IAEA SUPPORT ON INFRASTRUCTURE DEVELOPMENT FOR A NEW NUCLEAR POWER PROGRAMME

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IAEA and Newcomer Countries

“It is each country’s sovereign decision whether to add nuclear power to its energy mix”

“The Agency has a key role to play in ensuring that expansion in nuclear power takes place in an efficient, responsible and sustainable manner.”

“Assistance to newcomers, especially those which are most advanced on the road to having operational reactors, will remain a high-priority issue.”

Yukiya Amano
IAEA Director General
## Countries Embarking on Nuclear Power

Number of Member States at different stages of decision making and planning for nuclear power in 2012–2016 according to their official statements

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</thead>
<tbody>
<tr>
<td>First nuclear power plant started construction/under construction</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>First nuclear power plant ordered</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Decided to introduce nuclear power and started preparing the appropriate infrastructure</td>
<td>6</td>
<td>6</td>
<td>7</td>
<td>7</td>
<td>6</td>
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<tr>
<td>Active preparation for a possible nuclear power programme with no final decision</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Considering nuclear power programme</td>
<td>13</td>
<td>19</td>
<td>18</td>
<td>11</td>
<td>11*</td>
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* Another 17 countries expressed interest in nuclear power during 2015 at the IAEA General Conference or in high level bilateral meetings
Drivers for Nuclear Energy

Drivers for consideration of nuclear have not changed:

- Energy independence
- Volatile fossil fuel prices
- Climate change
- Increased demand for energy
The IAEA Milestones Approach for Nuclear Power Infrastructure Development

The Milestones Approach is holistic and considers 19 specific infrastructure issues

NG-G-3.1 issued in 2007
Updated in 2015
Milestones in the Development of a National Infrastructure for Nuclear Power (NG-G-3.1 Rev 1)

**NUCLEAR POWER INFRASTRUCTURE DEVELOPMENT**

**MILESTONE 1**
Ready to make a knowledgeable commitment to a nuclear power programme

**PHASE 1**
Considerations before a decision to launch a nuclear power programme is taken

**MILESTONE 2**
Ready to invite bids/negotiate a contract for the first nuclear power plant

**PHASE 2**
Preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken

**MILESTONE 3**
Ready to commission and operate the first nuclear power plant

**PHASE 3**
Activities to implement a first nuclear power plant

AT LEAST 10-15 YEARS

**FIRST NUCLEAR POWER PLANT PROJECT**

- Pre-project activities
- Project development
- Final investment decision
- Contracting
- Construction
- Commissioning
- Operation
- Decommissioning
<table>
<thead>
<tr>
<th>Milestones</th>
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</thead>
<tbody>
<tr>
<td>1. National position</td>
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<tr>
<td>2. Nuclear safety</td>
</tr>
<tr>
<td>3. Management</td>
</tr>
<tr>
<td>4. Funding and financing</td>
</tr>
<tr>
<td>5. Legal framework</td>
</tr>
<tr>
<td>6. Safeguards</td>
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<tr>
<td>7. Regulatory framework</td>
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<tr>
<td>8. Radiation protection</td>
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<tr>
<td>9. Electrical grid</td>
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<tr>
<td>10. Human resource development</td>
</tr>
<tr>
<td>11. Stakeholder involvement</td>
</tr>
<tr>
<td>12. Site and supporting facilities</td>
</tr>
<tr>
<td>13. Environmental protection</td>
</tr>
<tr>
<td>14. Emergency planning</td>
</tr>
<tr>
<td>15. Nuclear security</td>
</tr>
<tr>
<td>16. Nuclear fuel cycle</td>
</tr>
<tr>
<td>17. Radioactive waste management</td>
</tr>
<tr>
<td>18. Industrial involvement</td>
</tr>
<tr>
<td>19. Procurement</td>
</tr>
</tbody>
</table>
The Milestones Approach

Phase 1: Decide!

Phase 2: Prepare!

Phase 3: Construct!
Milestone 1: Ready to Make a Knowledgeable Decision

Prefeasibility study
• Reviews required infrastructure and feasibility of a nuclear power programme

Comprehensive report
• Comprehensive examination of all 19 infrastructure issues

National Strategy
• Should the comprehensive report recommend a positive national decision, a national strategy is defined
Phase 1: Coordination

Nuclear Energy Programme Implementing Organization (NEPIO)

“…a mechanism (which may involve high level and working level committees) to coordinate the development of the nuclear infrastructure development within a Member State.”
Milestone 2: Ready to Invite Bids or Negotiate a Contract

- Government (NEPIO)
- Regulatory Body (ies)
- Owner-Operator

Graphical representation of the four phases and milestones in the nuclear power infrastructure development process.
Phase 2: Building Institutions

Involvement of the Regulatory Body

- Establishment

Involvement of the Operating Organization

- Establishment

**Phase 1**
- Ready to make a knowledgeable commitment to a nuclear power programme
- 1~3 years

**Phase 2**
- Ready to invite bids/negotiate a contract for the 1st NPP
- 3~7 years

**Phase 3**
- Ready to commission and operate the first NPP
- 7~10 years
Phase 2: Establishing the Legal and Regulatory Framework

The Legal Framework is the foundation of the nuclear power programme

Regulatory body
- Strong
- Independent
- Competent
Milestone 3: Ready to Commission and Operate the 1st NPP

UAE, Barakah (2017)
Phase 3: Licensing and Construction
INTEGRATED NUCLEAR INFRASTRUCTURE REVIEW (INIR)
Integrated Nuclear Infrastructure Reviews (INIR)

• Based on the Milestones Approach: 19 Infrastructure Issues
  3 Phases, 3 Milestones
• International expert peer review led by a high level IAEA manager
• Identifies areas for further action and makes suggestions and recommendations
• Requested by Member State government results are delivered to government
INIR Missions 2009-2016

1. Jordan 2009
2. Indonesia 2009
3. Vietnam 2009
4. Thailand 2010
5. UAE (Phase 2) 2011
6. Bangladesh (Phase 1&2) 2011
7. Jordan follow-up 2012
8. Belarus (Phase 1&2) 2012
9. Vietnam (Phase 2) 2012
10. Poland 2013
11. South Africa (Phase 2) 2013
12. Turkey (Phase 2) 2013
13. Jordan (Phase 2) 2014
15. Nigeria (Phase 2) 2015
17. Morocco 2015
18. Bangladesh follow-up 2016
19. Poland follow-up 2016
20. Malaysia (phase 1) 2016
22. Ghana (phase 1) 2017
INIR Process for Philippines

1. Member State makes preparatory arrangements
   - Final SER
     - Supporting documents

2. INIR team completes preparatory work

3. IAEA conducts Main INIR mission

4. IAEA finalizes Main INIR mission report

5. IAEA hands over final report to Member State

6. Member State develops Action Plan

7. IAEA conducts Follow-up INIR mission

8. IAEA submits Follow-up report to Member State

Main INIR mission preliminary draft report

Main INIR mission final report

Follow-up INIR mission report
INIR missions: The First Six Years

Phase 1 and Phase 2 missions
The infrastructure issues where deficiencies were identified more frequently are:

- 1. National Position
- 3. Management
- 5. Legal Framework
- 7. Regulatory Framework
- 10. Human resource development
IAEA Assistance to Newcomer Countries

Small but strategic: wide range of IAEA products and services to support the introduction or expansion of nuclear power:

- Documentation; e-Learning modules; Networks
- Technical Workshops; Technical Meetings; Training Courses
- Review and Expert missions; Peer Reviews; Advisory Services
Nuclear Power Infrastructure Bibliography

- Key and supporting documentation exists for the 19 Infrastructure Issues

www.iaea.org/NuclearPower/Infrastructure
E-Learning Modules

1. Introduction and overview
2. Human resource development
3. Stakeholder involvement
4. NP programme management
5. Construction management
6. Systematic approach to training
7. Feasibility study
8. Management systems
9. Safety infrastructure
10. Emergency preparedness and Response
11. Safeguards
13. Siting
14. Legal framework – coming soon
15. National position

Further modules are under development
Competency Framework

https://nucleus.iaea.org/competency-framework/
Thank you!