Development of Indonesian Experimental Power Reactor Program: An Approach to Innovative R&D, Nuclear Cogeneration and Public Acceptance

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SCOPE OF PRESENTATION

1. BACKGROUND OF EXPERIMENTAL POWER REACTOR
2. OBJECTIVES
3. PROJECT AND PROGRESS STATUS
4. APPROACH TO VENDOR EVALUATION
5. APPROACH TO COLLABORATION
6. CONCLUSIONS.

Archipelago of Indonesia

1. BACKGROUND OF EXPERIMENTAL POWER REACTOR (1)

- Strong inter-institutional coordination among BATAN and the National Development Planning Agency/Ministry of National Development Planning (BAPPENAS) and the Ministry of Finance adopted the decision to deploy an experimental power reactor as a programmatic priority of BATAN.
- The trilateral institution coordination concurred to promote the experimental power reactor as a national project.
- The program will both promote and facilitate implementation of nuclear power in Indonesia for electricity production and cogeneration.
- HTGR is considered a proper technology to serve the programmatic objectives on innovative R&D.
- BATAN has performed a Feasibility Study of 200 MWth HTGR utilization as a research program since 2010.

1. BACKGROUND OF EXPERIMENTAL POWER REACTOR (2)

- National achievement in the development, operation and maintenance as well as utilization of the experimental power reactor will enhance public acceptance of nuclear technology.
- Main stakeholders:
  - Ministry of Research and Technology
  - Ministry of Energy and Mineral Resources (ESDM)
  - State Utility (PT. PLN)
  - State Oil Company (PT. Pertamina)
  - PT ANTAM (Mining company)
  - Regulatory body (BAPETEN)
  - MEDCO (Energy company)

Meeting among BATAN, BAPPENAS, MoEMR, Ministry of Finance etc.

Meeting at PT.PLN during IAEA workshop on 'Advanced Reactor and SMRs for Embarking Countries', Jakarta, 21-22 August 2013

2. OBJECTIVES

Main Objectives

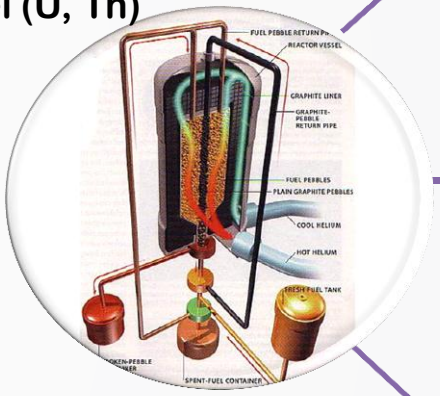
- To demonstrate the capability of the experimental reactor to operate and produce electricity safely and reliably.
- To conduct research to support development of HTGR program for cogeneration as well as new and renewable energy.

Specific Objectives

- To enhance HRD capability in technical aspect as well as project management of NPP to support national near nuclear energy programs.
- To provide facility to enhance knowledge and practicing NPP operation.
- To participate in developing HTGR innovation technology collaboration to support globally nuclear energy system sustainability by incorporating mixture of U-Th-Pu fuel.

3. PROJECT AND PROGRESS STATUS

- Power: 10-30 MWth
- Flexibility for heat application
- Very high inherent safety
- Very low probability of evacuation countermeasure, i.e. can be developed for a relatively dense population area
- Flexibility for fuel (U, Th)



Experimental Power Reactor

Electricity

Experimental Power Reactor will produce electricity for BATAN Puspiptek area (temporary substitution of installed capacity).

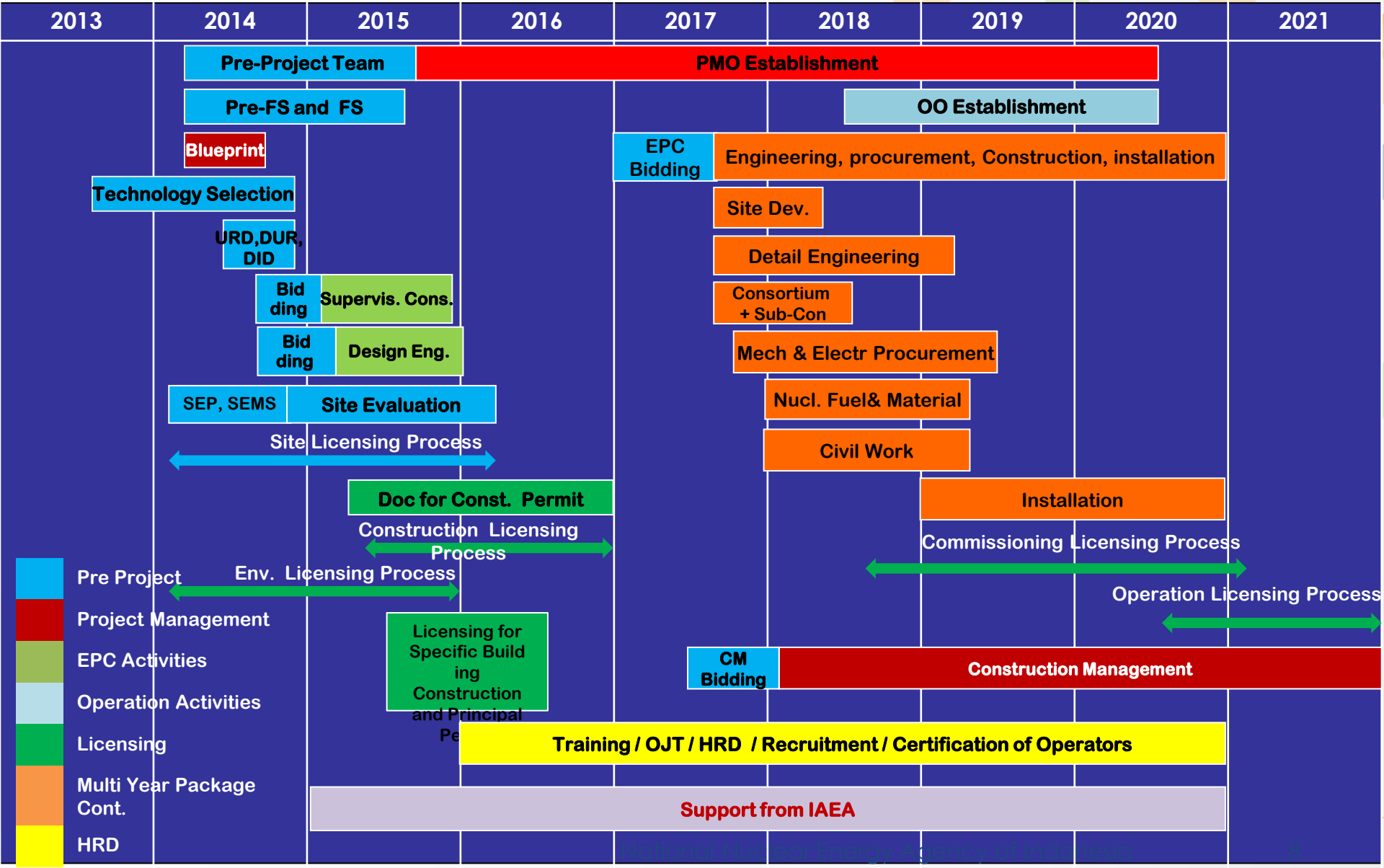
Heat Application Process

Experimental Power Reactor will be used for research of heat application process at T_{max} 800 °C (H_2 production, liquefaction / gasification of coal, etc).

R&D for HTGR Technology

R&D related to HTGR Technology for development of design and construction of Indonesia HTGR.

Roadmap of Experimental Power Reactor Development



Project Activities

- Blue Print Development
- Site Evaluation Program and Management System of Site Evaluation under processing for approval (by regulatory body).
- Site investigation: topography, geotechnics, geology survey, seismic catalog, hydrological hazard model establishment, volcanological data collection, meteorology, human induced events, land and water use, demography, infrastructure, etc.
- Environmental Impact Assessment: Preparation of TOR for approval by Ministry of Environment.
- Technical Specification
- Revised roadmap
- ToR for Bidding of Design Engineering by end of 2014; contract early 2015.

4. APPROACH TO VENDOR EVALUATION

Evaluation of vendors:

- Kick off meeting among stakeholder and potential vendors
- Submission of questionnaires to potential vendors
- Visits to facilities at vendors' countries
- Vendors' confirmation and response to questionnaires

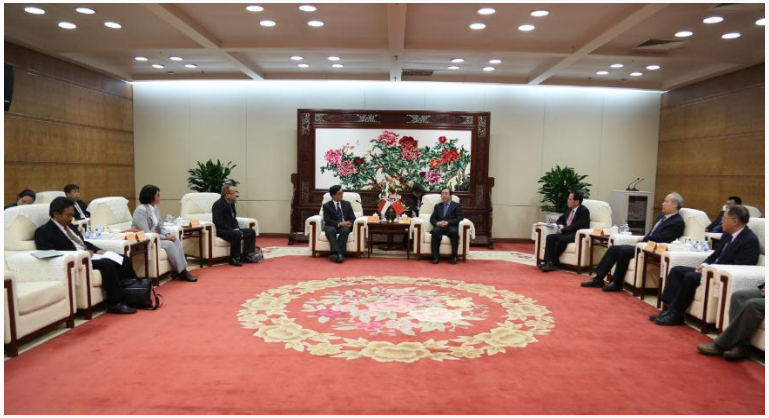
Obtain information on design, technology, licensing, nuclear fuel, radioactive waste management, economic, investment cost, project management, construction schedule, site requirement and other relevant information.

In the process of deciding the most appropriate reactor technology ready for deployment. EPC cost is expected to fall within budget provided by the government, or if more, to be done through international collaboration / consortium.

Highlight of Activities (1)

Japan, 12-13 May 2014

Russia, 9-11 June 2014



China, 15-17 May 2014

HTMR Ltd, 14-15 Oct 2014

Highlights of Activities (2)

- Sign cooperation to promote R&D on HTGR through joint research, exchange of information and personnel.
- Sign expression of interest for construction by G to G agreement to execute the project.
- Expression of interest for collaboration on the feasibility study, repatriation of spent fuel, complete fuel manufacturing in Indonesia, HRD, technology transfer.
- Suggestion to divide project targets into: (i) generate electricity, and (ii) gradual development for cogeneration at a later stage.
- Option to use thorium in the future.

5. APPROACH TO COLLABORATION

Development of MoU with country of origin of each vendor on joint R&D program

Participation in the international HTGR community for technological development

Meetings with main stakeholders to better prepare and move forward in the best possible manner

IAEA's technical assistance including through Technical Cooperation Project

Several Aspects for Collaboration

- *Funding*: Government provides a fixed budget. In case more funding is required, Indonesia is open international collaboration through G to G agreement.
- *Technical aspects* : To involve IAEA and other international experts from countries with HTGR technology.
- Fuel supply / production and Waste Management
- *R&D on cogeneration*: To work with interested country and international institutions, and also national industry.
- *Regulatory and licensing: issues:* To work with regulatory body in vendor country, IAEA and other countries (Scope of BAPETEN as regulatory body).
- *Education and Training*

Technical Assistance from IAEA(1)

- Consultancy meeting in Jakarta, Indonesia, 20-22 August 2014.
- Discussion on strategy, selection of reactor technology, integrated work plan, practical approach for engineering design, best approach for international cooperation, project organization establishment, master planning.

Meeting between BATAN Chairman and DDG-NE of IAEA, Jakarta, 20 August 2014

- Several key findings:
  - To clarify type of contract taking into account for long-term utilization of experimental power reactor
  - To improve criteria for technology selection
  - To identify experiments to be conducted
  - To clarify long term plan and priority, including subsequent units

Technical Assistance from IAEA (2)

Recommendations:

- To use Tecdoc Nuclear Reactor Technology Assessment for Near Term Deployment (NP-T-1.10) with technology criteria specific for Indonesia.
- To use commercial software for project management for preparing plan, managing project and resources.
- To separate between Design Engineering bid and Procurement and Construction Bid to avoid risk in the future.
- To complete Indonesia's NESA using INPRO Methodology for SMR and extend NESA beyond 2014 by cooperation with design organization.
- To use similar approach to IAEA's Milestones approach for the first NPP ("modified Milestones") in developing the infrastructure.
- Future assistance from IAEA through Technical Cooperation project.

Two IAEA workshops were held in Indonesia in 2013: (i) 'Advanced Reactor and SMRs for Embarking Countries' (21-22 August 2013) and (ii) HTGR Review Mission (2-6 September 2013)

6. CONCLUSIONS

- The experimental power reactor project in Indonesia is open for international collaboration.
- HTGR technology holders have been invited to participate in the project through mutual benefit agreement. Decision to be taken by the end of 2014. Basic design should commence in 2015; EPC & commissioning in 2017-2020.
- Indonesia will establish G-to-G agreement with any interested country or international institution to advance in the program.
- Facilitation and support from the IAEA are requested, from the Dept. of Nuclear Energy, potentially from (i) NPTDS on HTGR and SMR, (ii) INPRO on NESA, (iii) NIDS on modified Milestones, (iv) NEFW on fuel. This is to be supported through IAEA's Technical Cooperation. Assistance for regulations are dealt separately by the regulatory body (BAPETEN).

THANK YOU | TERIMA KASIH