



IAEA

International Atomic Energy Agency
Atoms for Peace and Development

Industrial Involvement Major elements: (3) Industrial Standards & Quality Assurance

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February 2020

Major Element (3)

Industrial Standards & Quality Assurance

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

Industrial Codes and Standards

Codes	Standards
A model that is adaptable by law.	A set of technical definitions, specifications, and guidelines.
Invoked by governmental bodies as law, to clarify <u>what</u> needs to be done.	Adopted by a group of manufacturers, users, engineers, to clarify <u>how</u> it should be done. (i.e. generally more detailed than codes)
✓ ASME (American Society of Mechanical Engineers) Boiler and Pressure Vessel Code	✓ ISO (International Organization for Standardization) Standards ✓ ASTM (American Standard Testing and Material) ✓ IAEA Safety Standards

“Phase 1-2” countries often face with these issues such as...



We (=embarking country) may discuss with potential vendors regarding “how to endorse C&S based on vendor country’s rules..., but before that, what can we do for preparation in this issue?”



We’d like to study the roles of intl’ codes/norms in NPP, and to highlight technical requirements in countries importing nuclear technology.



QA/QC is too complex to follow up, especially for SMEs. Our resources (human, finance, etc) are limited...! What is specificity of requirements seen from subcontractor/supplier perspective?

QA/QC is significant and challenging issues (seen from subcontractors/suppliers)

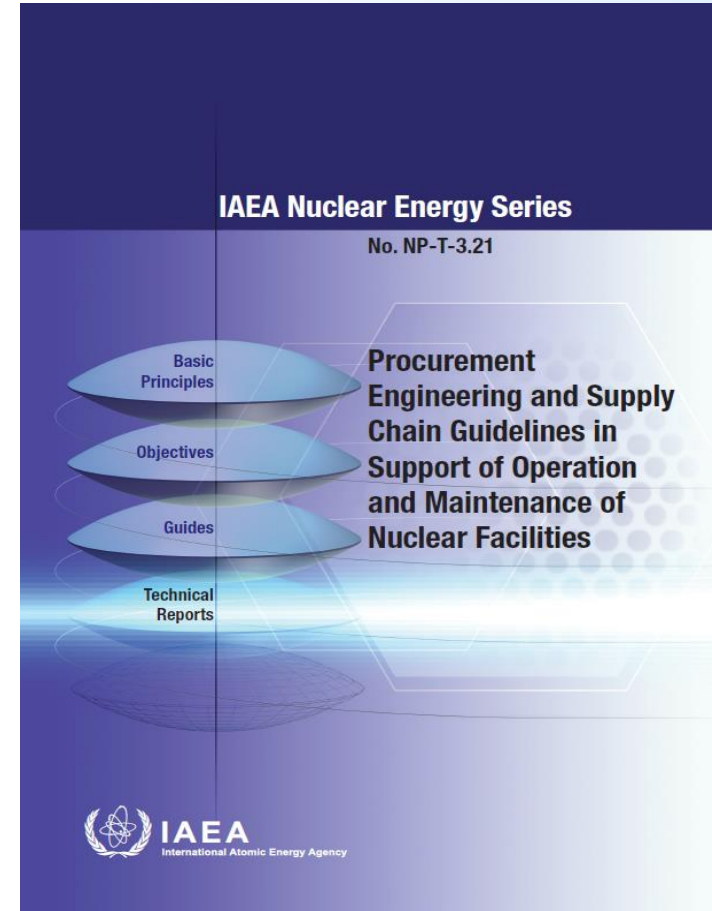
- ❑ Difficulty ($\hat{=}$ Strictness) depends on “Grade” of component, while the highest barrier to entry for newcomers can be “culture” rather than “technology”.
 - ❑ It may take years to master Quality Assurance / Quality Control practice after months formal trainings (esp. for a SME of craftsmanship): we need long-term strategy.
- ⇒ A Case: documents to apply a certified supplier for a vendor
- ✓ Manual to satisfy quality requirement surely
 - ✓ Operational guideline in detail
 - ✓ Track record of manufacturing
 - ✓ List of Equipment/Staff/Procurement
 - ✓ Financial portfolio



Ref. IAEA Procurement Guidelines: Nuclear Energy Series : NP-T-3.21



- Shows good practices for management of procurement & supply chain activities related to O&M of nuclear facilities.
- Focused on operational facilities but also provides lessons learned from new build organizations to avoid issues.
- “Must” readings before starting to deal with suppliers



Examples of Codes and Standards related to NPP procurement activities (1)

Country/organization	National code or standard related to procurement	Comments
USA	10 CFR 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants [70]	Regulation requiring control of procurement of safety related items. Includes specific requirements surrounding procurement document control, control of purchased items and services, inspection and test control, control of measuring and test equipment, handling storage and shipping, non-conformances and corrective action, among others.
	10 CFR 21, Reporting of Defects and Noncompliance [71]	Section 21.31 'procurement documents' specifically indicates that Part 21 reporting of defect requirements applies to procurement participants. This includes such things as maintaining records, providing access to the Nuclear Regulatory Commission and reporting defects to the Nuclear Regulatory Commission, among others.
	ASME NQA-1:2012, Quality Assurance Requirements for Nuclear Facility Applications [72]	Quality assurance system utilized for US nuclear power plants and referenced in some other countries. See Ref. [73] for a comparison between GS-R-3* and NQA-1-2008 [56].
	ANSI N45.2.2, Packing, Shipping, Receiving, Storage, and Handling [74]	Original standard used for nuclear power plant transport and storage issues. Now replaced/ incorporated into NQA-1-2012 [72].

Source: IAEA "Procurement Engineering and Supply Chain Guidelines in Support of Operation and Maintenance of Nuclear Facilities" (IAEA Nuclear Energy Series NP-T-3.21, 2016) pp. 13-19

Examples of Codes and Standards related to NPP procurement activities (2)



Country/organization	National code or standard related to procurement	Comments
Russian Federation	OPB-88/97 NP-001-97 (PNAE G-01 011-97), General Regulations on Ensuring Safety of Nuclear Power Plants [61]	Requires safety classes of nuclear power plant elements be designated by design (four classes defined), and quality assurance requirements assigned to safety classes 1, 2 and 3 be specified in regulatory documents.
	NP-082-07, Nuclear Safety Rules for Reactor Installations of Nuclear Power Plants [62]	Requires, among other things, that quality assurance programmes to be developed for all stages of nuclear power plant life, that safety important components be subjected to inspections and tests during manufacturing to verify design characteristics and that designs contain lists of structures, systems and components whose performance and characteristics are to be verified.
	RD EO 1.1.2.05.0929-2013, Guidance on Performance of Acceptance inspections at the Manufacturers and Incoming Inspection on Nuclear Power Equipment of Safety Classes 1, 2 and 3 [63]	None.
	NP-061-05, Safety Rules for Storage and Transportation of Nuclear Fuel at Nuclear Facilities [64]	Establishes technical and organizational requirements for nuclear fuel storage and transport systems at nuclear power plants, including separate storage on nuclear power plant sites, off-site facilities, nuclear research installations, and onshore and floating nuclear fuel storage facilities.

Examples of Codes and Standards related to NPP procurement activities (3)

Country/organization	National code or standard related to procurement	Comments
International Organization for Standards (ISO)	ISO 9001:2008, Quality Management Systems: Requirements [43]	See Ref. [44] for comparison to GS-R-3*.
	ISO 9004:2009, Managing for the Sustained Success of an Organization — A Quality Management Approach [45]	Provides guidance to organizations supporting achievement of sustained success by a quality management approach. Provides wider focus on quality management than ISO 9001:2008 [43], addressing needs and expectations of all relevant interested parties.
	<p>ISO 10845 series on construction procurement</p> <p>Part 1: Processes, Methods and Procedures [46]</p> <p>Part 2: Formatting and Compilation of Procurement Documentation [47]</p> <p>Part 3: Standard Conditions of Tender [48]</p> <p>Part 4: Standard Conditions for the Calling for Expressions of Interest [49]</p> <p>Part 5: Participation of Targeted Enterprises in Contracts [50]</p> <p>Part 6: Participation of Targeted Partners in Joint Ventures in Contracts [51]</p> <p>Part 7: Participation of Local Enterprises and Labour [52]</p> <p>Part 8: Participation of Targeted Labour in Contracts [53]</p>	Helps organizations to establish a procurement system that is fair, equitable, transparent, competitive and cost effective. These standards are designed to help public, private and international organizations and their main contractors to align their procurement systems with international best practice.
	ISO 14001:2004, Environmental Management Systems — Requirements with Guidance for Use [54]	Specifies requirements for an environmental management system for organizations. Often adopted by utilities and for a requirement for suppliers within the nuclear supply chain.

It'd be good start from IAEA GSR & ISO 9100



❑ IAEA Safety Requirement (GSR part 2) Leadership and management for Safety

Integration of safety into the management system / Interaction with interested parties / Documentation of the management system / Management of supply chain / Measurement, assessment and improvement

❑ IAEA Safety Guide (GS-G-3.1)

Application of the management system for facilities and activities

Management System / Management Responsibility / Resource Management / Process Implementation / Measurement, Assessment, and Improvement

❑ ISO 9001:2015 (with ISO 19443 for nuclear energy sector)

Quality management systems – Requirements

Leadership / Planning / Support / Operation / Performance Evaluation / Improvement



A Case of Codes & Standards: 1960-70s, Japan



1963 US- ASME published the first edition of “Section III” (incl. Nuclear Pressure Vessel)

1966 Japan’s ad-hoc committee for C&S on Reactor Pressure Vessel was established under **Thermal Power Engineering Society**, delegated by **MITI** (Ministry of International Trade and Industry)

The **Committee** sent a special mission group (consists of utility, manufacturer, government, university, national-lab) to the US to discuss with ASME members and vendors

1970 Japan’s “Technical Standards on NPP Structure” was legislated by MITI (and revised frequently...)

Lessons Learned from the Case (1)

- ❑ C&S is a large and complex area, advisable to prioritize specific fields you need to catch up (e.g. welding, piping, NDT).
- ❑ C&S is a kind of “lifetime work”, so it’s also advisable to assign professional staff focusing on these issues.
- ❑ Start working according to existent resources (e.g. ASME, ISO, NSQ-100, IAEA GSR Part2), rather than from scratch.

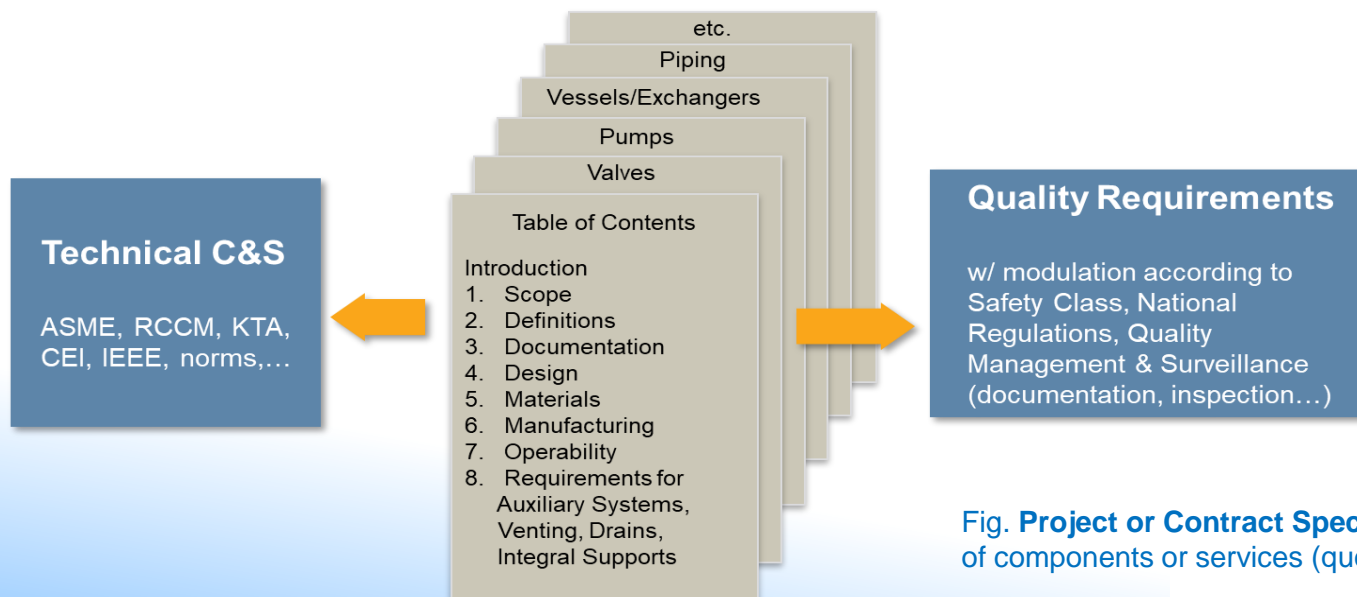


Fig. **Project or Contract Specifications** for supply of components or services (quoted from Y. ROBIN)

Lessons Learned from the Case (2)

- ❑ It needs substantial communication b/w the government, industry and other stakeholders, especially in C&S.
- ❑ It'd be a good way to establish ad-hoc group(s) to improve C&S expertise such as:
 - 1) Studies for C&S management cases in other countries
 - 2) Establish/revise C&S adjusted to local circumstances
- ❑ It's also advisable to launch mission group(s) to interview w/ skillful vendors and/or Tier2+ suppliers in each field local industry will focus on. Nuclear specific topics may involve:
 - 1) QA/QC system (e.g. ways of documentation, communication, securing traceability, operation manual, inspection period)
 - 2) Threshold of “In-house” or “Outsourcing”
 - 3) Ideal Suppliers condition with priorities

Thank you!

