



IAEA

International Atomic Energy Agency
Atoms for Peace and Development

The IAEA Milestones Approach and Industrial Involvement to assist developing national nuclear infrastructure

Satoru Yasuraoka


Nuclear Infrastructure Development Section

16 Oct 2018

IAEA Milestones Approach: Infrastructure Development Phases


Introducing
Nuclear Power

**Phase 1
Consider**



**Milestone 1
Decide**

**Phase 2
Prepare**



**Milestone 2
Contract**

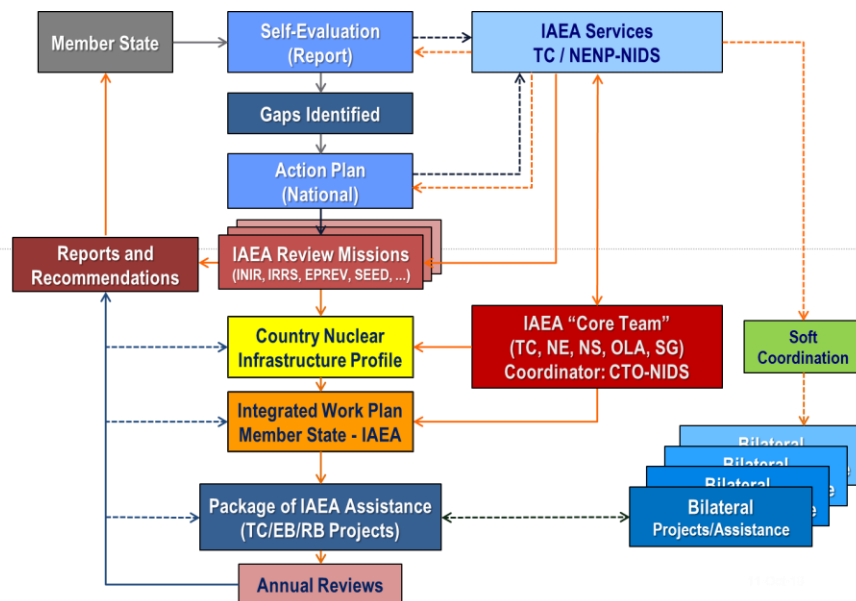
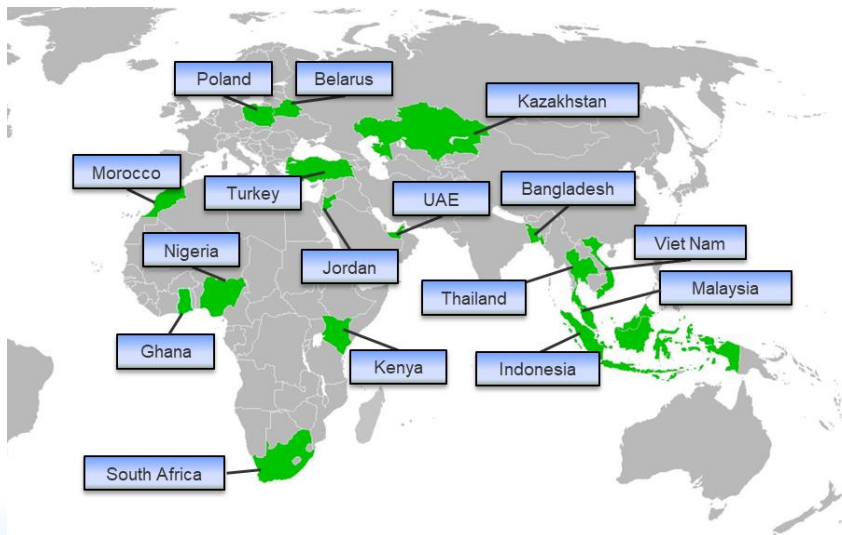
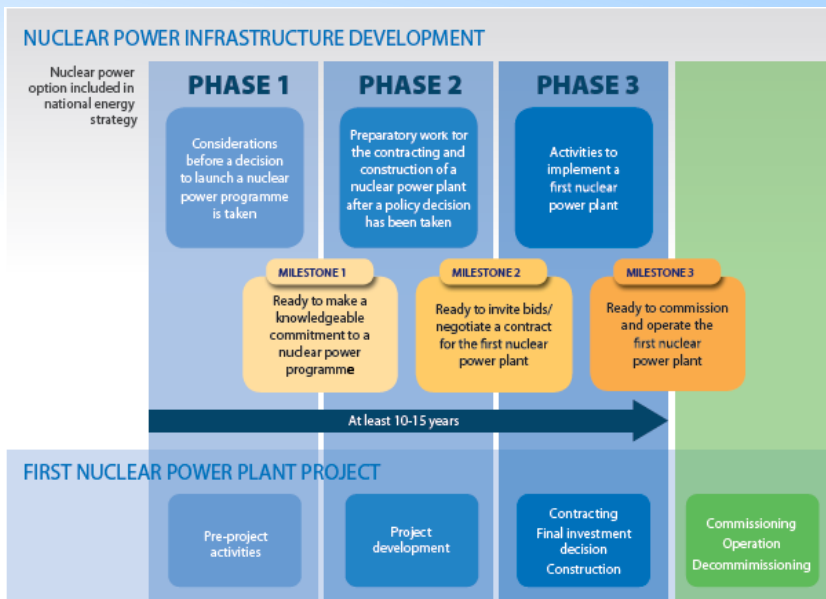
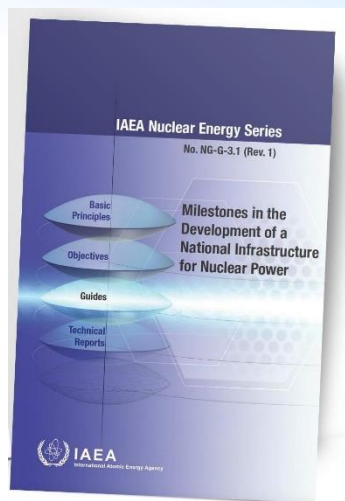
**Phase 3
Construct**



**Milestone 3
Commission**



⇒ Poland is now in **“Phase 2”**



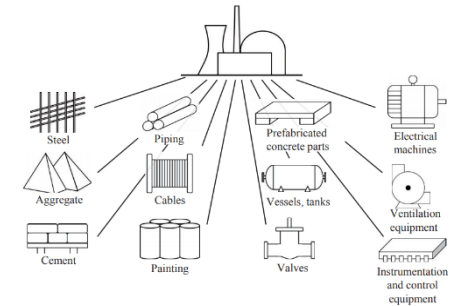
⇒ to be covered in the session on 17th October...

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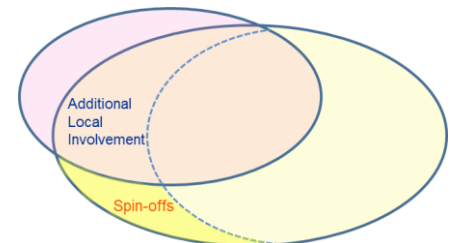
1. Industrial Involvement



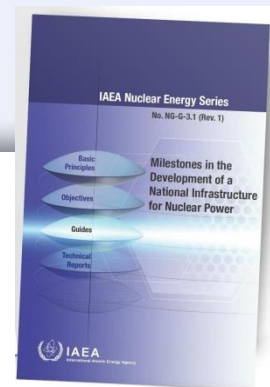
2. Supply Chain Issues



3. “Spin-offs” Potentials



IAEA Milestones Approach: Infrastructure Issues



“Industrial Involvement” is one of the 19 infrastructure issues in Milestones Approach.

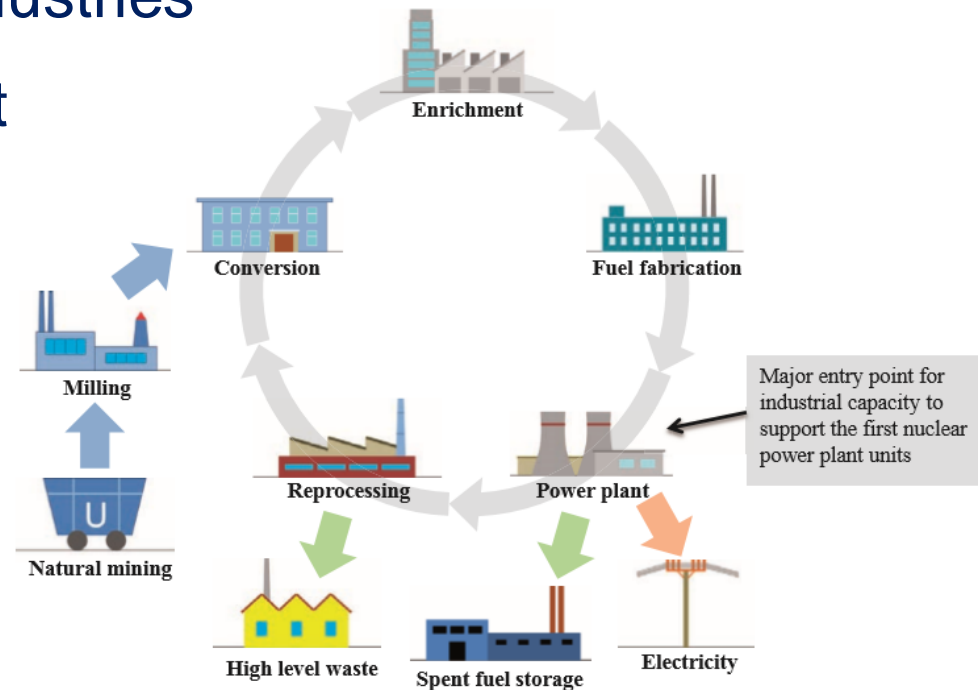
NPP Project and Industrial Involvement

□ Expectation to NPP Project

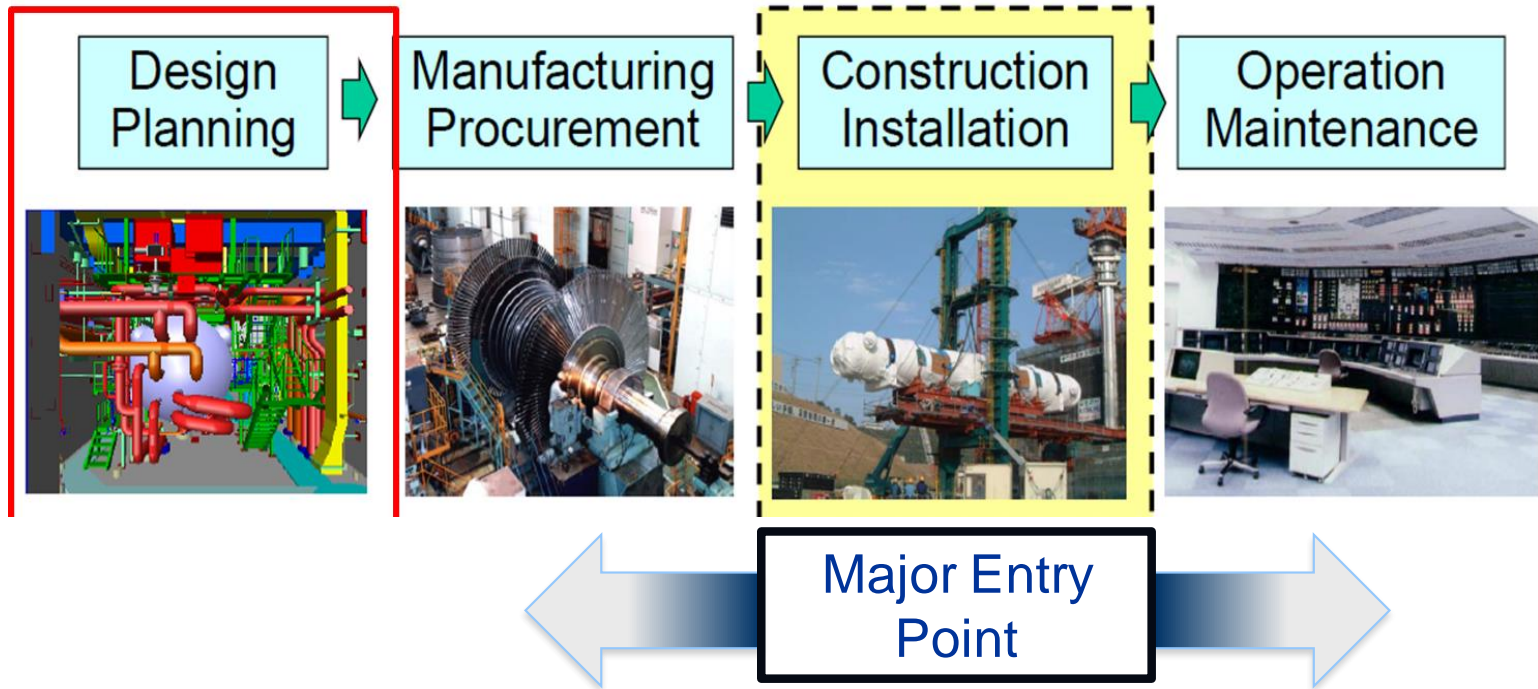
- Stable energy source
- Development of local industries
- Technology development

□ NPP Project requires:

- Advanced technology
- High quality standards
- Special material
- Long-term schedules
- Strict safety culture applied to supply chain overall



Industrial Involvement Needs Long-term Strategy



Benefits of Localization

❑ For **EPC Contractor**

- Secure supply chain
- Efficient employment
- Effective logistics

❑ For **Government**

- Job creation
- Support to high skilled jobs
- Impact on GDP growth

❑ For **Local Industries**

- Technology transfer
- Strengthen Partnerships
- Access to world market for nuclear/non-nuclear areas



Industrial involvement : Phase 1 (Consider to Decide)



- ❑ NEPIO (Nuclear Energy Project Implementation Organization) to **Assess**;
 - Local industrial capabilities
 - Interest of business / industrial leaders in participating in the NPP project considering the special requirements
 - Investment for intended upgrading of industrial facilities

- ❑ NEPIO to **Develop**;
 - Short term and long term policies on the area/level of local participation that is practical and desired

- ❑ NEPIO to **Initiate** dialogue with potential vendor(s)

Industrial involvement : Phase 2 (Prepare to Contract)



❑ NEPIO to **Consider**;

- Which local suppliers can reliably supply commodities, components and/or services.
- Which upgrades in skills & capabilities are realistic in the time-frame required to support NPP construction.

❑ NEPIO to **Determine**;

- Bid specification which should include information about domestic industry capabilities & requirements related to technology transfer.

❑ NEPIO to **Implement** policy regarding capacity building, incentives, etc.

Industrial involvement : Phase 3 (Construct to Commission)



☐ NEPIO to **Implement**;

- Industrial Involvement Policy continuously

☐ Owner/Operator to **Conduct**;

- Reassessment of the supply sources to support operation

☐ Local manufacturers to **Obtain**

- Necessary qualification for not only construction but also operational support by Owner/Operator

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

Poland in “Phase 2” — so far so good

❑ Objective — Clarified

- ✓ 30% at first stage, up to 60% to be localized

❑ Gap Analysis — Conducted

- ✓ 59 companies with nuclear experience in 10 years
- ✓ \simeq 400 potential companies are identified

❑ Capacity Building — Ongoing

- ✓ Ministry of Energy leads activities (e.g. tech workshop, manual, trade mission, supplier forum)

❑ Preparation for Bidding — TBD



Examples of **Suggestions/Recommendations** from INIR Missions (for other countries)



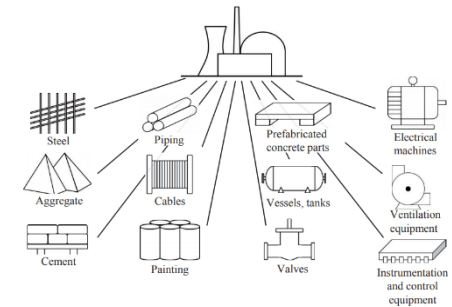
- The list of potential local suppliers for goods and services for the first NPP which was prepared in 2000 should be updated by (NEPIO) and included in the specification for contracting.
- It is suggested to include a determination of the needs for future investment in the potential local suppliers for goods and services for the first NPP during the detailed survey to be performed by (NEPIO) together with selected NPP vendor.
- (NEPIO) with the support of (Ministry of Economy) and other relevant agencies should develop a policy on industrial involvement for the Government approval.

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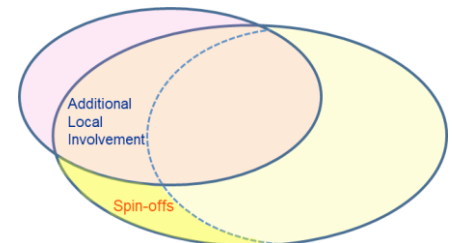
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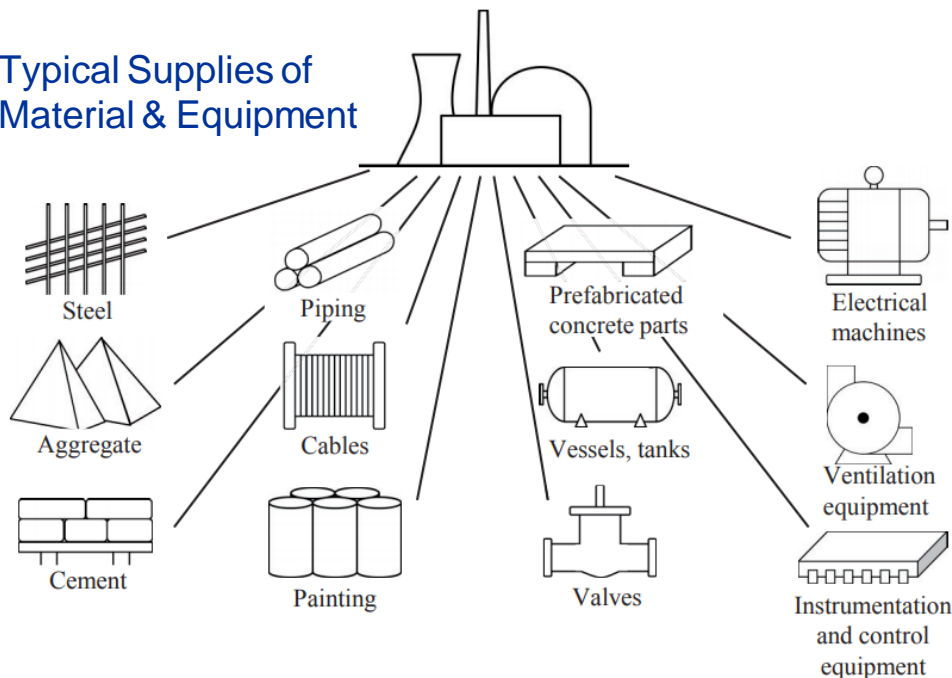


Supply Chain and Partnerships

□ For the **First NPP Project**,

- Supply Chain is created by EPC contractor (with inputs & supports from owner/operator), usually in **Phase 3**.
- After commissioning, owner/operator will take over some aspects of the supply chain from the EPC contractor.

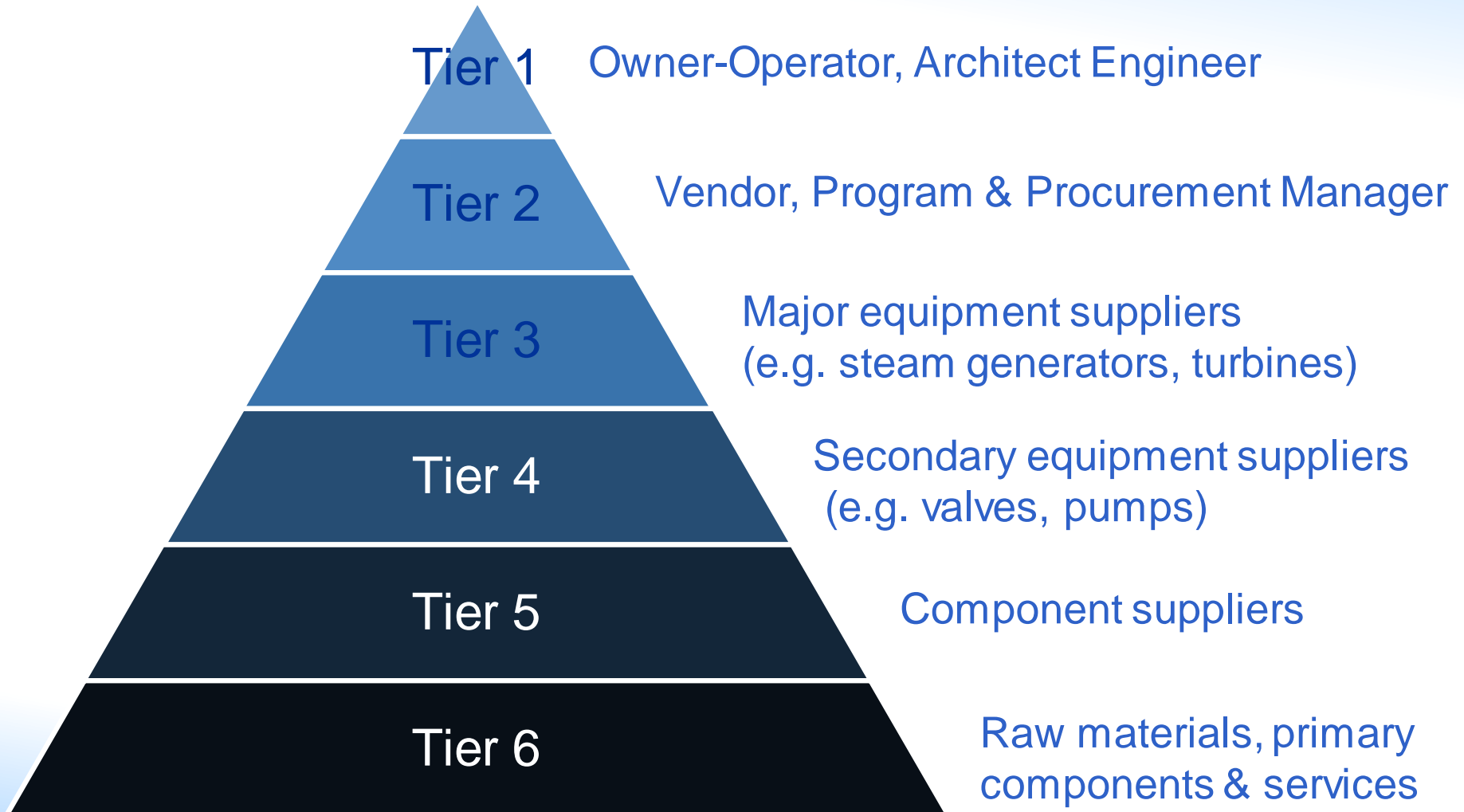
Typical Supplies of Material & Equipment



Cost (equipment/service, shipping), Quality, Delivery (Dates, stability)



Graduation of Suppliers in new NPP



Supply Chain Issues (1)

(seen from subcontractors/suppliers)

- ❑ Similar sectors' experience (e.g. petrochemical) helps you, but NOT automatically applicable to nuclear industry.
- ❑ Sometimes the highest barrier to entry is “culture” rather than “technology”. (it may take years to master QA/QM practice after months formal trainings, especially for a SME of craftsmanship)
- ❑ It'd be critical to understand potential vendors' policies in your battlefield such as:
 - 1) **Threshold of “In-house” or “Outsourcing”** (note: it'd be different by parts even in the same tech-field like welding)
 - 2) **Priorities of suppliers' condition** (Financial stability first? “ISO9001”-holder? Potential Management Skills or simply cost?)

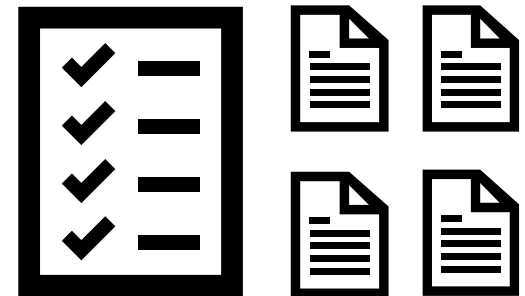
Supply Chain Issues (2)

(seen from subcontractors/suppliers)

- ❑ It'd be critical to estimate long-term “Investment & Return” scenarios in your battlefield. The factors may include:
 - 1) **Continuity of orders** (Construction? O&M?)
 - 2) **Geography of NPPs** (Inside/outside of Poland?)
 - 3) **Scale of Development** (Machinery? Documents? HR?)

⇒ A Case: documents to apply a certified supplier (example)

- ✓ Manual to satisfy quality requirement surely
- ✓ Operational guideline in detail
- ✓ Track record of manufacturing
- ✓ List of Equipment/Staff/Procurement
- ✓ Financial portfolio



Suggestions to be provided gently... (1)



- ❑ Before selecting a vendor, launch/drive ad-hoc group(s) focusing on Codes & Standards (C&S) issues such as:
 - 1) Studies for C&S management cases in other countries
 - 2) Establish/revise C&S adjusted to Polish circumstances

- ❑ Before starting bidding process, launch mission group(s) to interview with skillful vendors and/or Tier2+ suppliers in each field Polish industry targets on. Topics may involve:
 - 1) QA/QM system (e.g. work allocation, documentation method, inspection period, communication with sub-suppliers)
 - 2) Threshold of “In-house” or “Outsourcing”
 - 3) Ideal Suppliers condition with priorities

Suggestions to be provided gently... (2)



- ❑ (mainly to NEPIO) through the process of “Gap-Analysis” on local industry, doing cost-effective analysis on each policy option such as:
 - 1) Financial Incentive (e.g. low-interest loan)
 - 2) Direct subsidies for machinery investments
 - 3) Indirect subsidies for knowledge building (e.g. missions)
 - 4) Mid/Long-term national plan for NPPs

- ❑ (mainly to companies) through proactive participating in NEPIO/governments’ activities noted above, to prepare “Investment & Return” scenarios in each business area.

A Case: 1960-80s, Japan

Name of NPP	Tsuruga Unit 1 (1st Operated LWR)	Fukushima Unit 1 (3rd Operated LWR)	Shimane Unit 1 (5th Operated, and 1st “Localized” LWR)
Main Contractor	GE	GE	Hitachi
Capacity (Net)	341 MWe	439 MWe	439 MWe
Ratio of Domestic Production	55%	56%	<u>94%</u>
Start of Construction	1966	1967	1970
Start of Operation	1970	1971	1974
Supplier of Reactor System	GE	GE	Hitachi
Supplier of Steam System	GE	GE	Hitachi
Supplier of Turbine System	GE / Toshiba	GE	Hitachi

Source: JAIF “World Nuclear Power Plant” (2017), et al.

A Case: 1960-80s, Japan

1963 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

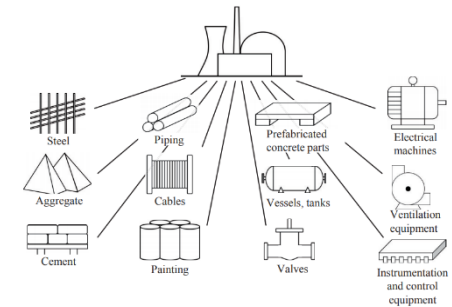
1980 Japan’s “Technical Standards on NPP Structure” was legislated by MITI (and revised frequently...)

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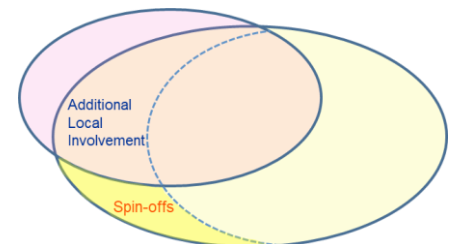
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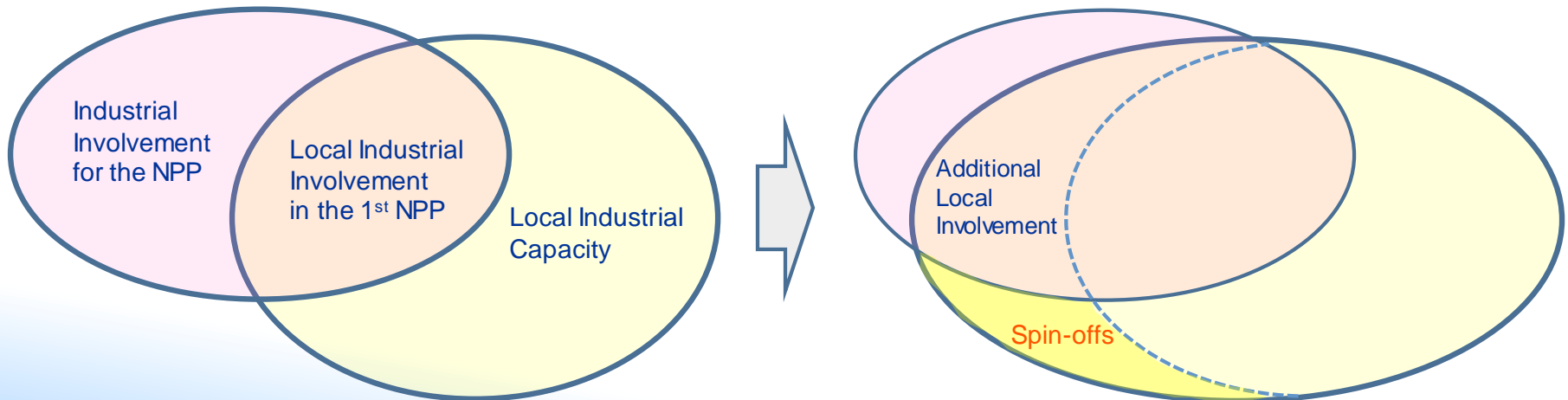


3. “Spin-offs” Potentials



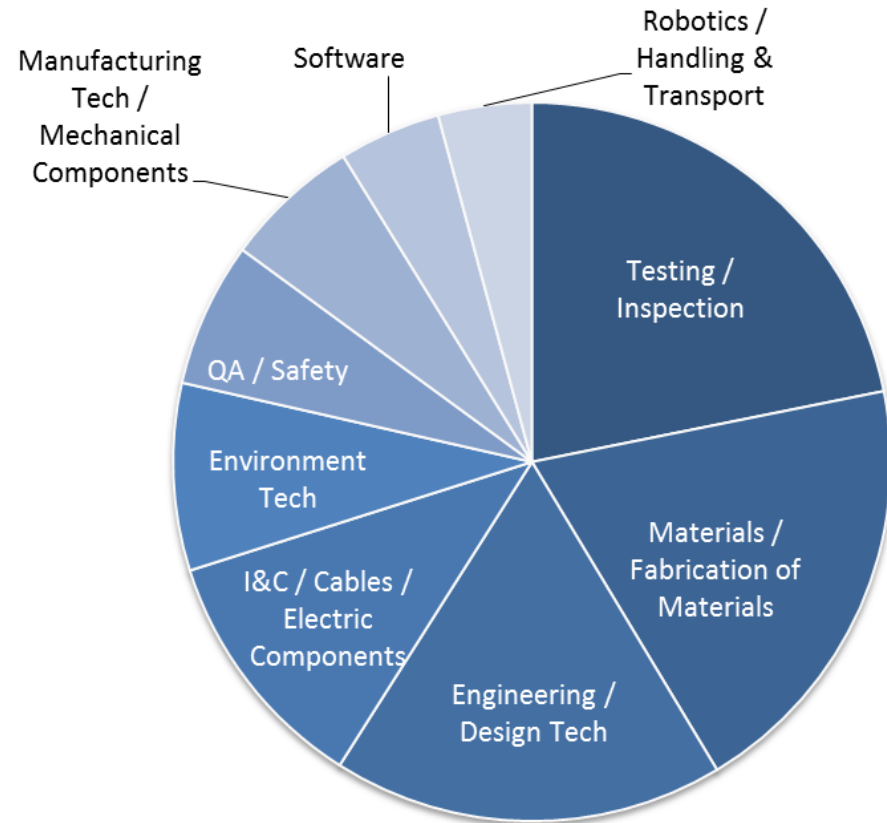
“Spin-offs” borne by the NPP Projects

- “Local Industrial Involvement” can expand as NPPs mature.
- This expansion will depend on several factors such as Government Policies, the # of NPP, and TT Agreements.
- There can be “Spin-offs” through participation in the NPP.

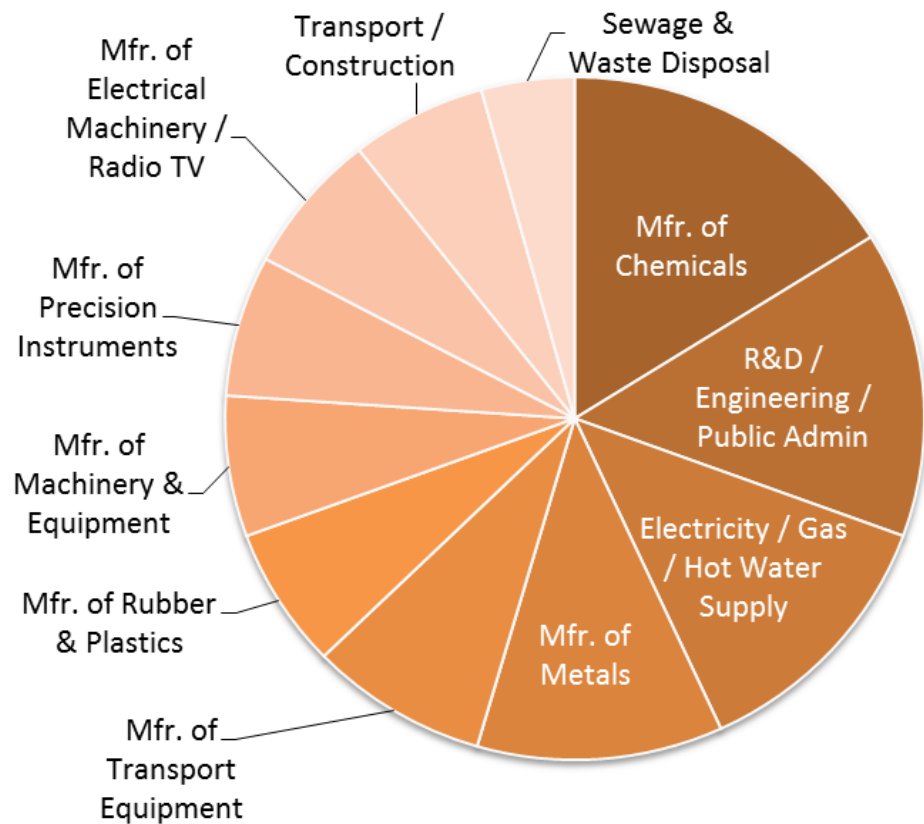


“Spin-offs”: Technology and Target Industry

Category of Technology (n = 261)



Target Industry (n = 255)

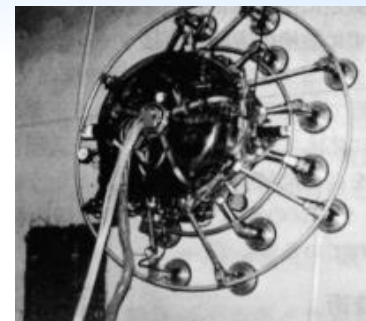


Ref. OECD/NEA “Spin-off Technologies Developed Through Nuclear Activities” (1993)

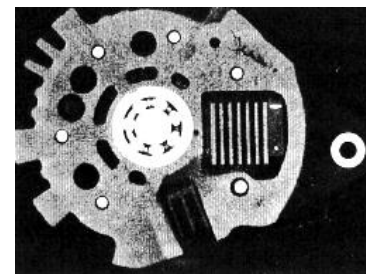
* Only items represented by more than 10 cases noted in this chart.

Examples of Techs applied to Other Industries

- **Seismic Response Technology:** can be used in base isolated foundations for buildings
- **Remote Controlled Inspection Technology:** can be used in the maintenance of ships
- **Non-destructive Inspection Technology** (e.g. X-ray, Acoustic and Associated Imaging): can be used in non-nuclear plants
- **Laser Technology** (e.g. For Improving Residual Stress): can be used in automobile, aviation and other manufacturers



Inspection Robot for Spherical Gas Holder

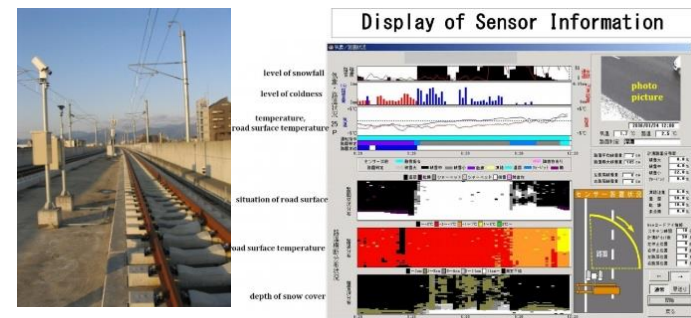
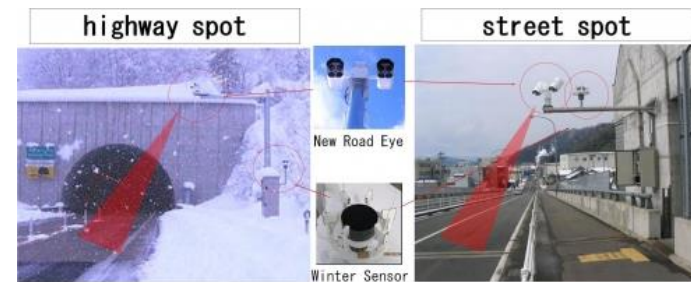


Imaging by X-Ray Computed Tomography

A Case of Spin-offs: RR to a Small Company



- A road surface sensor improved its accuracy of snow determination by anomaly detection technology in a nuclear Research Reactor.
- An owner of the reactor (national R&D organization) allowed a small company (manufacturer of sensor) to use the patent.
- It was a case under the government policy to encourage “Spin-offs” from nuclear to non-nuclear industry.



Tips for Successful “Spin-offs”

- Spin-offs are basically occasional. The ways of generation range from “spontaneous” to “organized”.
- Spin-offs themselves are not unique to the nuclear industry: it can be insightful to look through “better practices” from other industries and/or other countries.
- Spin-offs policies should consider basic issues such as:
 - Understanding the target industry sector and the way it works.
 - Carefully assessing technical, economic or market applicability.
 - The field of application needs to be defined as tightly as possible.

IAEA Supports in Industrial Involvement



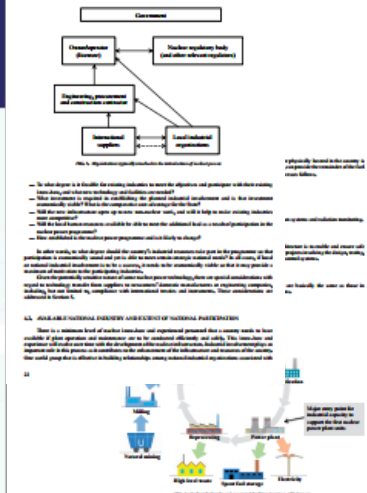
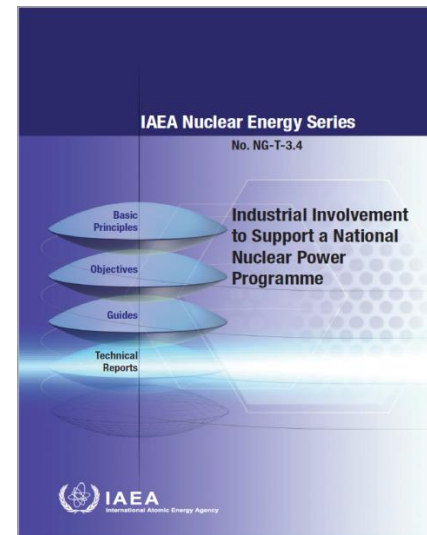
- ❑ Industrial involvement highly depends on the circumstance of each receiving country. ⇒ **There is no silver bullet.**
- ❑ IAEA assistance on Industrial Involvement

Sharing Knowledge and Experience



- Technical Meeting in France and China (2013, 2014), and Korea (2017)
- Training Course in France (2014, 2016)
- National Workshop (Ghana, Turkey, Egypt, etc)

Publishing Tech Documents



“Industrial Involvement to Support a National Nuclear Power Program”, IAEA Nuclear Energy Series No. NG-T-3.4 (2016)

For Your Reference...



Industrial Involvement to Support a National Nuclear Power Program (IAEA, 2016)

<https://www-pub.iaea.org/books/iaeabooks/10825/Industrial-Involvement-to-Support-a-National-Nuclear-Power-Programme>

Facilities to support a NPP / Factors affecting the development of local Industrial Involvement / Technology Transfer and Intellectual Property / etc

Procurement Engineering and Supply Chain Guidelines in Support of Operation and Maintenance of Nuclear Facilities (IAEA, 2016)

<https://www-pub.iaea.org/books/iaeabooks/10865/procurement-engineering-and-supply-chain-guidelines-in-support-of-operation-and-maintenance-of-nuclear-facilities>

Managing Procurement / Procurement Process (e.g., Potential procurement scenarios & supplier selection) / Considerations & Lessons Learned / etc

Leadership and Management for Safety (IAEA, 2016)

<https://www-pub.iaea.org/books/iaeabooks/11070/Leadership-and-Management-for-Safety>

Responsibility for Safety / Management for Safety / Culture for Safety / etc

- A new IAEA Technical Document in the area of **Quality Assurance and Control** is planned and to be presented/discussed in the TM (12-15th Nov 2018, Vienna)

Dziękuję! (Thank you)

S.Yasuraoka@iaea.org

Contact me, in any issue, as you like.