Discussions on policy interests in the context of “Day 1-3” activities

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Quick Review for Day1-3
Milestones Approach

NUCLEAR POWER INFRASTRUCTURE DEVELOPMENT

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

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

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

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

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

PHASE 3
Activities to implement the 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
Overall Integrated Process

IAEA Core Team
(TC, NE, NS, OLA, SG)
Coordinator: CTO-NIDS

Member State’s Self-Evaluation
(Gaps Identified)

INIR Mission

Updated National Action Plan/
Request IAEA Support

Annual Review
(CNIP & IWP, TC, EB)

IAEA Assistance
IWP & CNIP
(Integrated Work Plan & Country Nuclear Infrastructure Profile)

Information on Activities Not
Requiring IAEA Support

IAEA Review Services
(When Relevant)

Competence Building
- Interregional/regional TC projects
- Nuclear Energy Management Schools
- IAEA Technical Meetings

Other Supporting Tools
(NIDS Interactive Platform, Infrastructure Bibliography, Competency Framework)
INIR process

- The integrated nuclear infrastructure review is comprised of the following **4 steps:**
  - Step 1: Self Evaluation Report (SER) review
  - Step 2: Pre-INIR mission
  - Step 3: INIR mission
  - **Step 4: INIR Follow-up mission**

- The INIR is conducted upon formal request from the Member State, and consists of all 4 steps
- The timing of each of the 4 steps is agreed with the Member State
IAEA Milestones Approach: Infrastructure Issues

The Milestones Approach is holistic and considers 19 specific infrastructure issues.
Industrial involvement: Phase 1 (Consider to Decide)

- NEPIO (Nuclear Energy Project Implementation Organization) to Assess;
  - Local industrial capabilities
  - Interest of business / industrial leaders in participating in the NPP project considering the special requirements
  - Investment for intended upgrading of industrial facilities

- NEPIO to Develop;
  - Short term and long term policies on the area/level of local participation that is practical and desired

- NEPIO to Initiate dialogue with potential vendor(s)
Elements for successful Industrial involvement

Receiving countries need to develop/prepare/conduct;

- **Capacity surveys of local industries**
- **Policies for developing industrial capacity**
- **Industrial standards & quality assurance mechanisms**
- **Capacity building activities** such as:
  - National R&D programme
  - Partnership w/ competent players for technology transfer
  - Long-term and low-interest loan for capital investment
- **National/Local investment for the above activities**
- **Negotiation with vendor and/or EPC contractor**
Policy Interests by Indonesia
1) Based on your experiences, how to prepare transfer technology program in order could reach self reliance?

2) What is the key items should be focused for technology transfer for every step?

3) Would you please to elaborate more about the transfer technology contract with base practices in other countries?

4) How to make NPP competitive with fossil (or another) power plant from industrial point of view? (Ministry of industry)
Q1. How to prepare for Technology Transfer program in order to reach self-reliance?

Q2. What is the key items should be focused for technology transfer for every step?

- To understand “Types”, “Stages”, and “Structure” of TT properly, by learning international case studies. **Recognize where you are & where you want to go…!**

- It’s good strategy to build **multiple channels** to negotiate, even in an early phase for Technology Transfer.

- It’s important that industrial sector makes **policy proposals** to the gov proactively. Utility & industry know their needs.

- TT is not only for overall NPP(s), but also for **varied types** such as component design & manufacturing, software engineering, construction.. **Prioritize your area for TT first!**
Types of TT: Techs can be Transferred

1) Design Tech
   - From the R&D stage to the Final Process Design of all the systems comprising NPP.

2) Manufacturing & Construction Tech
   - From Design of Equipment to Special Manufacturing Techs & Quality Assurance in the NPP construction.

3) Project Engineering & Management
   - Works for the successful execution of the NPP project including Office & On-site Activities.
Stages of TT: Moving toward Self-reliance

1) Initiating Stage
   - Technical dependency as a subcontractor

2) Selective Stage
   - Technical acquisition of the technology as a subcontractor

3) Adaptive Stage
   - Joint design of indigenous products (start modifying the vendor’s tech to adapt to specific markets) as a subcontractor or primary contractor

4) Mastery Stage
   - Technical self-reliance as a primary contractor
Structures of TT: Defining the Scope & Nature

1) Inter-governmental Agreements
   - Give a framework of TT. Detailed agreements can be among R&D, Standard or Educational Institutions if both parties wish.

2) Company Agreements
   - Give a definition of “which” and “how” techs are to be transferred. Basically they forms four types of structure:
     1. Licensing Agreements
     2. Technical Cooperation Agreements
     3. Joint Ventures
     4. Consultancies
Q3. elaborate more about the TT contract with base practices in other countries?

1945  Defeat in WWII: 60-70% of production capacity damaged

1952  Hitachi negotiated with potential partners in gas turbine: 1) AEG@German, 2) EE@UK, 3) GE@US

1953  Hitachi decided GE (= gave up doing by herself) and proposed policies (subsidies & tax merit for investment)

1966  Hitachi and GE agreed tech-partnership in nuclear power ⇒ System License: 1) design documents & analysis tools, 2) dispatched engineering staff to GE San Jose site

1974  “Shimane Unit.2” localized in 94% mainly by Hitachi
# A Case of TT in History: 1960-70s, Japan

<table>
<thead>
<tr>
<th>Name of NPP</th>
<th>Tsuruga Unit 1 (1st Operated LWR)</th>
<th>Fukushima Unit 1 (3rd Operated LWR)</th>
<th>Shimane Unit 1 (5th Operated, and 1st “Localized” LWR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Contractor</td>
<td>GE</td>
<td>GE</td>
<td>Hitachi</td>
</tr>
<tr>
<td>Capacity (Net)</td>
<td>341 MWe</td>
<td>439 MWe</td>
<td>439 MWe</td>
</tr>
<tr>
<td>Ratio of Domestic Production</td>
<td>55%</td>
<td>56%</td>
<td>94%</td>
</tr>
<tr>
<td>Supplier of Reactor System</td>
<td>GE</td>
<td>GE</td>
<td>Hitachi</td>
</tr>
<tr>
<td>Supplier of Steam System</td>
<td>GE</td>
<td>GE</td>
<td>Hitachi</td>
</tr>
<tr>
<td>Supplier of Turbine System</td>
<td>GE / Toshiba</td>
<td>GE</td>
<td>Hitachi</td>
</tr>
</tbody>
</table>

Source: JAIF "World Nuclear Power Plant" (2017), et al.
Analysis: Why did Japan succeed in TT?

1) Industry-wise

- Technology Matured in Hydroelectric Power since 1940s
- Experienced in Gas Turbine (Alliance of GE & Hitachi signed 1953)
- Catch-up as a Subcontractor under the Licensing Contract
- Structured Supply-chain (366 companies involved in NPP in 1972)

2) Utility-wise

- Led R&D Projects w/ Domestic Manufacturers for Localization
- Well-Judged in the 1st Localized NPP (e.g. Chose Conventional Type of Reactors; Classified Components for Localization*)

* Utility decided to import hi-spec components such as I&C, Circulation Pumps, Control Rods
Analysis: Why did Japan succeed in TT?

3) Government-wise

- National Program (1st Long-term Plan Published in 1956)
- Subsidy for R&D ($0.9M in 1967FY, mainly for Manufacturers)
- Finance
  - Long-term & Low-Interest Loan by Japan Development Bank
  - Export Credit Finance by US Exim Bank
- Tax Benefit
  - Exemption from Tariff
  - Special Depreciation

“Japan Power Demonstration Reactor”
(BWR provided by GE, operated for 1963-1976)
Analysis: Why did Japan succeed in TT?

4) Market-wise (External Factors)

- In the Early Stage of the NPP Technology
  - Dawn of “Generation II” Reactors
  - Favorable “Buyer’s Market” ⇒ Room to Negotiate
  - US Vendors (WH, GE) were positive for TT
  - Not Yet Experienced TMI, Chernobyl, Fukushima

- In the Period of High Economic Growth
  - High Demand for Electricity
  - Lack of Domestic Energy Resources

“Shimane” Unit 1
(At the time under Construction)
Analysis: Issues after the 1st Localization
⇒ “Self-reliance” is difficult than it looks…!

- Troubles/Accidents in NPPs
  ⇒ Lower Capacity Factor
  ⇒ Higher Cost

- Needed to localize for larger/newer NPPs
  (e.g. Localization ratio of “Tokai-2” (1,056MW, operated since 1978) is 51%)

- Needed to improve the level of technologies including Operating and Maintenance (O&M)

- Needed to have opportunities of learning repetitively

Source: Japan Nuclear Energy Safety Organization, et al
Q4. How to make NPP competitive with fossil (or another) power plant from industrial point of view?

https://www.enecho.meti.go.jp/about/special/tokushu/nuclear/nuclearcost.html
Trend 1: Nuclear Power as a Clean Energy Option

“For many countries, nuclear power is a proven, clean, safe, and economical technology. And for many countries, it can play an increasingly important role in achieving energy security, reducing the impact of volatile fossil fuel prices, and mitigating the effects of both climate change and air pollution.”

“The challenges of climate change and ensuring sufficient supplies of energy for the future are issues on which the Agency’s voice must be heard. I will take our message... to COP 25, in Madrid next week.”
What are the available options?

• Nuclear power makes a significant contribution to electricity generation, providing 10% of global electricity supply in 2018.

• Despite the impressive growth of solar and wind power, the overall share of clean energy sources in total electricity supply in 2018, at 36%, was the same as it was 20 years earlier because of the decline in nuclear.
Benefits of Localization

- For **EPC Contractor**
  - Secure supply chain
  - Efficient employment
  - Effective logistics

- For **Government**
  - Job creation
  - Support to high skilled jobs
  - Impact on GDP growth

- For **Local Industries**
  - Technology transfer
  - Strengthen Partnerships
  - Access to world market for nuclear/non-nuclear areas
Thank you so much!
Terima kasih banyak!