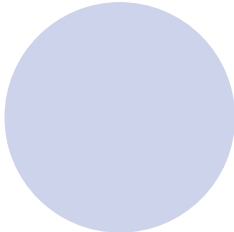
Exchange of information



Joint trainings



Complement country support



Event participation

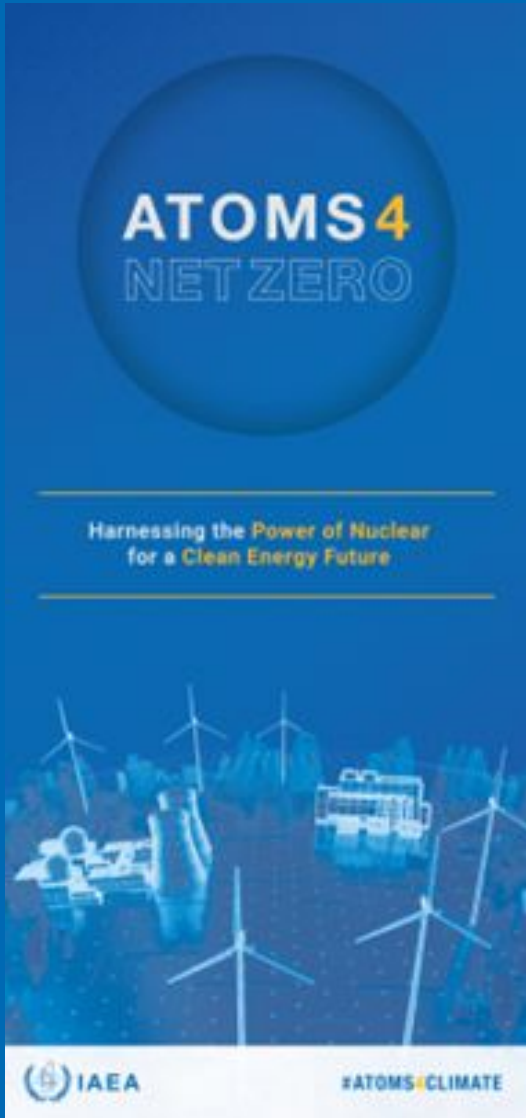


Example of cooperation with ADB – Trainings on energy supply model MESSAGE and energy demand model MAED



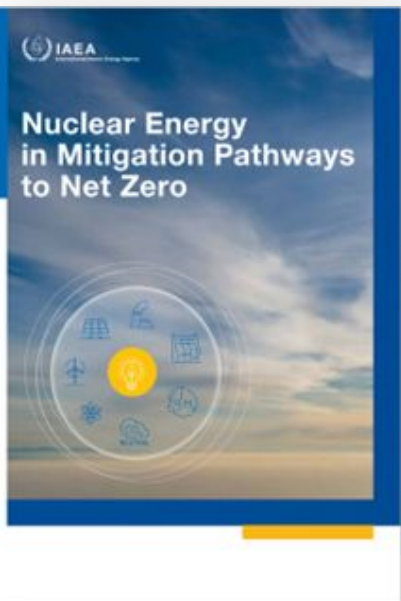
- In 2023, MESSAGE trainings were conducted for Southeast Asia and Central and West Asia countries
- In May 2024, MESSAGE training was conducted for South Asia countries in Dhaka, Bangladesh
- In Sep/Oct 2024, MESSAGE training was conducted for South Pacific countries in Nadi, Fiji
- In Sept 2025: IAEA, ADB, CCG and ESCAP supported the 1st Energy Modelling Platform Training for Asia and the Pacific (EMP-APAC), in Bangkok – with MESSAGE training for ADB DMCs
- In April 2026, Regional Training Workshop on Energy Demand Assessment and Use of the IAEA’s tool MAED, in Colombo, Sri Lanka.

Atoms4NetZero: Designing climate-resilient NZ energy infrastructures, taking full advantage of nuclear's potential

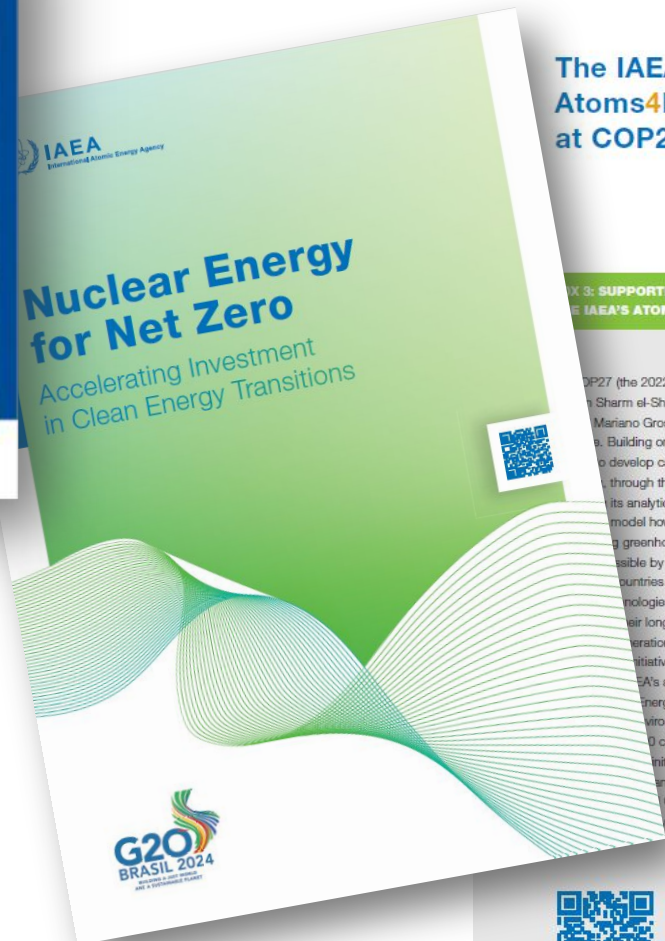


At COP27, Mr Grossi announced the IAEA's new **Atoms4NetZero initiative**, through which the IAEA will use its analytical tools and expertise to help countries that request it, to model how with the contribution of nuclear power they can reduce greenhouse gas emissions to as close to zero as possible by 2050. The Atoms4NetZero initiative will help countries assess the potential of innovative nuclear technologies, including SMRs, as potential contributors to their long-term strategies to decarbonize the electricity and other carbon-intensive sectors.

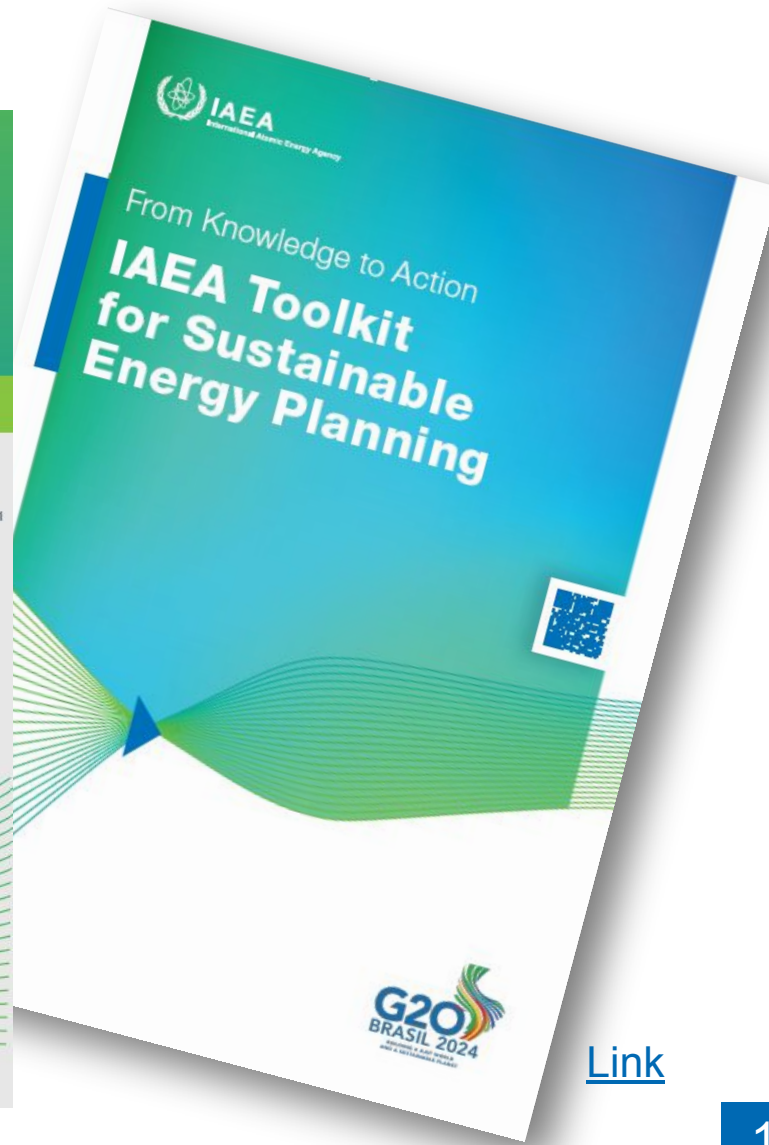
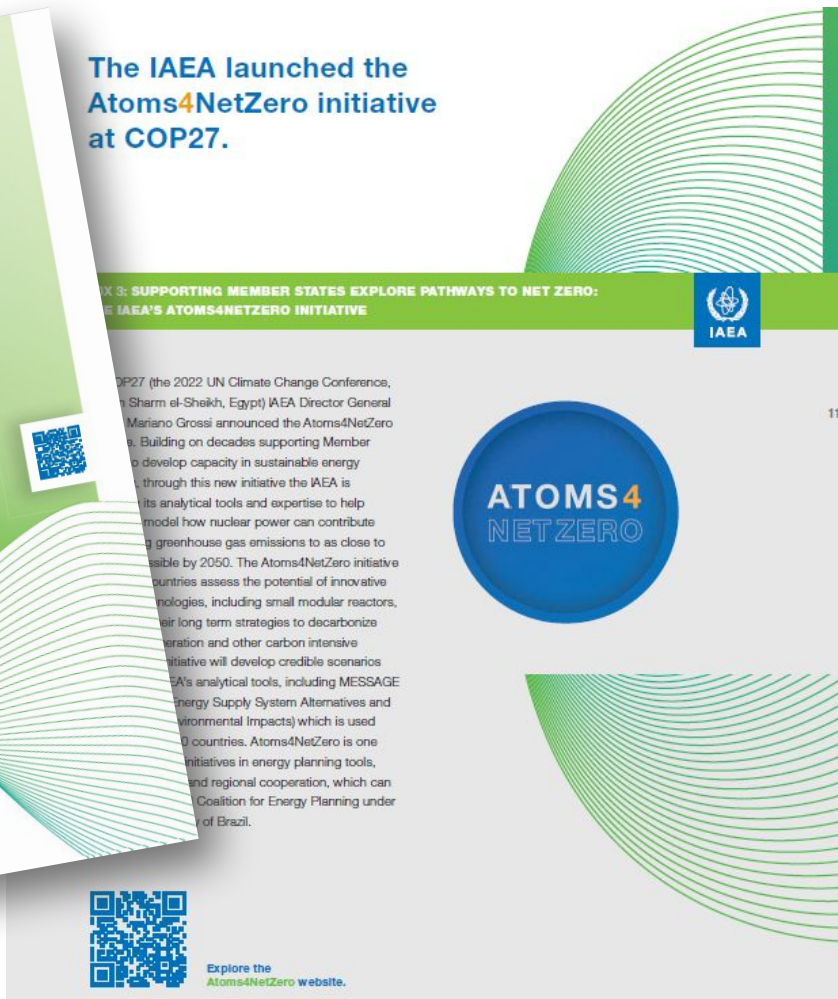
Atoms4NetZero: building on Agency's energy planning capabilities & analysis of nuclear's role in decarbonization scenarios (e.g. IPCC 6th AR)



[Link](#)



[Link](#)



[Link](#)

Examples of collaboration under Atoms4NetZero: Estonia / China / Singapore

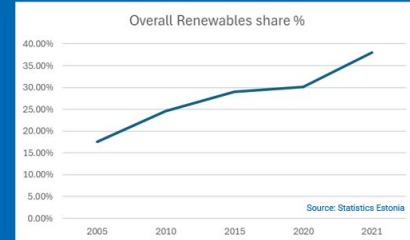
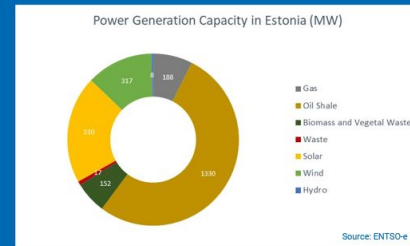
International Conference on SMRs and their applications (2024)



Estonia's energy system

Estonia has historically been reliant on domestically supplied oil shale.

- Net installed capacity of 2542 MW (ENTSO-e, 2023). Energy mix includes fossil fuels and renewables.
- Being an EU member state, Estonia has to comply with the EU climate target (42.5% of gross final energy consumption from renewables, by 2030)
- Goal to have gross final consumption of electricity of 100% renewable by 2030 (National Energy Climate Plan, NECP).



A fruitful few days with the International Atomic Energy Agency (IAEA) in Singapore! We co-organised two workshops with the IAEA, bringing together more than 60 participants to exchange knowledge and insights on nuclear energy planning and financing. It was a great opportunity for our teams to learn from global experts and strengthen Singapore's capabilities as we explore our nuclear energy options. Thank you to the IAEA and all who took part!



Modelling & analysis using MESSAGE

Reference scenario

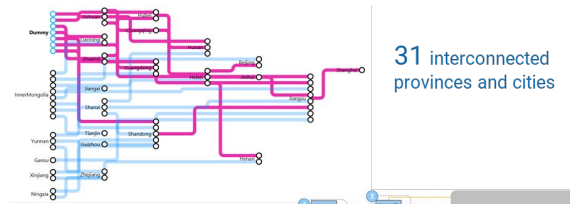
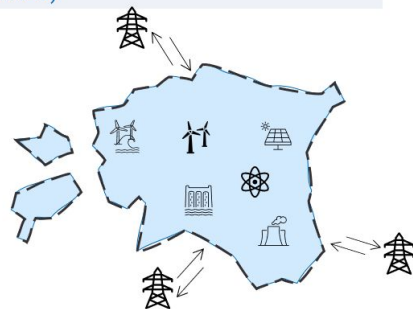
Achieving international and energy policy goals by expansion of currently used low carbon options (e.g. biomass, wind, solar; energy storages)

Nuclear scenario

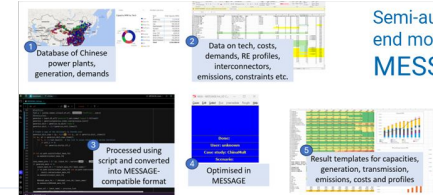
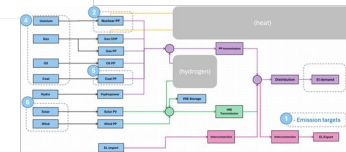
Achieving international and internal energy policy goals by introducing nuclear power, specifically 2 SMR units (first in 2035, and second in 2040)

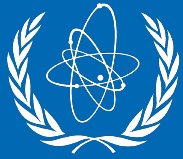
Model includes:

- Planning period 2020-2050
- Power and district heating demand
- >110 technologies, including utility-scale and rooftop solar PV, onshore and offshore wind, nuclear, storage, CHP, heat pumps
- Interconnections with neighbouring markets
- Carbon price projections
- Can be extended to hydrogen market



>1000 producing options (aggregated from smaller units) and batteries





IAEA

Topic 2: The 19 Infrastructure Issues associated with developing nuclear power and the global best practices

Nuclear Power today (May 2026)

31

Operating countries

415



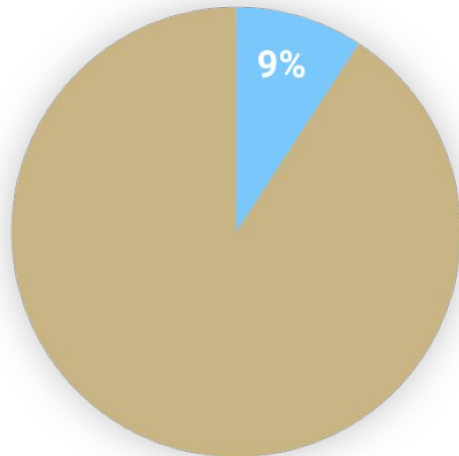
Reactors in operation

73



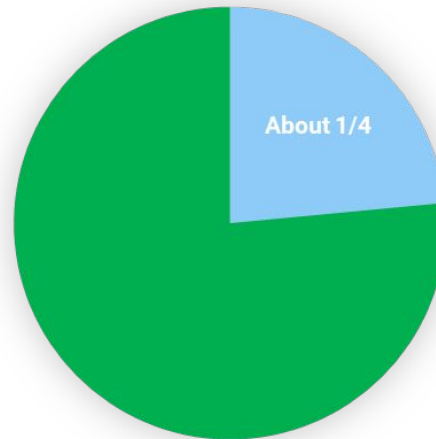
Reactors under construction

Nuclear Share of World's total electricity production



~9 % share electricity

Nuclear Share of world's low-carbon electricity production



**A little less than
a 1/4 low-carbon electricity**



Drivers for an expanded role of nuclear power

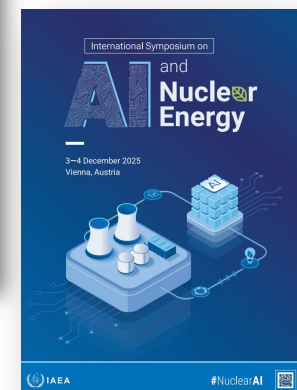
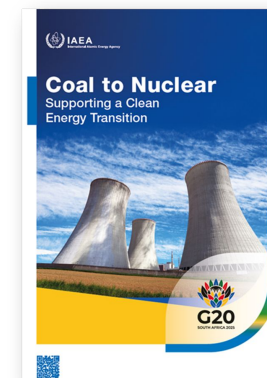
Depending on national priorities / circumstances:

- Security of supply
- Grid reliability & resilience
- Low-carbon and sustainability attributes
- Enabling integration of large % shares of renewables and contributing to lowering overall cost of the transitions (system cost)
- Decarbonization beyond electricity

ECONOMIC
DEVELOPMENT

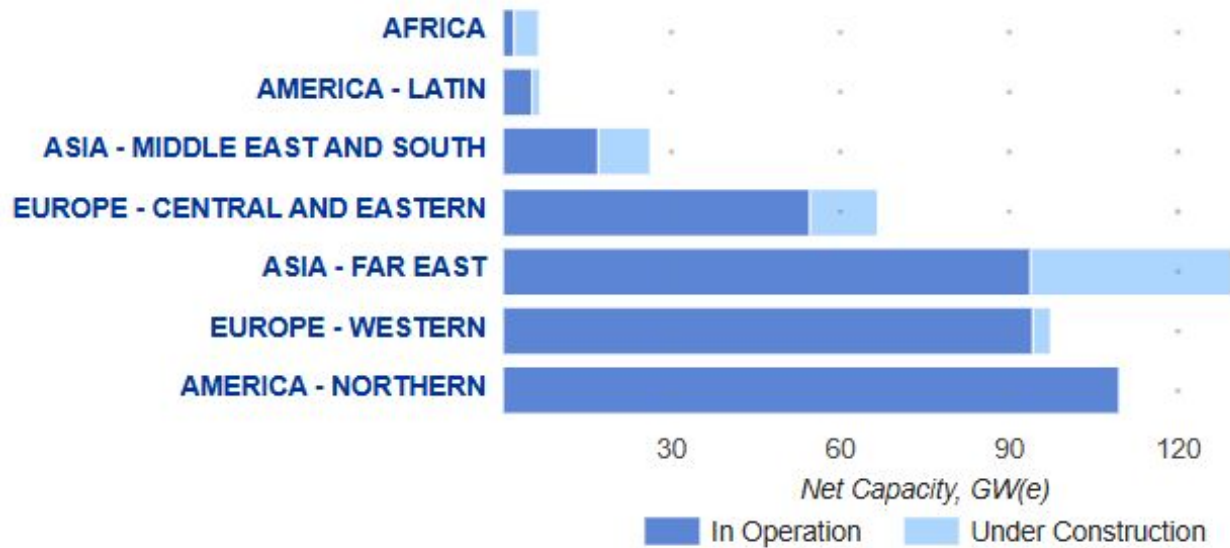
But also:

- Supporting transitions away from fossil fuels (COP30 Presidency Roadmap)
- Supporting 24/7 clean energy demand from data centers/AI

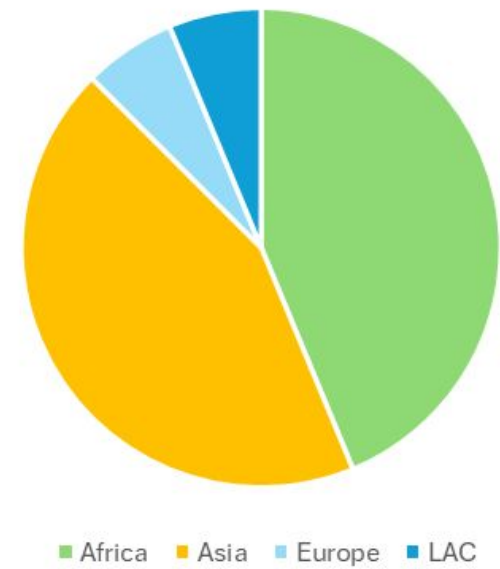


Nuclear energy tomorrow?

REGIONAL DISTRIBUTION OF NUCLEAR POWER CAPACITY



Newcomer countries



Nearly all the **31 countries** operating nuclear power today are planning an expansion of their fleet (or at least new constructions)

+40 additional countries are planning to embark on nuclear power, with assistance from IAEA under the “Milestones Approach”.
 Three are completing construction of their first NPP (Nuclear Power Plant):
 Türkiye, Bangladesh, Egypt

Considerations for Nuclear Power

- Nuclear power is a long-term commitment that requires strong national leadership.
- It is informed by energy planning and/or policy considerations (e.g. meeting increased demand, decarbonization objectives)
- A successful nuclear power programme requires commitment of at least 100 years.
- Creating the infrastructure and building the first nuclear power plant will take at least 10–15 years.
- The leadership should ensure coordination and broad political and popular support.
- The highest standards of safety, security and safeguards must be applied.

Introducing Nuclear Power
The Role of National Leadership

"Why nuclear power?"
National leaders must present a credible answer

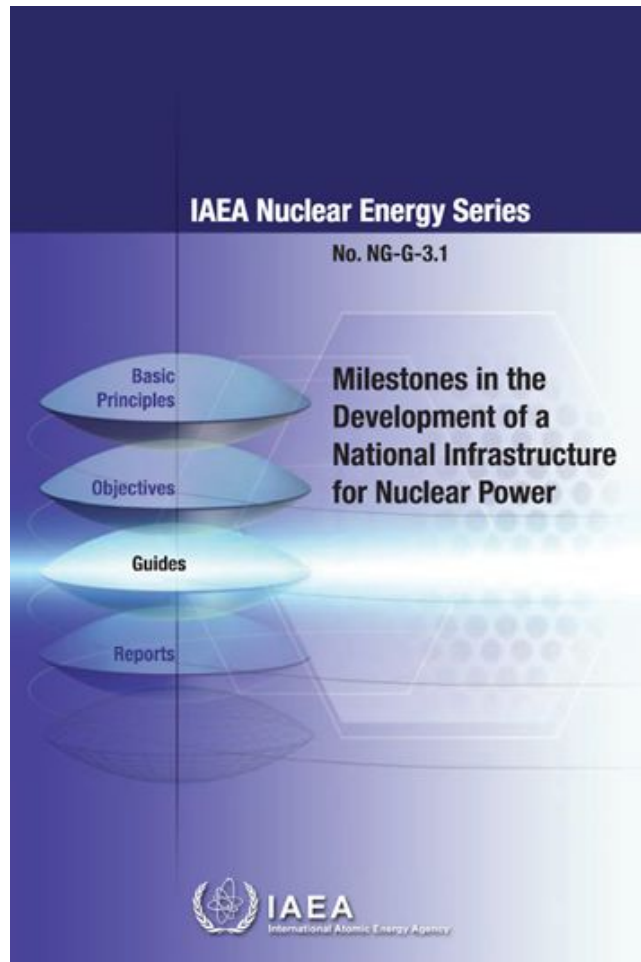
Nuclear power is a long term national commitment that requires strong leadership

Nuclear power's characteristics require special attention

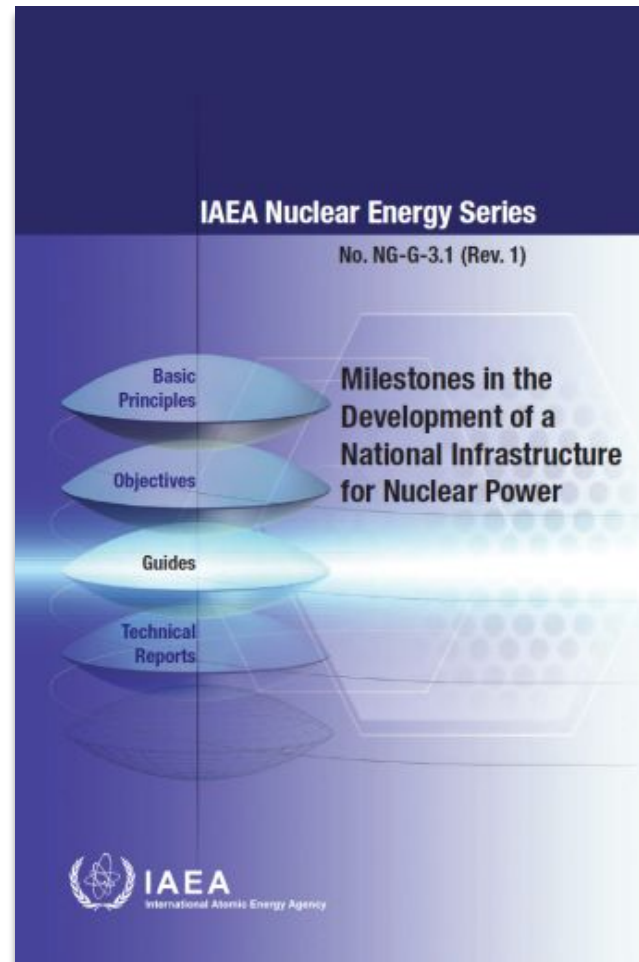
IAEA 60 Years
Atoms for Peace and Development

The infographic is a grid of colored boxes (green and light blue) containing text and images. The images include: a night view of a city with lights, a group of people in white lab coats and hard hats looking at documents, a nuclear power plant with cooling towers, and a group of people in a meeting room.

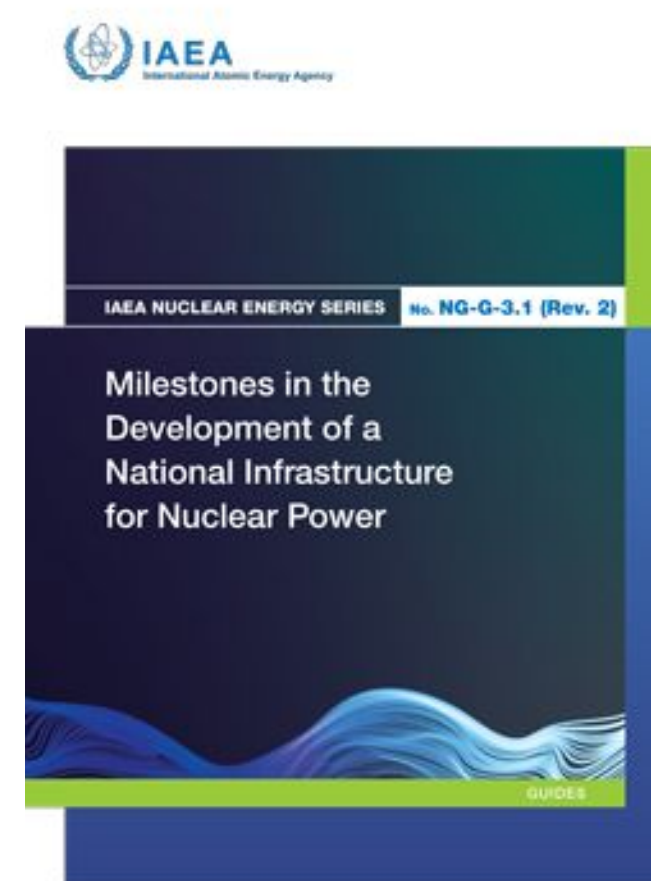
Milestones in the Development of a National Infrastructure for Nuclear Power



NG-G-3.1 issued in 2007



Updated in 2015 (rev. 1)



Updated in 2024 (rev. 2)

IAEA Milestones Approach: Infrastructure Development Phases

Introducing Nuclear Power

A phased and comprehensive management guide on creating an enabling environment for successful and sustainable nuclear power programme



19 Infrastructure Issues and INIR missions

Integrated Nuclear Infrastructure Review (INIR):

- At a Member State's request, the IAEA conducts an INIR mission with international experts and IAEA staff. Countries must first complete a self-evaluation of the 19 nuclear infrastructure issues under the IAEA Milestones approach

- More info:**
<https://www.iaea.org/services/review-missions/integrated-nuclear-infrastructure-review-inir>



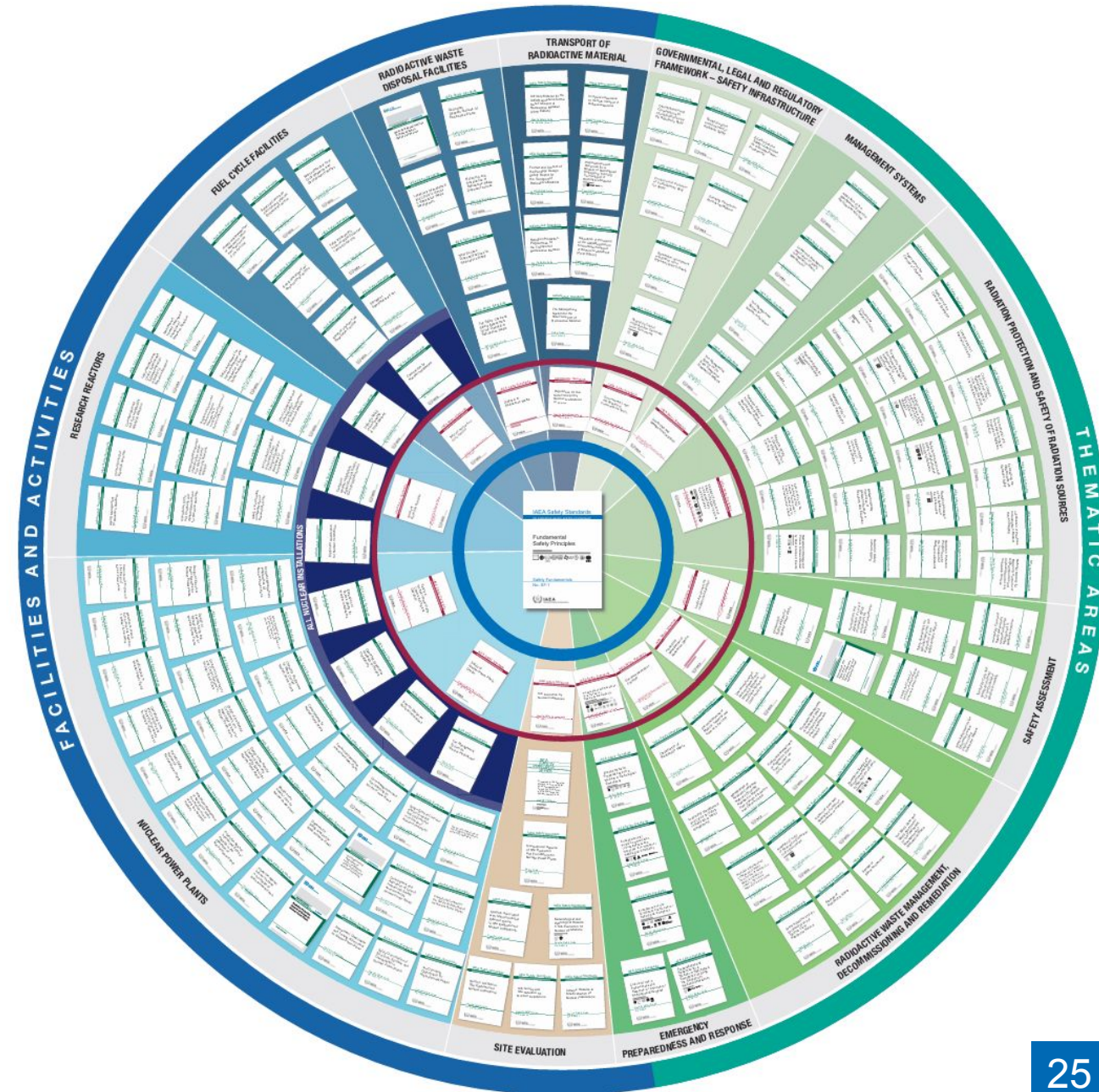
IAEA Safety Standards

Purpose: International standards for safe use of nuclear and radiation technologies.

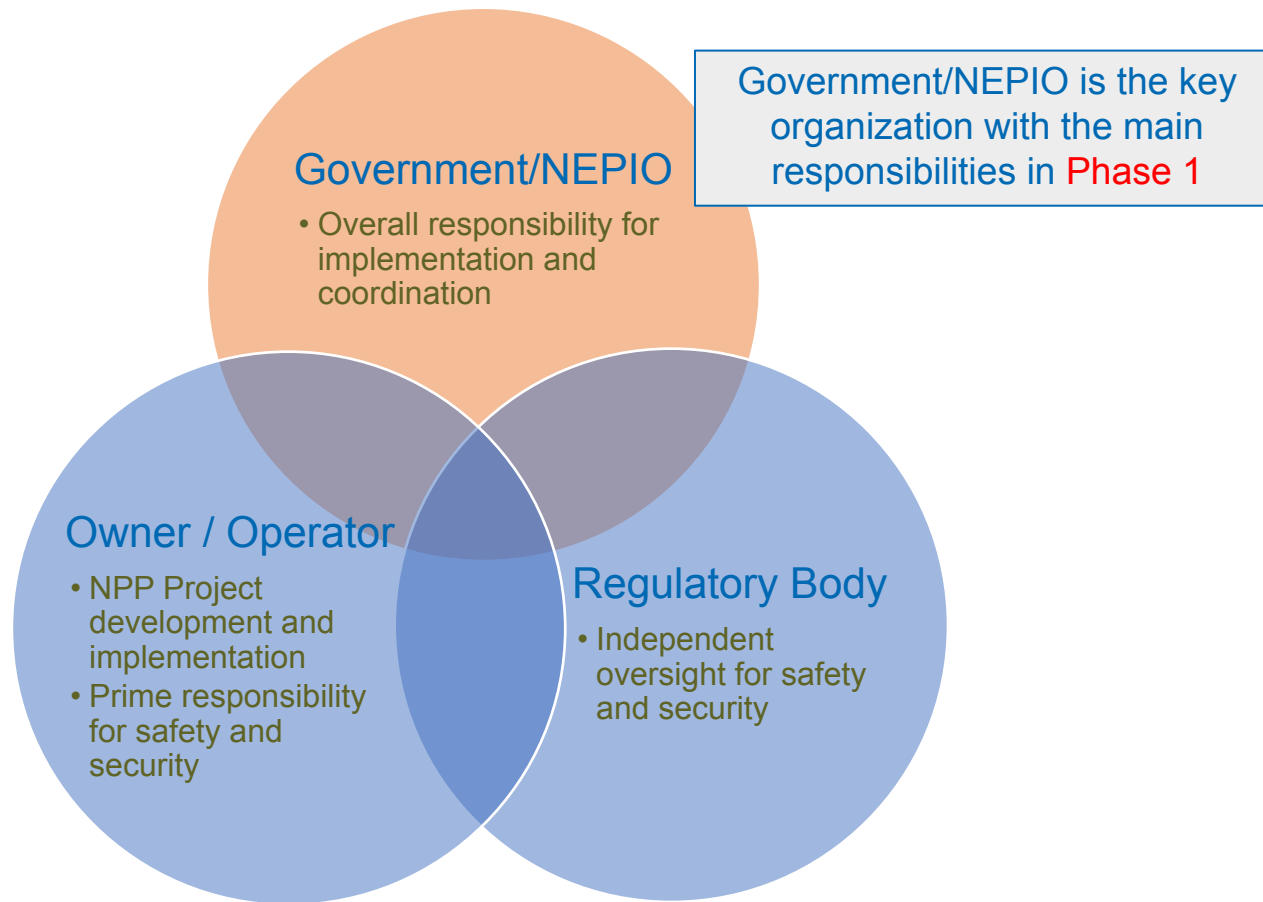
Development: Three-tier system developed through global expert review.

Usage: Voluntary adoption by countries to strengthen national safety frameworks.

The Hierarchy of the IAEA Safety Standards



Key and other relevant organizations



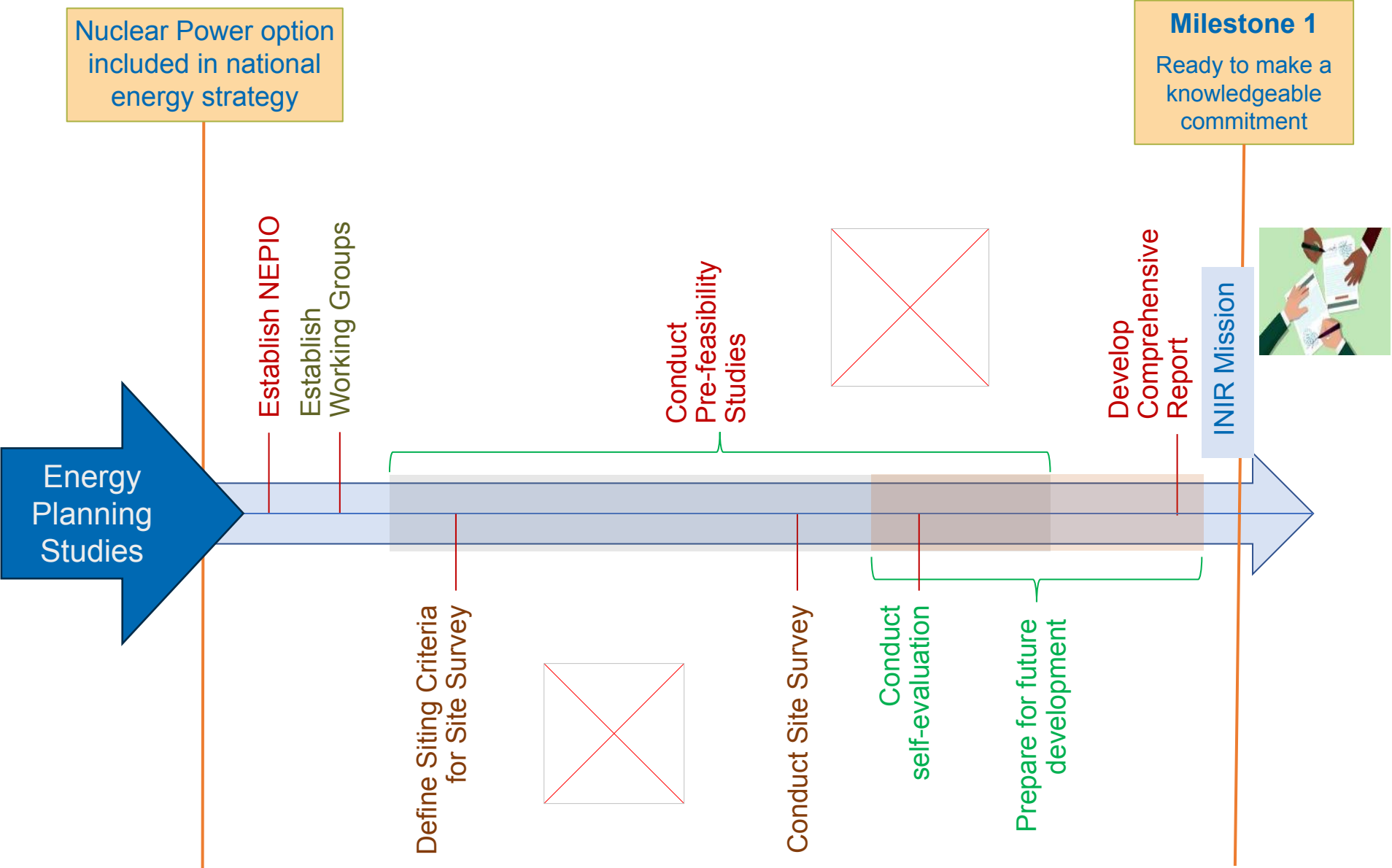
Other relevant organizations

- Ministry of Energy
- Ministry of Environment
- Security authorities, local and national
- Technical and educational/academical institutions
- Etc.

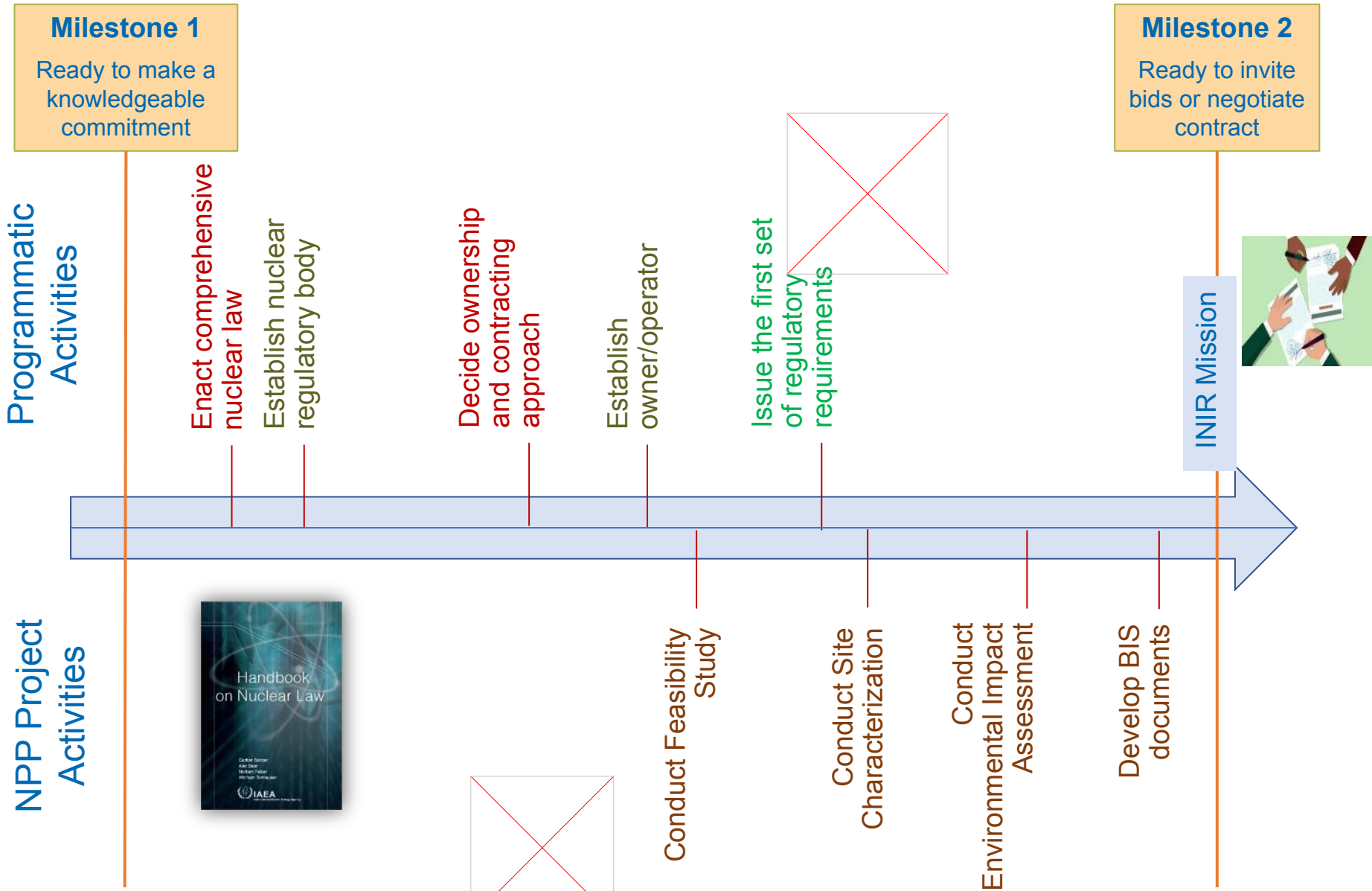
All organizations

- to implement necessary activities in the current Phase
 - to make preparations for the next Phases
- of the nuclear power programme

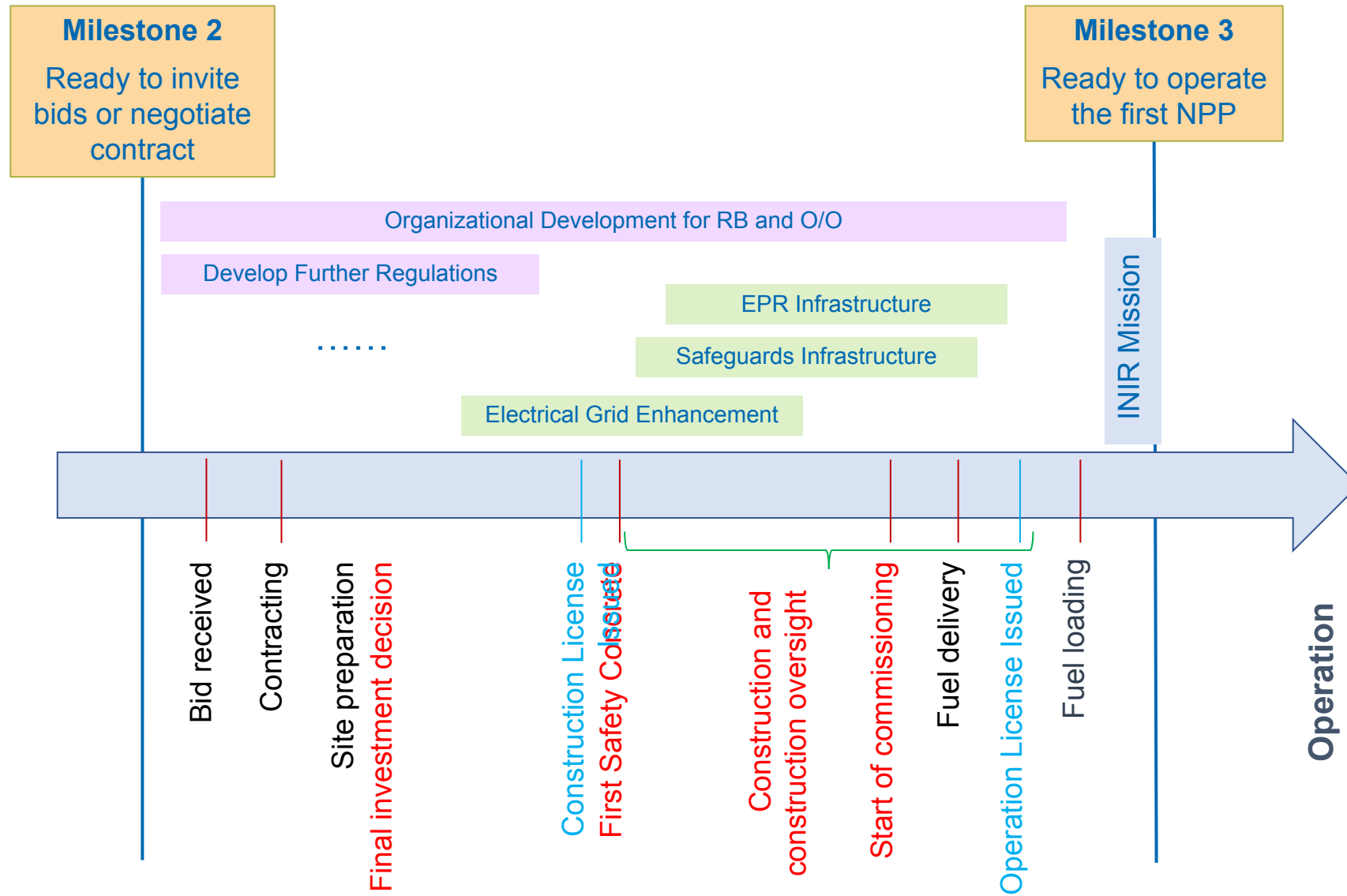
Key activities in Phase 1:



Key activities in Phase 2:



Key activities in Phase 3:



Operating and Embarking Countries in Asia

Asian Countries Operating or Embarking on Nuclear Power	
Operating	China, Japan, Republic of Korea, India, Pakistan, Iran, United Arab Emirates
Phase 3	Bangladesh, Saudi Arabia, Uzbekistan
Phase 2	Kazakhstan, Viet Nam, Philippines, Jordan
Phase 1	Azerbaijan, Indonesia, Iraq, Malaysia, Mongolia, Myanmar, Singapore, Sri Lanka, Thailand
Pre-Phase 1	Brunei Darussalam, Israel, Kuwait, Kyrgyzstan, Laos

Recent and future INIR missions in selected countries in Asia

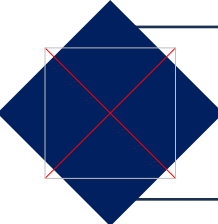
- INIR Phase 1 Follow-up Philippines (2024)
<https://www.iaea.org/newscenter/pressreleases/iaea-reviews-progress-of-the-philippines-nuclear-infrastructure-development>
- INIR Phase 2 Viet Nam (2025): <https://www.iaea.org/fr/node/288630>
- INIR Phase 1 Follow-up Sri Lanka (2025):
<https://www.iaea.org/newscenter/pressreleases/iaea-reviews-progress-of-sri-lankas-nuclear-infrastructure-development>
- INIR Phase 2 Follow-up to Uzbekistan is planned for July 2026.
- INIR Phase 3 in Bangladesh is planned for December 2026.
- INIR Phase 2 in Kazakhstan is planned for April 2027.
- INIR Phase 1 in Singapore is planned for end of 2027.
- INIR Phase 1 to Iraq is planned for 2027.
- INIR Phase 1 to Azerbaijan is planned for 2027.

Milestones and SMRs

- The Milestones approach remains largely applicable to SMRs
- Similar infrastructure requirements than large NPPs
- Some elements can be downscaled, as the associated power and risks are smaller
- The timeframe for readiness of infrastructure could be shorter



Take Away Points



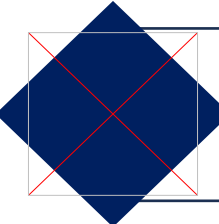
IAEA estimates show that the production of electricity from nuclear power will increase. New units will be built and put into operation including in embarking countries



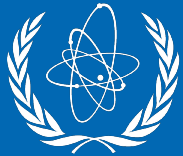
Milestones Approach is the framework for embarking countries. The Milestones Approach covers the nuclear programme and splits in 3 Phases and in 19 Infrastructure Issues



Milestone Approach is applicable for nuclear power programs with SMR projects, and the IAEA will continue to adopt this methodology to support infrastructure for SMR technology



The IAEA provides relevant support to embarking countries including Nuclear Infrastructure Bibliography, IWP process, competency framework, e-learning modules, INIT programme, etc.



IAEA

Thank you

Planning and Economic Studies Section (PESS)
&
Nuclear Infrastructure Development Section
(NIDS)
International Atomic Energy Agency