INPRO Manual - Infrastructure
Economic Infrastructure

Considerations on Criterion CR2.4 ‘Support’

Franck Lignini
Reactor & Services / Safety & Licensing
UR2 = Industrial and Economic Infrastructure

The industrial and economic infrastructure of a country planning to install an INS installation should be adequate to support the project throughout the complete lifetime of the nuclear power program, including planning, construction, operation, decommissioning and related waste management activities

- CR2.1 Funding of Infrastructure
- CR2.2 Size (of Nuclear Facility)
- CR2.3 Siting
- CR2.4 Support Infrastructure
- CR2.5 Added Value
CR2.4 Industrial Support Infrastructure

- Indicator IN2.4: Availability of infrastructure to support owner/operator
- Acceptance limit: Internally or externally available
  - EP2.4.1 Survey of existing capabilities of the national industry
  - EP2.4.2 Plan for national participation
Considerations on CR2.4

▶ Optimum balance [internal / external ] industrial infrastructure may depend on
  ◆ Geography
  ◆ Existing industry [domestic, neighboring countries, international]
  ◆ Size of the national nuclear power programme

▶ A robust domestic supply chain is likely to offer competitive and reliable solutions to the owner/operator
Considerations on CR2.4

- Potential benefits of developing a robust domestic nuclear supply chain

Local supply chain developed together will bring to

**VENDOR**
- Supply securization
- Competencies & manpower resources
- Logistic savings

**LOCAL INDUSTRY**
- High-skilled competencies
- Billion of revenue generated
- Technology transfer
- Partnerships
- Access to worldwide market

**GOVERNMENT**
- Balance trade impact
- Higher employment
- Impact on the GDP growth
- Support to high-skilled job development
Considerations on CR2.4

- Localization should be a national programme supported by the government

**VENDOR**
- Assessment of local industry
- Supplier Development program
- Supplier days
- Skill and technology transfer
- Support to partnership

**LOCAL INDUSTRY**
- Professional organizations
- Commitment of companies top management
- Investment
- Safety culture and Project management orientation

**GOVERNMENT**
- Clear picture on the Program size (fleet approach)
- Training programs
- Funding solutions
- Factory upgrade and/or new factories investment

**to support a strong and mature Nuclear Supply Chain**

Continuous process to be implemented up front of the Program
Continuous dialogue between stakeholders
Anticipation of necessary efforts is crucial
Considerations on CR2.4

Potential level of involvement of the local industrial infrastructure

- Evaluation of the local industries and suppliers with the potential to participate in the nuclear power programme
- Development of competencies and industrial capacities
- Adaptation of the allotment to match the objective of involvement of national industries and suppliers
- Qualification process
Evaluation of the local industries and suppliers with the potential to participate in the nuclear power programme

Survey of domestic industry

Realistic assessment (including financial situation)

- Check ability to satisfy requirements
- For either nuclear safety / non-nuclear safety related activities
- Technical, Quality, Health, Safety and Environment Considerations on CR2.4

RFI & scoring
Considerations on CR2.4

The evaluations allow a mapping of the country capacities.
Considerations on CR2.4

Development of competencies and industrial capacities
Considerations on CR2.4

Development of competencies and industrial capacities

Slovakia: AREVA sets up partnership with the University of Technology in Bratislava to train future specialists in instrumentation and control systems

Paris, July 15, 2014

AREVA has signed an agreement with the Slovak University of Technology in Bratislava (STU) to support the development of nuclear technology courses.

Under this partnership, the group will contribute to the development of a teaching program dedicated to instrumentation and control (I&C) systems. Designed for the operation and control of a nuclear power plant, the I&C system is a key component for reactor operations.

The AREVA experts will ensure the training program will provide relevant information and offer the operational skills required to work at nuclear plants. They will also teach certain courses.

"We want to offer the best programs to future professionals and give them access to the latest technology and expertise in each specialist area. We are delighted to be working with AREVA, which, as a market leader in digital instrumentation and control systems and supplier to Slovak nuclear plants, is the ideal partner for the development of these courses," explained Professor Gabriel Junas, Dean of STU’s Electrical Engineering and Information Technology department.

"We are very pleased to be collaborating with such a prestigious education establishment. It will help meet the future needs of the nuclear industry for advanced technical skills," commented Dr. Stefan Niessen, head of Research & Development at AREVA GmbH.

AREVA offers nuclear operators flexible, reliable and proven solutions in both safety and operational instrumentation and control. To date, the safety-related digital TELEPERM X5 platform has been installed in or ordered for 96 nuclear power plants in 16 countries for 14 different reactor designs. It is the most widely deployed digital instrumentation and control system in the world.

MORE ABOUT AREVA

AREVA is a world leader in nuclear power. The group is able to utilize every stage of the nuclear value cycle: reactor design and construction, and operating services, as well as decommissioning. This know-how and experience is the backbone of AREVA’s international strategy, which seeks to position itself as the leading renewable energy solutions provider in the world.

Further to the successes of the two Codes & Standards Seminars held in December 2012 and April 2013, this NEW Seminar will continue to show the role of AFCEN Codes & Standards for Electrical part design and Erection, and the corresponding lessons learned from the construction and operation of the worldwide fleet of PWR NPP’s. This Seminar will provide more in-depth specificities of the AFCEN Codes on the following subjects:

- Presentations on Electrical Installation design and equipments with RCC-E Codes, and experience feedback from the first EPR™ Plants constructions,
- Presentation of RCC-E Electrical Equipments AFCEN CODE, key points on Basic design and construction,
- Presentation of Electrical System Approaches,
- Presentation of Components Approaches
- Presentations on Quality Assurance and the role of surveillance
- The points addressed by the Ministry of Economy further to the December Seminar will be completely addressed, following presentation performed during last April seminar.
- The main topics and overall presentations on Electrical AFCEN standards will be included in the Seminar agenda.
- This Seminar is a great opportunity for the Polish Industry, the Authorities, the Electrical Utilities, main Institutes and Laboratories as well as any other stakeholders, to exchange and address their expectations to the AFCEN members and speakers.
- Save the date in your agenda, register NOW and do not hesitate to forward this message to your respective organizations.
Considerations on CR2.4

Development of competencies and industrial capacities

**AREVA Training Offer** as a support to nuclear industry new entrants

- Nuclear energy essentials
- Nuclear Project Management
- Nuclear Safety Skills
- Design, Operations and Maintenance of nuclear facilities
- Decommissioning and Dismantling

**Two major off-the-shelf training programs**

- Nuclear Learning Tour
- Supplier Excellence Program

**And many more tailor made training programs**
Considerations on CR2.4

- Adaptation of the allotment to match the objective of involvement of national industries and suppliers

<table>
<thead>
<tr>
<th>Nuclear Island / Conventional Island</th>
<th>Balance of Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>◆ Project Management</td>
<td>◆ Site Preparation &amp; Infrastructure</td>
</tr>
<tr>
<td>◆ Engineering</td>
<td>(Clearance / leveling &amp; roads, drainage, water, etc.)</td>
</tr>
<tr>
<td>◆   Basic and Detailed Design</td>
<td>◆ Temporary Works</td>
</tr>
<tr>
<td>◆ Equipment Supply</td>
<td>◆ Site Camp</td>
</tr>
<tr>
<td>◆ Installation</td>
<td>◆ Marine Works / Cooling Towers</td>
</tr>
<tr>
<td>◆ Civil Works</td>
<td>◆ Marine Offshore Loading Facilities (MOLF)</td>
</tr>
<tr>
<td>◆   Construction</td>
<td>◆ Process and Non-Process Buildings outside of NI and CI</td>
</tr>
<tr>
<td>◆   Excavation</td>
<td></td>
</tr>
<tr>
<td>◆ Commissioning</td>
<td></td>
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</tbody>
</table>

- NI includes safety and non-safety equipment and systems
- CI/BoP scope is similar to the type of work generated by refineries or fossil power plants
Considerations on CR2.4

**Qualification process**

1. **Sourcing:**
   - Establish the Master supplier list
   - First contact visits
   - Request For Interest sent

2. **Pre selection:**
   - Supplier Pre Selection according to RFI’s Feedback analysis
   - Supplier Pre Assessment visit (Quality management, design, manufacturing,..)

3. **Pre Qualification:**
   - Action Plan definition and follow up
   - Product or process qualification tests as necessary
   - Blank RFQ for detailed technical assessment

4. **Qualification:**
   - Before contract, when the Qualification is satisfactory, approval of the Supplier (Approved Vendor List)
Considerations for national participation
### Considerations on CR2.4

**Potential Scope of Localization**

#### Degree of investment and complexity

<table>
<thead>
<tr>
<th>Most easily to obtain, no need for special qualification</th>
<th>Minimum investment or time needed to qualify</th>
<th>Significant investment needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthworks &amp; Foundations</td>
<td>Pumps (non-primary)</td>
<td>Fuel fabrication</td>
</tr>
<tr>
<td>Concrete and rebar supply</td>
<td>Valves</td>
<td>Spent fuel reprocessing</td>
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<tr>
<td>Intake and outfall construction</td>
<td>Filters</td>
<td>High level waste storage</td>
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<tr>
<td>Auxiliary buildings</td>
<td>Vessels</td>
<td>Steel works (critical)</td>
</tr>
<tr>
<td>Substations</td>
<td>HVAC</td>
<td>Heavy forgings</td>
</tr>
<tr>
<td>Cranes</td>
<td>Pipe fabrication</td>
<td>Reactor Pressure Vessel</td>
</tr>
<tr>
<td>Piping</td>
<td>Motors</td>
<td>Steam Generator manufacture</td>
</tr>
<tr>
<td>Valves</td>
<td>Transformers</td>
<td>Polar Crane</td>
</tr>
<tr>
<td>Pumps</td>
<td>MV &amp; LV Switchgears</td>
<td>Safety &amp; Operational I&amp;C</td>
</tr>
<tr>
<td>Installation Work</td>
<td>Junction Boxes</td>
<td>Main auxiliaries pumps</td>
</tr>
<tr>
<td>Fire Fighting Equipment</td>
<td>Heat Exchanger</td>
<td>Main Control Room</td>
</tr>
<tr>
<td>Cable trays</td>
<td>Engineering</td>
<td>Emergency Diesel Generators</td>
</tr>
</tbody>
</table>

- **1 – 2 units**
  - Earthworks & Foundations
  - Concrete and rebar supply
  - Intake and outfall construction
  - Auxiliary buildings
  - Substations
  - Cranes
  - Piping
  - Valves

- **3 – 4 units**
  - Pumps (non-primary)
  - Valves
  - Filters
  - Vessels
  - HVAC
  - Pipe fabrication
  - Motors
  - Transformers
  - MV & LV Switchgears
  - Junction Boxes
  - Heat Exchanger
  - Engineering
  - Power Cable

- **6+ units**
  - Fuel fabrication
  - Spent fuel reprocessing
  - High level waste storage
  - Steel works (critical)
  - Heavy forgings
  - Reactor Pressure Vessel
  - Steam Generator manufacture
  - Polar Crane
  - Safety & Operational I&C
  - Main auxiliaries pumps
  - Main Control Room
  - Emergency Diesel Generators

The optimum level of localization will be proportional to the size of the program and to the maturity of the local industry.
Considerations for national participation

Nuclear safety grade

Grade 1
- NSSS Component Manufacturing
- Radioactive waste Packages - Radio protection & monitoring systems

Grade 2
- Valves
- Operational Digital Control System
- Emergency Power Source
- Full scope simulator

Grade 3
- Bulk Pipes, Fittings, Forgings, Supports, Insulation
- Fuel Handling
- Pumps & Motors, agitators
- Cranes, Bridges, Handling components
- Instrumentation equipment
- Electrical distribution

Engineering

Grade 4
- Vessels & Heat exchangers
- HVAC
- Standard ancillary services

Power plant and civil work construction

Start Y₁ NPP contract negotiation Y₄ Y₅ NPP building time

The level of localization is proportional to the size of the NPP program
Conclusions
Establishing a localization plan and building a robust domestic nuclear supply chain are major undertakings.

**Safety**: a key factor for developing a nuclear power plant program.

**Suppliers**: has to comply with strict codes and standards.

**Owner/operator**: responsible for relationship with the nuclear regulator, vendors and suppliers during the **whole life cycle of the NPP**.

**National supply chain**: a necessity.

**Construction**:
- civil works,
- erection, ....

**Operation**:
- maintenance
- Components replacement
- NDE, ...

**Construction**: an opportunity for developing a national supply chain for the lifetime of the nuclear power program.
Lessons learned

1. Effective programs are those supported by the government with funding and planning including assignment of national champions as well as development of local SME’s.

2. Providing sufficient information regarding the requirements of the nuclear industry to the relevant government agencies and local industry allows realistic (size of the program, duration, certainty, etc.) approaches to localization.

3. Establishing the mechanism for transfer of know-how and technology through partnerships as example.

4. Understanding the impact of the localization requirements on the contract and the performance impacts for the Nuclear Project.

5. Define regulatory environment at early stage including codes & standards and quality requirement.

6. Involve and select Vendors with robust methodology.
Thank you for your attention
Back-up
On going localization for EPR Finland
OL3 – One EPR unit

Sourcing on Local Supplier Market – AREVA has demonstrated already:

- 47 Finnish companies have won international Call for Bid for global Supply Chain for Safety Related Applications up to now for OL3-Project
- Local Procurement have place order to 338 Finnish Suppliers and Contractors for daily services on site, safety or not safety related, for a turnover around 100 MEuro on the last 18 Months

Even for a single unit project (as in Finland), local suppliers can be significantly involved
Several majors MoUs signed for global partnerships

- Civil construction work
- Manufacturing
- Collaboration on potential recycling projects in UK
- Collaboration on international projects

Over 400 UK companies already identified

60 UK suppliers ready to be involved in the next EPR projects

- 38 companies pre-qualified (Thomson Valves, Ultra electronics, SPX, …)
- 22 companies qualified, having already business with AREVA

- RPV insulation
- Installation work
- Vessel manufacturing

AREVA relies upon its Global Supply Chain and develops UK partnerships
AREVA Track Record in Technology Transfer and Localization in China

Real life experience : China

A total cooperation for nuclear energy self-reliance
Looking at middle class components ~ 20 suppliers qualified by AREVA for the NI:

- Part of Cl1 piping: SCMP
- All auxiliary piping prefabrication and erection (Classified and non Classified): Company 23 and CEMR
- Classified and non Classified Pressure vessels, tanks and heat exchangers manufacturing: SPEC (Shanghai) and DBC
- All Supports of heavy and others components (Classified and non Classified): CNE (Erzong), Company 23
- Most of auxiliary handling tools and components including parts of fuel handling: XNE (Xian)
- HVAC components manufacturing: Jiangsu Shenhai, Jiangsu Huagang
- Classified Cables manufacturing: SCW (Shanghai),
- All Cable trays: ZCT (Zhengjiang) and NCT (Ningbo)
Successful example of localization for primary components