INPRO Dialogue Forum on Sustainable Supply Chains for Advanced Nuclear Power Systems

overview of supply chains used for Nuclear reactor and facility for Sustainable Supply

Said sabry
contents

- over view of Egypt
- Egyptian Electricity Sector Structure
- Background of Nuclear Energy in Egypt
- Status of Implementation of the Egyptian Nuclear power Plant Program
- Vendor Selection for Construction of the First NPP
- Management for NPP Construction Phase
- The Nuclear Supply Chain
- Different types of supply chains
- Overview - Nuclear Energy Industry Supply Chains
- Suppliers are committed
- Long-Term Spare Parts Supply – Management for Nuclear Power Plants
- Spare Parts Qualification Services
- Cooperation with IAEA
• Egypt lies in the northern corner of Africa. It is bounded by the Mediterranean Sea in the North, the Red Sea in the East, Libya in the west and Sudan in the south. Cairo is its Capital.

The total area of Egypt is 1.01 million km². The daily max. temp. in Egypt ranges from 18°C to 41°C and daily min. temperature ranges from 4°C to 23°C. The Egyptian population is around 90 millions.
Background of Nuclear Energy in Egypt

Nuclear ambitions in Egypt date back to 1954.

• There are two (2) nuclear research reactors in operation

  1st from Russia (1961) with (2 MW) and the 2nd from Argentina (1998) with 20 MW.

  Egypt realized the importance of nuclear power that could be used to secure the supply of electricity and fresh water.

  • Several attempts haven't been materialized in the last 3 decades due to different factors. Recently, Egypt has reconsidered the nuclear power as an option to supply electricity
Status of Implementation of the Egyptian Nuclear power Plant Program

• A Nuclear Law “ N0. 7 – 2010 “ was issued in March 2010, and its executive regulation in Oct. 2011.
• An independent Nuclear Regulatory body was established and it becomes affiliated to the Prime Minister in March 2012.
Vendor Selection for Construction of the First NPP

• As the political and economic situation improved, the GOE decided to resume the project in Oct. 2013.
• It was decided to take a strategic partner instead of international bidding.
• MOEE has asked for ROI and entering in direct negotiation with 5 potential Vendors. Three of them have responded positively. They are CNNC of China, KEPCO of Korea, ROSATOM of Russian Federation.
• The negotiations on the Russian track have achieved a relative progress and led to : a Project Development Agreement signature on 13/2/2015, A site Survey contract with NPPA on 20/10/2015.
Russia and Egypt signed an intergovernmental agreement to collaborate in the construction and operation of a nuclear power plant equipped with four 1200 MWe units in Dabaa. In Cairo by Mohamed Shaker, Egypt's energy minister, and Sergey Kirienko, director general of Russian state nuclear corporation Rosatom.

The signing ceremony was attended by Egyptian President Abdel Fattahel-Sisi.
Management for NPP Construction Phase

- NPPA is functioning as Owner/Operator in the NPP Project.
- ENRRA is functioning as the Nuclear Regulator.
- Main Contractor.
  - NPPA’s Technical Consultant.

Four contracts are being handled and approaching to conclusion.

- They are, namely:
  - The main contract is to be of turnkey EPC contract.
  - nuclear fuel supply,
  - O&M,
  - spent fuel storage facility.
The Nuclear Supply Chain

• All Category need to qualified to high standards
Potential Solutions

Strengthen product realization/ conformity assessment processes along the supply chain:

• Quality assurance (QA): focus on an organization’s quality management system (QMS), e.g.
  • IAEA GSR Part 2 (revision of GS-R-3: 2006) requirements on leadership & management for safety – “safety culture”
  • ASME NQA-1: 2008 (links to US Federal Code 10 CFR 50
  • ISO 9001: 2008 + NSQ-100: 2011 (promoted by NQSA)

• Quality control (QC): focus on the product or process of production.

• Industry consensus on “critical manufacturing processes” (aka “special processes”)

• Oversight (surveillance) of critical manufacturing processes

• Advanced product quality planning

• Reducing non-conformances
Overview - Nuclear Energy Industry Supply Chains

• Building new nuclear energy power plants requires a robust supply chain due to the large number of components and sub-components and depend on nuclear manufacturers to deliver the high-quality supplies needed to include concrete, pumps, electronics, wiring, instrumentation, piping, and specific equipment. A “cradle to grave” approach demands that each new build nuclear energy plant have multiple supply chain elements include pre-build, construction, operation, and decommissioning components. Moreover, reliability and safety considerations drive emerging measures for the global standardization for the raw material supply chain.

• Safety and reliability of the supply chain is an important issue at every point in the nuclear energy life cycle
strategic supply chain

• A strategic supply chain and a national industrial involvement are major keys for success when developing a nuclear power program. The nuclear industry and its suppliers are to comply with strict codes and standards, and rigorous quality programmers rely on this for reliability.

• Through a strategic partnership with an experienced nuclear utility, a robust and long-term cooperation between the local owner/operator and an experienced nuclear utility is essential to reduce the industrial risk and improve the project financing, to ensure a strong safety culture and to support the development of a national supply chain integrated to goods and services.
Different types of supply chains

- Manufacturing and assembly of Structures, Systems and Components (SSCs) - with performance characteristics driven by technical specifications
- Coding and validation of software, computer codes
- Services – e.g. safety analysis, environmental impact statements, operations support (commissioning, outages), maintain

Supply chains for all areas have become longer and more global in nature. Many levels of subcontracting being used, even licensing.
Suppliers must are committed

• Export nuclear power plants that:
  Apply consistent, high safety standards, reflecting the Vendors’ safety goals
  ➢ Reflect the uncompromising application of recognized safety principles, including the IAEA Fundamental Safety Principles;
  ➢ Are based on reliable technology, which is proven either a) in operation or b) by a test program or analysis consistent with internationally recognized safety principles, before operation of the plant begins;
  ➢ Are designed in accordance with the IAEA Safety Requirements,3 giving due consideration to relevant IAEA Safety Guides, and meeting regulatory requirements of the Customer State
  ➢ Use components manufactured in accordance with appropriate nuclear standards; and
  ➢ Incorporate design provisions to address emergency response requirements
Role of the ENPP

• Promotes awareness of the need for strong supply chain management
• Ensures requirements and guidance bases are from sound nuclear safety principles and are reflective of the latest Operating Experience
• Participates in development of pertinent Egyptian industrial codes and standards
• Seeks stakeholder input to verify requirements and guidance are fit-for-purpose
  - To confirm the licensee is meeting regulatory requirements and apply enforcement measures if necessary
  - Reviews how the licensee is continually assessing their supply chain (what codes and standards are being used)
  - Can perform independent vendor inspections where warranted
Spare Parts and Procurement

• The licensee shall establish processes and procedures to procure, receive, store, secure and issue spare parts, tools and materials.

• Authority for specifying technical and quality assurance requirements shall be clearly defined when procuring spare parts.

• The spares, as a minimum, shall meet the same technical standards and quality assurance requirements as the installed plant items.

• The licensee shall have a change control process in place to deal with non-identical replacement parts and deviations from the original specifications.

• The receipt and acceptance procedures shall include a requirement to label, tag and quarantine items that are non-conforming. Parts which have a limited lifetime shall be replaced accordingly.

• Defective parts which are not suitable for reuse shall be disposed of following a documented process to prevent reuse.
Long-Term Spare Parts Supply – Management for Nuclear Power Plants

• Power plants can operate for over 60 years. As time goes on, plant operators have increasing issues with spare parts planning and procurement: On the one hand, parts in use continuously wear and age, and plant life extension (PLEX) and plant life management (PLIM) programs require parts. This creates a constant need for spare parts, but alternatively, equipment obsolescence and a shrinking supplier base for safety-related equipment make procurement almost impossible.

• Therefore, the supplier must comply with the supply of parts to the plant during installation and operation, as well as the extension of the life of the plant
Spare Parts Qualification Services

• vender must Nuclear procurement spare parts in order to fulfill the requirements for safety and reliability. Obsolescence, availability, long delivery time and cost restraints can make stocking and ad hoc supply of spare parts difficult.

• vender must supply the Components and Spare Parts for Nuclear Power Plants in following parts according to international standard
  • Electrical Power Supply Systems,
  • Mechanical,
  • Instrumentation and Control
Cooperation with IAEA

• One dimension of this cooperation is building of the Egyptian capacity of human resources needed for the Nuclear Power Program.
• More training on the work and how to choose spare parts
• We are truly indebted very much to IAEA support and involvement of the Egyptian NPP.
Thank you