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Introducing of Doosan

- **Business Overview**

  - **President COO**
    - **Casting & Forging BG**
      - Material
    - **Nuclear BG**
      - NSSS, BOP
    - **TG BG**
      - Turbine, Generator
    - **Power Service BG**
      - T/G, Boiler, Piping
    - **Water BG**
      - MSF, MED, RO, Hybrid
    - **Construction BG**
      - Civil, Power Plant
Introducing of Doosan

Power Business Global Network

- Doosan Babcock
  - Boiler Engineering & Design
  - Turbine Generator - Engineering & Design
- IMGB
- DPS Europe
- SKODA Powers
- Operation Center
  - Engineering Support in MENA
- DBE&S
  - Detail Engineering Center
- Changwon Factory
  - Control Tower - A/E, Design
  - R&D Center
- DPS North America
  - New Jersey
  - Architecture Engineering Alliance with Burns & Roe
- DPS Latin America
  - Sao Paulo
- DOOSAN VINA
  - HANVICO
Introducing of Doosan

Changwon Facility

Doosan has an integrated manufacturing facility in Changwon, Korea which is capable from raw material production to final assembly of nuclear components.

Changwon Manufacturing Complex

Total Area: 4,429,000 m² (575 x Soccer Field)
Floor Space: 425,000 m² (55 x Soccer Field)
Introducing of Doosan

**Nuclear Steam Supply System**
- Reactor Vessel and Internals
- Steam Generator
- Reactor Coolant Pump
- Control Element Drive Mechanism
- Pressurizer
- Integrated Head Assembly
- Fuel Handling System

**Balance of Plant**
- Containment Post-tensioning System
- Containment Liner Plates
- Stainless Steel Liner Plates
- Condenser and Heat Exchangers
- Pressure Vessels & Tanks
- Gas Stripper, Boric Acid Concentrator
- Containment Polar Crane, etc.
- New and Spent Fuel Racks
- Spent Fuel Transportation Cask

**Turbine / Generator System**
- Turbine
- Generator
- Moisture Separator Reheater, etc.

**I&C**
- NPP I&C total Package
  - Safety / Non-Safety System
  - Cable Assembly, etc.
- Upgrade of I&C in operating NPPs
  - I&C Digital Upgrade
  - Control Rod Control System

**Nuclear Service**
- Replacement Service
  - RSG, RVCH
- Repair & NDE Service
  - RVCH, SG, PZR
- Maintenance
  - RCP Internal & Refueling System
- Upgrade & Modification
  - FHS, IHA. High Density Fuel Rack, etc.
- Technical Advisory Service
Introducing of Doosan

- 22 New Nuclear Power Plants (8 Overseas Projects)
- 17 Replacement Projects (10 Overseas Projects)
Introducing of Doosan

- Qinshan Phase III #1&2 Steam Generator (China)
- V.C Summer #2,3 Reactor Vessel (USA)
- BNPP#1~4 Steam Generator (UAE)
- Shinhanul#1,2 Reactor Vessel (Korea)
Supplier evaluation program is normally based on applicable Nuclear Safety Act, ASME/KEPIC Code, ISO 9001 etc., and contract requirements.

**Domestic Project**
- Nuclear Safety Act
- Enforcement Decree of Act
- Regulation of Act
- Notice of NSSS
- KEPIC MNA/SNA/ENA
- KEPIC QAP

**Overseas Project (USA)**
- NRC Regulation (10 CFR)
  - 10 CFR 50.55a / 50 App.B
- ASME NCA-4000
- ASME NQA-1

Doosan QA Program
### Applicable Requirements for Supplier Evaluation

Applicable Code & Standards, customer requirements, regulation requirements are included in Doosan quality specification and transferred to suppliers as a part of Purchase Order.

<table>
<thead>
<tr>
<th>Quality Class</th>
<th>Description</th>
<th>Evaluation Method</th>
<th>General Quality Specification</th>
</tr>
</thead>
</table>
| **Complete Items** | **Safety Related Items** | - Audit prior to initial purchase order  
- Triennial audit for renewal  
- Annual evaluation | NQAPS-001  
PQAP-1602  
NPS-11101V |
| **T/ R/ A** | **Safety Impact/ Reliability Item** | - Audit or document evaluation for initial evaluation and renewal every three years | NPS-TRI001 |
| **Material** | **ASME III Code Materials** | - Audit prior to initial purchase order  
- Triennial audit for renewal  
- Annual evaluation by document review  
(Peat. Holder)  
- Annual audit or performance evaluation including sample test  
(Qualified Material Organization) | NPS-11101F |
| **Services** | **Services for Safety Related Item** | - On-site audit prior to initial purchase order  
- Annual evaluation by document review | NPS-11102-NS |
Applicable Requirements for Supplier Evaluation

In addition, customers are requesting Doosan to reflect the requirements to prevent CFSI cases especially into the vendor evaluation and/or procurement process.

Applicable requirements reflected in the Audit Checklist

<table>
<thead>
<tr>
<th>SECTION 8 - Counter Measures for Counterfeit/ Fraudulent or Suspect Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1 Verify that <strong>applicable measures have been established and implemented to identify the counterfeit/ fraudulent or suspect items when there is any indication as below during the inspection or test of the purchased item, material, or services?</strong> <em>(referring the Doosan Heavy QAI-0701 Appendix 1-4)</em></td>
</tr>
<tr>
<td>(If not, it is required to establish and implement the appropriate measures)</td>
</tr>
<tr>
<td>8.2 <strong>Verify if the established countermeasure of vendor is appropriate</strong> to prevent/ identify the counterfeit/ fraudulent or suspect items.</td>
</tr>
<tr>
<td>8.3 <strong>Verify if there is any counterfeit/ fraudulent case or suspected case</strong> of items or activities of the vendor to the current audit/survey period since the last audit/survey. (referring the QAI-0701)</td>
</tr>
<tr>
<td>(If there is any activity or case of counterfeit/ fraudulent and suspected item, it should be checked to confirmed take appropriate action*.)</td>
</tr>
</tbody>
</table>

* Appropriate action: **notify to the Doosan immediately, and submit related information and counter-measures within 3 working days including followings at least.**
1) Vendors responsible for counterfeit, fraudulent or suspect cases with description of such cases.
2) Verification result on items ordered by Doosan against counterfeit or fraudulence
3) Follow-up action plan and recurrence prevention measures
4) Evidences in support of the description of counterfeit, fraudulent or suspect cases and the verification result thereon.

8.4 ~~~~~
8.5 ~~~~~
8.6 ~~~~~
8.7 ~~~~~
Supplier Evaluation and Control _ Evaluation Process

Supplier evaluation system is based on ASME NCA/ NQA-1, ISO 9001, and customer requirements to maintain competitive supply chain.

Vendor Information Report (VIR)
- QA Manual & Company details, etc.
- Vendor submit VIR to Procurement Team

Evaluation for Technical Capability
- Applied to New vendors
- Evaluate capability for implementation of contract

Evaluation for Quality Capability
- Performed by Qualified Lead Auditors
- On-Site Audit, Records/History Review etc.

Acceptable?
- Yes
- No
  - Return to Procurement Team
  - Inform to the vendor

Register on the Approved Vendor List (AVL)
- Quality level, approval duration, approved QA Manual, Certificate etc.

Maintenance of Vendor Qualification
- Periodic Evaluation by Site Survey, performance assessment etc.

Distribution of AVL
- Distribute through ERP System
Doosan applies three steps for supplier evaluation/monitoring and management as below.

- **Initial Qualification**
  - Quality System
  - Technical Capability

- **Procurement Control**
  - Procurement Specification
  - Source Inspection

- **Periodic Management**
  - Periodic Evaluation
  - On-Site Surveillance

**Monitoring/Three-out System**
Supplier Evaluation and Control _ Three-out System

Doosan performs monitoring and surveillance to suppliers during the fabrication of items or services, and impose the restrictions as below according to the impact of the issues.

- **Purpose**
  - Monitor/Coach Vendors to decrease sourcing risk
  - Follow-up for corrective action and prevention of recurrence
  - Restrict vendors that make the serious quality problems

- **Serious Problems**
  - Sub-contracting without approval from Doosan
  - Use of Un-qualified personnel
  - Arbitrary fabrication/ repair without approval
  - Counterfeiting of quality document and/ or product
  - Use of inappropriate material
  - Excessive quality problems/quality cost
  - Poor corrective action for quality problems

- **Restriction**
  - 1 Out : Warning and request corrective action
  - 2 Out : Restrict participation to bid evaluation for more than one month
  - 3 Out : Cancel the approval and prohibit placing order permanently
  
* 2, 3 out shall be under the decision of Sub-contract Control Committee*
Challenges Related to Supply Chain Management

Doosan is also facing the same difficulties as competent suppliers are leaving the nuclear industry because of the recessions of nuclear industry and the severe requirements than the other industries.

Suppliers

- Many **audit/survey** as required by regulatory or contract requirements **though it is not required for the Certificate Holders** by Code.
  - Certification Body: **initial and triennial audit/survey**
  - Utility Owner: **initial audit and annual or triennial audit**
  - Regulatory Body: **Periodic inspection** for major equipment suppliers
- In addition, establishment and implementation of QA Program for service suppliers is very weak.

Utilities/ Major Manufacturers

- Hard to maintain Supply Chain
  - many QA Audit to suppliers
  - suppliers are leaving from the nuclear industry
- Procurement cost is going up
- CGI Dedication, USM Utilization are expected to be increased.
Recommendations for Improvement

So, it shall be considered to focus on the activities that directly affect safety and/or quality of the product to keep reliable suppliers in nuclear industry as below.

**Reducing of QA Audit**

- **Periodic Audit may be exempted for the Certificate Holders**
  - applicable org.: component manufacturers, material organizations
  - alternative control measure may be established by Certificate Holders considering the importance, supply history, surveillance system etc.

- **Evaluation for Service suppliers may be simplified**
  - Initial survey/audit and periodic evaluation may be exempted, and Equipment manufacturers may establish the evaluation and control measures
  - Considering the capability of the service suppliers, direct control and verification of the service performance could be more effective.

**Utilization of evaluation result by others**

- **Evaluation result by other organization may be utilized**
  - Inspection result by regulatory body, and audit result by utility owner and Certificate Holders may be reviewed and used for supplier evaluation.
  - ex) NUPIC*, NIAC**
  - If there is any insufficient area of the evaluation result, or areas not covered, additional evaluation method should be applied.

* NUPIC : Nuclear Procurement Issues Committee
** NIAC : Nuclear Industry Assessment Committee