Light Water Reactors

Review Process, Experience Feedback,

Expansion Plan
and
Industry Participation

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Existing Review Process
and
Incorporation of Experience Feedback

Early Commencement of Review Process

An early deliberation process with AERB to identify any potential licensing issues prior to finalization of Technical Configuration:

(a) Presently interaction starts with AERB through submission of a document – 'Technical Assignment' prepared jointly by NPCIL and the Vendor.

(b) 'Pre-Application Review' or 'Early Design Review' would provide additional guidance to utility, on expectation of AERB ,on additional regulatory requirements, if any.

Consolidated Application for Site

- For site specific expansion Plan of LWRs with imported technologies such as:

  - VVER-1000 (6 units at future site),
  - AP1000 (6 units at Kovada) and
  - EPR (6 units at JNPP),

- ‘consolidated application’ at Consenting stages of ‘Construction’ and ‘Commissioning’ for all the units of specific technology at one site location ,will have positive impact on implementation of the project.

Regulatory Interface Issue to be addressed by Licensee

- Safety and design documentation are developed by the technology provider on the basis of codes, standards and regulatory requirement of the country of origin.
- Significant efforts are involved in ensuring compliance with AERB standards.
- Technology developers may not share some specific know-how as part of their intellectual property which requires utility efforts for independent verification.
- Adaption of locally available equivalent material and incorporating the same , with the acceptance of vendor.

Expansion Plan for LWR

Salient Objective of Implementation

- Assimilation of Technology during the implementation of project towards the functioning of Design Authority, Safety Analysis and Fuel Management.
- Challenge for Licensing of the plant concurrent with project schedule.
- Maintaining design integrity throughout the operating life time of the nuclear installation.
- Spares management and localization.
- Reference Plant Concept.
- Life time supply of fuel.
- Progressive technology transfer.
- Economic viability
- Completion of project without cost or time overrun.

VVER Technology

I. Kudankulam, Tamilnadu Site

- Two Units KKNPP 1&2 of 1000 MWe capacity each under Operation
- Two Units KKNPP 3&4 of 1000 MWe capacity each under Construction
- Two Units KKNPP 5&6 of 1000 MWe capacity are Planned
- Fuel: Assured life time supply .

II. New Site: Not yet finalised

- Six Units of 1200 MWe capacity each planned to be set up.
- Schedule of around 14 years for the completion of six reactors.
- Built & Operated by NPCIL or by Joint Venture company between NPCIL and Other Central PSUs.

AP1000 Technology

Westinghouse Electric Corp., USA

Site: KOVADA in Andhra Pradesh

- Six Units of 1100 MWe capacity each planned to be set up.
- Schedule : Around 14 years for the completion of six reactors.
- Land : Acquisition under progress.
- To be Built & Operated by NPCIL or by Joint Venture company between NPCIL and Other Central PSUs.
- Preliminary Technical Feasibility study : Concluded.
- Fuel: Assured life time supply .

EPR Technology

EDF, France

Site : Jaitapur in Maharashtra

- Six Units of 1650 MWe capacity each planed to be set up.
- **Schedule :** Around 15 years for the completion of six reactors.
- **Land :** Acquired. CRZ & MoEF Clearances obtained.
- To be Built & Operated by NPCIL or by Joint Venture company between NPCIL and Other Central PSUs
- Pre Engineering Agreement for Engineering Services nearing completion.
- **Fuel:** Assured life time supply.

Implementation Aspects

- The experience gained is now being utilized for faster implementation of KKNPP units 3-6.
- The new units are being constructed as repeat project with design improvement based on experience feedback and safety upgrades based on new AERB code.
- New units have larger localization content and less involvement of Russian side for licensing support.

Industry Participation

Localisation

- Industries need to work on mandatory quality certification requirements.
- Industries need to get qualified/included in the Foreign Vendor’s Supply Chain.
- A technical tie-up between foreign Vendor and Indian vendor may be necessary in the initial phase.
- Knowledge improvement on design codes followed by non-ASME vendors (e.g. Russian Codes (PNAEG, GOST etc) French codes (RCC-M etc) is required.
- Indigenization of spares as a long term measure .
- Large scale efforts are required for developing and qualifying spares of equivalent specification.

Localisation for KKNPP 3 & 4

- **For KKNPP-3&4**

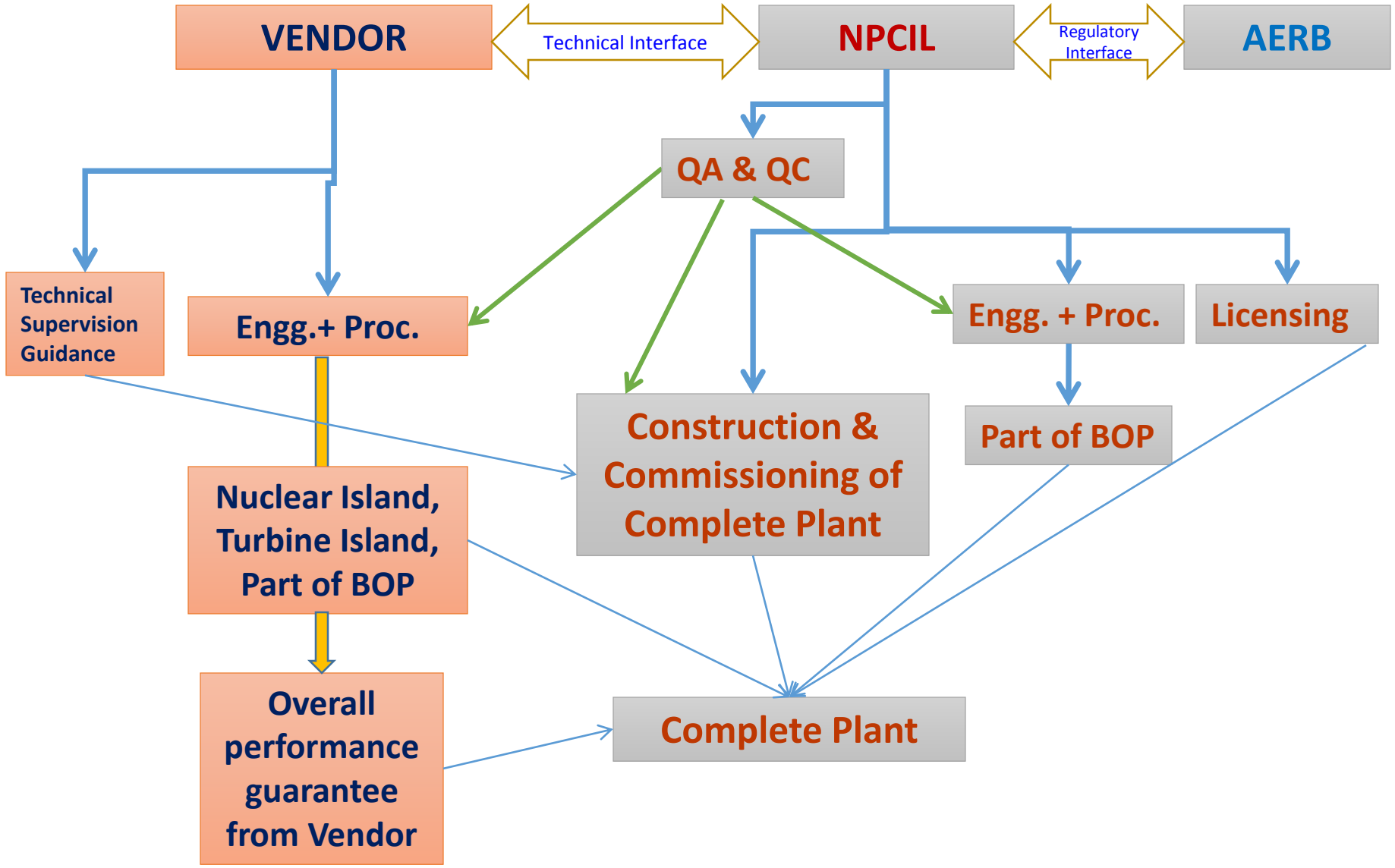
Steps taken by NPCIL :

- Design & Supply in the scope of NPCIL based on technical inputs from RF (eg.: Balance of the plant : for electro-mechanical system, Tanks etc.)
- Responsibility of procurement for Electrical Systems/Equipment (eg.: Safety related DG sets).
- A detailed evaluation/qualification of many vendors underway for localization of Safety Tanks, PHRS heat exchanger and Feed water heat exchangers, etc.

Division of Responsibility

	Nuclear island	Turbine Island	BOP	Tech. Superv. for guarantee
PROJECT MANAGEMENT	NPCIL	NPCIL	NPCIL	
BASIC DESIGN	VENDOR	VENDOR	VENDOR	
DETAILED DESIGN	VENDOR	VENDOR	VENDOR +NPCIL	
LICENSING	NPCIL +TA from VENDOR	NPCIL +TA from VENDOR	NPCIL +TA from VENDOR	
OVERALL SCHEDULING & PROJECT MONITORING	VENDOR + NPCIL	VENDOR + NPCIL	VENDOR + NPCIL	BY VENDOR
EQUIPMENT SUPPLY	VENDOR	VENDOR	VENDOR +NPCIL	
INTERFACE MANAGEMENT	VENDOR + NPCIL	VENDOR + NPCIL	VENDOR + NPCIL	
CONSTRUCTION & ERECTION	NPCIL + (VENDOR TA+ SUP.)	NPCIL + (VENDOR TA+ SUP.)	NPCIL + (VENDOR TA+ SUP.)	
TESTING & COMMISSIONING	NPCIL with TA from VENDOR	NPCIL with TA from VENDOR	NPCIL with TA from VENDOR	

Flow Chart with Progressive Localization Effort



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NPCIL

End of Presentation