Procurement Programs for BOO Projects

Timur Gabyash
Business development project manager, JSC “Rusatom Energy International”
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## ROSATOM BOO PROJECTS ABROAD

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Akkuyu NPP</th>
<th>Hanhikivi NPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Mercin Province, Turkey</td>
<td>Oulu Province, Finland</td>
</tr>
<tr>
<td>Installed Capacity:</td>
<td>4 800 MWe</td>
<td>1 200 MWe</td>
</tr>
<tr>
<td>Rosatom’ target share in project:</td>
<td>51%</td>
<td>34%</td>
</tr>
<tr>
<td>Project phase</td>
<td>Designing/Construction License Acquisition</td>
<td>Designing/Construction License Acquisition</td>
</tr>
<tr>
<td>Beginning of the construction phase:</td>
<td>2018 (first unit)</td>
<td>2018</td>
</tr>
<tr>
<td>Commissioning:</td>
<td>2024</td>
<td>2024</td>
</tr>
<tr>
<td>Energy sales chart</td>
<td>Power Purchase Agreement, free market sales</td>
<td>Mankala Principle Agreement</td>
</tr>
</tbody>
</table>

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LOCALIZATION & INTERNATIONAL COOPERATION POLICY ON BOO PROJECTS

ROSATOM

- Project management
- Nuclear island design incl. I&C
- Nuclear island equipment fabrication, assembly, start-up and commissioning
- Nuclear fuel supply
- Radioactive waste and spent fuel handling services

Rosatom proprietary part of Supply Chain Management

EXTERNAL SUPPLIERS

- Environmental Assessment Study
- Turbine island and BOP engineering, including:
  - cooling system
  - water treatment
  - condensate system
  - power distribution system
  - site infrastructure
- Design of NPP I&C systems and integration with nuclear island I&C
- Construction management

International part of Supply Chain Management

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QUALIFICATION PROCESS FOR SUPPLIERS OF 1–3 CLASSES EQUIPMENT

Step 1
Project Companies & Suppliers

Critical Parts Supply Contract Signing

Suspensive condition

Step 2
Project Companies & National Nuclear Agencies

Qualification Assessment by Project Company

Production Capabilities Audit

Audit Report for National Regulator

Qualification Assessment by National Regulator

Regulator’s Audit of Supplier’s Qualification

Audit Report Assessment

Issue of Nuclear Qualification Certificate by National Regulator

Delivery of Products/Services

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QUALIFICATION PROCESS FOR SUPPLIERS OF 4 CLASS EQUIPMENT

Project Companies & Suppliers

Qualification Assessment

Production Capabilities Audit

Production Site Visit

Production Capabilities Approval

Class 4 Supplies Contract Signing

Delivery of Products/Services
### NEAREST PROCUREMENT OPPORTUNITIES FOR AKKUYU PROJECT (PART 1)

<table>
<thead>
<tr>
<th>n°</th>
<th>Equipment item</th>
<th>IV Q 2017</th>
<th>I Q 2018</th>
<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Containment pre–tensioning system (CPRS) (anchors; dome, cylinder and vertical ropes; wedge locks; force sensors; tensioning monitoring system; channel formers; cement to be injected into channel formers)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sealed pipeline penetration with built–in parts</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Molten core catcher</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><strong>Vessel equipment</strong> (to 2,100 m³, stainless steel/carbon steel)</td>
<td>● ●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>Pump units</strong> (circulation, vacuum, water jets; capacity of up to 2,500m³/h, working medium: aggressive environments such as alkali, acids, primary coolant)</td>
<td>● ●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td><strong>Doors and gates</strong> (protective, sealed, and fire-safety)</td>
<td>● ●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><strong>Shell–and–tube exchangers</strong> (Q to 5,350kW; F to 69.5m²)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td><strong>Plate heat exchangers</strong> (Q to 1,118MW; F to 189.1m²)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td><strong>Normal and emergency power supply diesel generators</strong></td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td><strong>UPS equipment</strong> (DC switchgear; batteries; inverters and rectifiers)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td><strong>Radioactive drains manways</strong></td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><strong>10kV packaged switchgear</strong></td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td><strong>Sluices</strong> (for transport, personnel, and fresh fuel storages)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td><strong>Hoisting equipment</strong> (cranes and tackles)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Turbine hall crane</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td><strong>Afterheat removal passive system (ARMS) equipment</strong> (heat exchangers, air ducts, gates, and electric magnets)</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td><strong>Polar crane</strong></td>
<td>●</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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NEAREST PROCUREMENT OPPORTUNITIES FOR AKKUYU PROJECT (PART 2)

<table>
<thead>
<tr>
<th>n°</th>
<th>Equipment item</th>
<th>IV Q 2017</th>
<th>I Q 2018</th>
<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Transport portal crane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Generator switchgear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>0.4kV packaged switchgear</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>PCS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>22</td>
<td>Pulse safety device (JEF, JNA, JNG, KVA, SAOZ systems)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Compressors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Interim storage facility crane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Workshop equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Mobile modular decontamination units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>●</td>
</tr>
<tr>
<td>27</td>
<td>Reserve boiler</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>LRW handling system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Telecommunication systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Media separators (filters)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Refrigerators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Refueling machine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Process pipeline valves (lock valves, regulation, safety, and return valves; DN≤600mm and PN≤16MPa and manual, electric, pneumatic, and hydraulic drives, including companion flanges of all types supplied with the valves)</td>
<td></td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>34</td>
<td>Process pipelines (pressure to 16MPa, stainless steel/carbon steel)</td>
<td></td>
<td></td>
<td></td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

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### Nearest Procurement Opportunities for Hanhikivi Project via General Contractor "Titan–2"

<table>
<thead>
<tr>
<th>n°</th>
<th>Lot No</th>
<th>Type of the contract</th>
<th>Contract item</th>
<th>IV Q 2017</th>
<th>I Q 2018</th>
<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>96</td>
<td>Construction</td>
<td>Construction of a reserve water discharge facility in the NPP basin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>70</td>
<td>Construction</td>
<td>Construction of foundation slabs for 10UJA 10UJE buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>71</td>
<td>Construction</td>
<td>Installation of pipelines and gangways for fire wastewater discharge system (GML) in 10UJA 10UJE buildings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>69</td>
<td>Construction</td>
<td>Installation of foundation grounding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>102</td>
<td>Construction</td>
<td>Construction of an air duct assembly shop (95UST), turnkey part</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Equipment</td>
<td>Supply of transformer sub–stations (two permanent units)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>137</td>
<td>Construction</td>
<td>Gatehouse construction, 93UYF, 94UYF, 95UYF, at the construction and installation depot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>107</td>
<td>Construction</td>
<td>Vertical design and installation of type I warehousing facilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>109</td>
<td>Design/Survey</td>
<td>Development of regulations for a concrete cap for main buildings and structures of the Turbine Island</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>72</td>
<td>Construction</td>
<td>Installation of CPRS anchor pockets in 10UJA building</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>106</td>
<td>Construction</td>
<td>Construction of the contractor’s workshops</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>40</td>
<td>Construction</td>
<td>Construction of workshops (6UST and 4UZC buildings)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>140</td>
<td>Construction</td>
<td>Installation of structural steel at 10UPP (supply pipeline for critical loads)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>138</td>
<td>Construction</td>
<td>Construction of type II warehousing facilities (storage areas, cold and heated warehouses)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Equipment</td>
<td>Diesel generator units</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>110</td>
<td>Construction</td>
<td>Concrete cap for main maintenance buildings and structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>139</td>
<td>Construction</td>
<td>Construction of a bus station pavilion, 1UZA and 2UZA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>Equipment</td>
<td>Full–scale and analytical simulators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td>Equipment</td>
<td>Turbine Island bridge crane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>Equipment</td>
<td>Transformers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Possibilities for cooperation with foreign partners
Procurement program for 2018

Nikita Konstantinov
Rosenergoatom Concern
Conversion and enrichment → Fuel fabrication → NPPs construction → Power Generation → Spent nuclear fuel treatment

Rosenergoatom:
- Electric Power Division of Rosatom
- NPPs operation and power generation

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**KEY FIGURES**

**ROSENERGOATOM**

Rosenergoatom has over 60-years experience

10 NPP (35 units)  
8 units under construction

### IN RUSSIA

- National NPP operator

### IN THE WORLD

- Reliable international partner

- Support Rosatom projects in 41 countries

- Membership in international associations: IAEA, WANO, NEA

- Joint projects with international operators: EDF, IBERDROLA

- Installed capacity: ~28 GW

- Annual Generation (plan 2017): ~ 200 bln KWh

- Rosenergoatom has over 60-years experience in NPP life-cycle operation maintenance
ANNUAL PROCUREMENT PROGRAM (BILLION EUR)

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### Examples of Foreign Equipment Procurement in 2017

<table>
<thead>
<tr>
<th>No.</th>
<th>Subject of the Contract</th>
<th>Manufacturer's Name</th>
<th>Contract Price, kEUR, VAT Including</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Supply of closing gate for the purge system of the steam generator</td>
<td>MSA a.s., (Czech Republic)</td>
<td>302,33</td>
</tr>
<tr>
<td>2</td>
<td>Spare parts supply for the auxiliary feed pump</td>
<td>«JACTREBAC», (Serbia)</td>
<td>133,29</td>
</tr>
<tr>
<td>3</td>
<td>Spare parts, tools and accessory for AUMA drives supply</td>
<td>AUMA Riester GmbH &amp; Co, (Germany)</td>
<td>38,37</td>
</tr>
<tr>
<td>4</td>
<td>Cleaning balls for balls cleaning system</td>
<td>Taprogge GmbH, (Germany)</td>
<td>127,33</td>
</tr>
<tr>
<td>5</td>
<td>Power circuit-breakers supply</td>
<td>ABB AB Power Products, (Sweden)</td>
<td>3302,47</td>
</tr>
<tr>
<td>6</td>
<td>Line transformer supply</td>
<td>Siemens, (Germany)</td>
<td>1139,16</td>
</tr>
<tr>
<td>7</td>
<td>Level sensors supply</td>
<td>VEGA Griechaber KG, (Germany)</td>
<td>8,57</td>
</tr>
<tr>
<td>8</td>
<td>Cables supply</td>
<td>TKB Kabel, (Germany)</td>
<td>4,48</td>
</tr>
<tr>
<td>9</td>
<td>Vertical diagonal pumps with the pre rotation adjustment option, for modernization of the electric pump units160DPV10-28</td>
<td>Ganz EEM, (Hungary)</td>
<td>6763,71</td>
</tr>
</tbody>
</table>

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PARTICIPATION IN ROSENERGOATOM PROCUREMENT

You can familiarize with the scheduled procurements on the following websites:
www.zakupki.gov.ru
www.zakupki.rosatom.ru

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Procurement documentation contains:
- Terms of reference (technical specification);
- Draft contract;
- Assessment criteria;

Requirements for participants:
- General legal capacity
  Registration as a legal entity in accordance with legislation at its location
- Financial sustainability
  Required to provide financial statements
- Experience
  Confirmed experience of supply/ manufacture of similar equipment
- Licenses
  For Russian companies – license and permits
  For foreign participants – declaration of readiness to comply with the requirements in the field of quality assurance
- Certification
  Existence of a quality management system, e.g. ISO 9001

Annual procurement program
Notification and procurement documentation publishing
Application submission
Application and assessment Review of applications
Contract signature

Procurement commission conducts the selection and assessment of participants’ applications in accordance with established requirements and criteria.

Protocol to be published on
www.zakupki.gov.ru
www.zakupki.rosatom.ru
ETP (fabrikant.ru; atom.roseltorg.ru; b2b-center.ru)

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KEY PERFORMANCE INDICATORS

RASU

On-going projects on
25+ NPP Units

More than 550 high-qualified specialists
and 350 engineers having the NPP experience

Over 2300 employees in the entire I&C business (including business units),

More than €850 mln —
Project pipeline for 10 years

System integrator and supplier of I&C and electrical equipment

More than 30 manufacturing, engineering and R&D facilities

Over 70 NPP units are equipped with our I&C based on the Russian design

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## RASU - SYSTEM INTEGRATOR AND SUPPLIER OF I&C AND ELECTRICAL EQUIPMENT

**JSC RASU** – project implementation at all stages using the company’s own resources and expertise in integration, and also in cooperation with foreign vendors.

- **System integration**
- **Design**
- **Project management**
- **Supply chain management**
- **Metrology**
- **Maintenance service**

### SAFETY SYSTEMS
- **Development, Production and Testing**
  - Engineering
  - Production
  - Testing
  - R&D

- **Supplied by Rosatom companies**
- **May be supplied by other suppliers**

### NORMAL OPERATION SYSTEMS and ELECTRICAL EQUIPMENT
- **Development, Production and Testing**
  - Engineering
  - Production
  - Testing
  - R&D

- **Supplied by Rosatom companies**
- **May be supplied by other suppliers**

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BASIC CONTRACT CONCLUSION SCHEME USED BY RASU

CUSTOMER

EPC contract

Design, system integration and supply contract

RASU

Subsystems suppliers contracts

Sub supplier 1
Sub supplier 2
...  
Sub supplier N

Design
- I&C and subsystems design
- I&C requirements management
- I&C technical solutions unification

Engineering and Production
- QA and performance control
- Coordination of I&C development
- Testing, metrology, compliance assessment

Engineering and Production
- Supply chain management
- Package supply
- Pre-commissioning and installation supervision

Operation and Modernization
- Supply of spare parts and components
- Maintenance, repair and modernization
- Periodic calibration
- Consulting and personnel training
CURRENT INTERNATIONAL NPP PROJECTS – NEW BUILDS

HUNGARY PAKS-2 NPP
Design
Overall I&C supply
System integration

FINLAND HANHIKIVI-1 NPP
Design
System integration

INDIA KUDANKULAM NPP
Overall I&C supply
System integration

IRAN BUSHEHR NPP
Overall I&C supply
System integration

BANGLADESH ROOPPUR NPP
Overall I&C supply
System integration

TURKEY. AKKUYU NPP
Design
Overall I&C supply
System integration

EGYPT. EL-DABAA NPP
Design
Overall I&C supply
System integration

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<table>
<thead>
<tr>
<th>n°</th>
<th>Equipment item</th>
<th>I Q 2018</th>
<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
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<tbody>
<tr>
<td>1</td>
<td>Automated external excess system</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Common-plant EE I&amp;C (Electrical Equipment I&amp;C)</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Back-up control panels</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Automated radiation monitoring system (ARMS)</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Leak detection system for secondary circuit</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hydraulic shock absorber monitoring system</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Diverse protection system</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Neutron flux monitoring equipment (NFME)</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Water chemistry instrumentation and control system</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Monitoring, control and diagnostics system (MCDS)</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CPS electrical equipment package</td>
<td></td>
<td>★</td>
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</table>
## ROOPPUR NPP (BANGLADESH) PROCUREMENT SCHEDULE (2/2)

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<tr>
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<th>Equipment item</th>
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<th>IV Q 2018</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td>Hydrogen concentration monitoring system (HCMS)</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
<tr>
<td>13</td>
<td>Commissioning measurement systems</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
</tbody>
</table>

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### BUSHEHR NPP (IRAN) PROCUREMENT SCHEDULE (1/2)

<table>
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<tr>
<th>n°</th>
<th>Equipment item</th>
<th>I Q 2018</th>
<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Secondary circuit leak detection system and heat exchanger leak detection system</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Common-plant I&amp;C</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Local control stations</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reactor protection system</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Normal operation I&amp;C</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Upper-level system</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Automated Radiation Monitoring System (ARMS)</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Radiation leak monitoring system from primary into secondary circuit</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
<tr>
<td>9</td>
<td>Hydrogen concentration monitoring system (HCMS)</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
<tr>
<td>10</td>
<td>Fire protection and alarm system (Unit FP I&amp;C)</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
<tr>
<td>11</td>
<td>Automated external excess system</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
</tbody>
</table>

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# BUSHEHR NPP (IRAN) PROCUREMENT SCHEDULE (2/2)

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<th>IV Q 2018</th>
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</thead>
<tbody>
<tr>
<td>12</td>
<td>Control and protection system (CPS)</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Hydraulic shock absorber monitoring system</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Commissioning measurement systems</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Diverse protection system</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Industrial seismic protection system (ISPS)</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Neutron flux monitoring equipment (NFME)</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>CPS electrical equipment package</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
</tbody>
</table>
Procurements of Machine Building Division

Roman Murashov
Head of International Business Department
JSC Atomenergomash
ATOMENERGOMASH (AEM) - ENGINEERING DIVISION OF STATE NUCLEAR CORPORATION ROSATOM

Established in 2006 as a core machine building division within the structure of Rosatom Corporation

- 27% of Russian power generation equipment (PGE) industry
- More than 30 manufacturing, engineering and R&D facilities in Russia, Ukraine, Czech Republic, Hungary
- Employing a 17,000 skilled and professional workforce
- Order backlog exceeds 7.4 bln. USD

Unique production capacity, strong research base and wide-ranging expertise are the key drivers of AEM successful development

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AEM: COMPLETE PRODUCTION CHAIN

- **Scientific Research**
  - Fundamental and applied research
  - Development of new materials and processes
  - Test samples and tests
  - Welding techniques nondestructive control

- **Design**
  - Development of reactor equipment for all NPPs designed in Russia
  - Reactor plants for icebreaker and submarine fleet
  - Advanced research for production of reactor plants for medium and small power nuclear power plants

- **Castings & Forgings**
  - Production of castings and forgings for nuclear, power and other industries
  - Development of new structural materials
  - Design and manufacturing of non-standard equipment

- **Manufacturing**
  - Production of nuclear and turbine island equipment
  - Production of NPP auxiliary equipment
  - Unique process and production competences

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CORE PRODUCTS FOR NUCLEAR POWER PLANTS

Atomenergomash’s enterprises manufacture and deliver different equipment for NPP of the Russian design.

- Reactor equipment
- Steam generators and heat exchangers
- Pumps, main circulation pump
- Pressurizing system
- Turbine hall heat-mechanical equipment
- Complete transportation system equipment
- Piping and valves
- Control and protection system (CPS)
- Emergency core cooling system ECCS
- Auxiliary equipment

Complete manufacturing and delivery of Nuclear Island equipment

Complete manufacturing and delivery of Turbine Island equipment
LICENSING AND CERTIFICATION IN THE GLOBAL MARKET

Successful licensing by national regulatory bodies and manufactured equipment certification are essential for work in the foreign markets.

NATIONAL REGULATORS REQUIREMENTS

- Radiation and Nuclear Safety Authority in Finland (STUK)
- Atomic Energy Regulatory Board in India (AERB)
- National Nuclear Security Administration of China (NNSA)
- Turkish Atomic Energy Authority (TAEK)
- Iran Nuclear Regulatory Authority (INRA)
- The Hungarian Atomic Energy Authority (HAEA)
- Rostechnadzor, Russia

INTERNATIONAL CERTIFICATION

- ISO
- ASME
- Lloyd's Register
- DETNORSKE
- TÜV SÜD
- American Bureau of Shipping

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GEOGRAPHY OF ATOMENERGOMASH COMPANIES

- MOSCOW (RUSSIA)
  - JSK «Atomenergomash»
  - JSC NPO «CNIITMASH»
  - JSK «VNIIAM»
  - JSK «ATM»
  - JSK «SNIIP»
  - JSK «OZTM TS»
  - JSK «NGSS»

- ST. PETERSBURG (RUSSIA)
  - JSK «CKBM»
  - JSK «AEM-Technologies»
  - JSK «AAEM»

- PETROZOVODSK (RUSSIA)
  - JSK «Petrozavodskmas», branch of AEM-Technologies

- NIZHNYA TURA (RUSSIA)
  - JSK «VENTA»

- EKATERINBURG (RUSSIA)
  - JSK «SverdNIIkhimmash»

- DUBNA (RUSSIA)
  - JSK «FTP»

- OPAVA (CZECH REPUBLIC)
  - ARAKO spol.s r.o.

- BUDAPEST (HUNGARY)
  - Ganz EEM LLC

- KRAMATORSK (UKRAINE)
  - JSK «EMSS»

- VOLGODONSK (RUSSIA)
  - JSK «Atommas», AEM-Technologies branch

- PODOLSK (RUSSIA)
  - OKB «GIDROPRESS»
  - JSK «ZIO-PODOLSK»
  - JSK «ZIOMAR»
FOREIGN OEMS’ OPPORTUNITIES IN SUPPLY FOR ROSATOM NUCLEAR FACILITIES

Main long-lead equipment for NPP

- Lifting facilities, incl. polar crane
- Refueling
- Pressure Vessel with Assemblies
- Sealed air
- Main Coolant Pump
- Steam
- Instrumentation and control
- Turbine island equipment
- Pumping equipment
- Diesel generator unit

Other equipment

- Equipment for radioactive and waste handling
- Facilities to handle spent nuclear fuel
- Ventilation equipment
- Electrical equipment, cables and Instrumentation
- Cranes facilities
- Compressor equipment
- Vessels
- Heat exchangers equipment
- Valves

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PROCUREMENT PLANNING

PUBLICATION IN THE OFFICIAL WEB-SITE

- The order and timing of the publication of the approved annual procurement program (APP) and its correcting established by the Government of the Russian Federation and administrative documents CEO of State Corporation.

- Accommodation approved APP and information on changes made within 10 calendar days from the date of approval of APP or changes.

- You can be get acquainted with the approved APP on the JSC “Atomenergomash” website WWW.AEM-GROUP.RU (1), on the www site “Rosatom” WWW.ZAKUPKI.ROSATOM.RU (2), the official State website WWW.ZAKUPKI.GOV.RU (3)

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REQUIREMENTS FOR PARTICIPANTS OF THE PROCUREMENT, CONTRACTORS, MANUFACTURERS

For manufacturers of equipment related to the important safety elements of nuclear facilities 1, 2, 3 safety classes in accordance with the federal regulations and the use of atomic energy, including long-lead equipment, the customer makes the compulsive requirements in terms of availability experience and the current quality management system (management, quality assurance and control).

In the documentation for the procurement of the standard shall be indicated, which shall conform to the quality management system or should be set out the basic requirements for such a system.
# HANHIKIVI 1 NPP (FINLAND)
## REACTOR ISLAND PROCUREMENT SCHEDULE

<table>
<thead>
<tr>
<th>n°</th>
<th>Equipment item</th>
<th>IV Q 2017</th>
<th>I Q 2018</th>
<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bridge circular electric crane (polar crane)</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Reactor compartment trestle crane</td>
<td>★</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Reactor concrete vault equipment</strong> (Embedded parts of the reactor cavity, thermal insulation of the vessel cylindrical part, thermal insulation of the upper unit, retaining truss, supporting truss, air duct, thermal and biological protection of the nozzle areas, dividing bellow valve, dry protection, measuring channels)</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td><strong>Inspection cavity equipment and embedded parts:</strong> (mahnole, spacer, transportation platform for protective tube unit, internal shaft transportation device, upper block service platform, protective tube unit centralizer guide, internal shaft centralizer guide, protective tube unit centralizer guides, internal shaft centralizer guide, transition platform, upright stand service platform, racks for solenoid drive units, racks for drive housings, racks for position control sensors, racks for movers and extension shafts, spacer support, protective tube unit support, internal shaft support, upper unit support, platform, embedded parts)</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td><strong>Hydraulic shock–absorbers for reactor compartment equipment and pipeline</strong></td>
<td></td>
<td></td>
<td>★</td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Reactor multi–stud tensioner</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Steam Generator multi–stud tensioner</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
<td>★</td>
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</tbody>
</table>

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## AKKUYU NPP (TURKEY) AUXILIARY EQUIPMENT PROCUREMENT SCHEDULE

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<th>n°</th>
<th>Equipment item</th>
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<th>II Q 2018</th>
<th>III Q 2018</th>
<th>IV Q 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flat products 08X18H10T for the passive core flooding system tank shell</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Flat products 08X18H10T for the passive core flooding system tank body</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Blank bottoms 08X18H10T for the passive core flooding system tank</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>Transportation of the passive core flooding system tank</td>
<td></td>
<td></td>
<td>★</td>
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</table>
**ROOPPUR NPP (BANGLADESH)**

**PROCUREMENT SCHEDULE**

<table>
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<tr>
<th>n°</th>
<th>Equipment item</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Flat products 08X18H10T for the passive core flooding system tank body</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Blank bottoms 08X18H10T for the passive core flooding system tank</td>
<td></td>
<td>★</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Flat products 22K+08X18H10T for the emergency core cooling system</td>
<td></td>
<td></td>
<td>★</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Flat products 22K+08X18H10T for the emergency core cooling system shells</td>
<td></td>
<td></td>
<td></td>
<td>★</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Flat products 22K+08X18H10T for the emergency core cooling system bottoms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>★</td>
</tr>
</tbody>
</table>

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