Rosatom Engineering & Construction Division

Execution of Complex Engineering & Capital Projects: Nuclear New Build, Waste and Spent Fuel Management, Decommissioning of Nuclear Facilities

Dmitri Vysotski
Head of Strategy, NIAEP-ASE
Director, Global Strategy Integration, NUKEM Technologies
State Corporation “ROSATOM”

Nuclear Africa 2014 Congress

March 18-20, 2014
Midrand, South Africa
The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
NIAEP-ASE has a diversified business portfolio – nuclear and non-nuclear businesses

NIAEP-ASE GROUP

NPP Design, Engineering, Construction, Modernization

TPP Design, Engineering, Construction, Modernization

Waste & Spent Fuel Management, Decommissioning

SMR, Research Reactors & Scientific Centers

Oil, Gas & Petrochemical facilities

Project Management Consulting (PMC) Services

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn’t lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Businesses, competences and performance highlights

- Revenues - 2 billion USD, over 20% - non-nuclear business
- 30% of worldwide NPP construction market
- Over 20 units in simultaneous design and construction
- Offices in 15 countries, 7000 employees

- Full scope of services: EPC, EPC(m), PMC
- Innovative project management system – Multi-D: construction of complex facilities
- Catalogue of NPP Power Products – UNICEM: systematic global information base for suppliers
- Own Engineering Center, Multi-D and PM Education & Learning Center

### Table: Services Offered

<table>
<thead>
<tr>
<th>Construction</th>
<th>O&amp;M</th>
<th>Decommissioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project management</td>
<td>Technical project</td>
<td>Working documentation</td>
</tr>
</tbody>
</table>

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
**Key NIAEP-ASE / NUKEM projects worldwide**

<table>
<thead>
<tr>
<th>Country</th>
<th>NPP</th>
<th>Back-end projects (selected projects)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenia</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Belarus</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>China</td>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>Czech Republic</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>France</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Hungary</td>
<td>2</td>
<td>+</td>
</tr>
<tr>
<td>India</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Lithuania</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Romania</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Russia</td>
<td>6</td>
<td>+</td>
</tr>
<tr>
<td>Slovakia</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>South Africa</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Turkey</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Ukraine</td>
<td>2</td>
<td>+</td>
</tr>
</tbody>
</table>

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Recent NPP EPC projects

Russia, Rostov NPP, Unit 2
1000 MW, 2009

China, Tianwan NPP, Unit 1-2
2*1000 MW, 2006-2007

Iran, Busher NPP, Unit 1
1000 MW, 2011-2013

India, Kundankulam NPP, Units 1-2,
2*1000 MW, 2013 +

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to Rosatom and its affiliated companies. Rosatom disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Complex engineering and construction processes are managed by Multi-D technology of NIAEP-ASE

Multi-D is an innovative technology of construction management for a complex industrial object

- Visual modeling of construction works
- Development of organizational and technological documentation
- Verification of contractual construction schedule
- Creation of project documentation structure
- Management of equipment and materials delivery terms
- Estimation of construction project’s budget
- Verification of construction norms

- 3D Design
- 4D Materials
- 5D Schedule of Works
- 6D Labor force

- + 7D non-labor resources (machinery, equipment);
- + 8D - construction costs
- + 9D - ...

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
E-catalogue functional applications*

NIAEP-ASE
E-catalogue:
✓ engineering and design 3D models
✓ system of standards for the equipment information on equipment class and coding
✓ industry-based guidelines
✓ technical documents

Engineering Company
• Specifications
• Drawings and 3D- models
• Certificates, Licenses
• Financial documents

Equipment manufacturers
• Specifications
• Certificates, Licenses

Nuclear Plant Operator
• Operations manual
• Drawings
• Instructions
• Specs, so forth

* the E-catalogue can be found at www.eoncom.niaep.ru

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
PMC services are offered by NIAEP-ASE to support an owner in complex project implementation

NIAEP-ASE PMC services

1. Control and supervision of engineering activity on behalf of the owner (choice of technology solution, master plan, layout, selection of equipment and materials, etc.)

2. Manage communication between designer and manufacturer, approval of technical documentation for equipment

3. Assistance in efficient procurement and monitoring manufacturing and delivery

4. Proper monitoring of construction, erection and commissioning operations including: resource planning for construction operation; scope distribution between contractors; monitoring of construction progress; participating in planning and implementation of commissioning operations

5. Review and acceptance of the detailed design documentation with respect to design solutions, as well as cost estimates

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Opportunities and challenges in waste/spent fuel management and decommissioning market

**Priority country markets**

- UK
- Germany
- Japan
- Russia
- Eastern Europe
- France
- South Africa
- Italy
- China
- Others

**Global challenges & trends**

1. **Demand for service providers that can develop solutions**
   
   “No defined work packages, we need companies, who identify our problems and provide solutions”
   
   *Executive of a German nuclear utility*

2. **Adherence to timeframe & budget as the biggest challenge in decommissioning**
   
   "Clients require minimum lead time and assured delivery"
   
   *Executive of a equipment manufacturer*

3. **Teaming & local presence as prerequisites for success**
   
   "Market players need to work on their local presence"
   
   *Executive of NDA (UK)*

4. **Openness for international expertise**
   
   "Japanese know-how in decommissioning should be enhanced by incorporating overseas players' experience"
   
   *Executive of a Japanese nuclear utility*

---

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn’t lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Solutions for Waste/Spent Fuel Management and Decommissioning

NIAEP-ASE & NUKEM Technologies provide integrated offer in Back-end and Decommissioning
NIAEP-ASE / NUKEM's comprehensive offering of solutions for Waste and Spent Fuel Management: EPC, BFOO

**Kozloduy NPP, Bulgaria**
- Spent Fuel Storage
  - Turn-key construction of storage
  - Delivery of casks

**Ignalina NPP, Lithuania**
- Waste Treatment Center
  - Turn-key construction of waste treatment complex
  - for solid radioactive waste

---

**BFOO of facilities → providing customers with solutions – not just products or facilities!**

- **Build**
- **Finance**
- **Own**
- **Operate**

**SF Storage or Waste Management Company**

---

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Market insights of South Africa: demand for complex engineering projects in nuclear

Characteristics / Market insights

- Government commitment for **nuclear future** is strong
- Plans for installation of **9600 MWe**, ready for operating in 2024 ff.
- Construction of **PBMR** has been **cancelled**
- Programme for new build of **Dedicated Isotope Production Reactor (DIPR)**

Market framework

- Major segments: New build of NPPs, Waste and Spent Fuel handling
- Major players:
  - **ESKOM** as biggest energy supplier
  - **NECSA** operator of Safari-1 reactor, Vaalputs site, Safari-2 is expected

Key Nuclear Industry Segments:

**NPP New Build:**
- Significant CAPEX
- Re-birth of the Industry
- Largest country’s infrastructure initiative with positive impact on economy and social sphere

**Spent Fuel Handling:**
- Demand is urgent for solving Spent Fuel issues of existing NPP units;
- A facility can be planned to take care of new NPP units (**modular approach**)

SA Nuclear Industry has ambitious New Build Plans and also needs to solve issues with Spent Fuel and Nuclear Waste

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
NIAEP-ASE/NUKEM have a proven track record for activities in South Africa

- **PBMR (Pty) Ltd., Project Pelindaba, South Africa**
  - Basic and detail design of the fuel production processes
  - Detail design for the recycling of effluents and uranium resulting from scrap material
  - Professional services for the procurement support and supervision of construction and commissioning activities for the PBMR Fuel Plan
  - Local supply chain management

- **Delivery of Castor casks for ESKOM via former subsidiary GNB**

- **Framework contract with NECSA**
  - Waste package requirements for LLW / ILW
  - Information on drummed waste
  - Low Level Solid Waste conditioning options
  - Assessment of measures necessary for final disposal at Vaalputs

- **Memorandum of Understanding between NECSA, NIAEP-ASE, NIAEP-ASE**

- **Provision of “Technical Concept” for DIPR/SAFARI II within ROSATOM consortium with NIKIET and NIAEP-ASE**

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
Possible Areas for Cooperation in Complex Engineering & Capital Projects

1. EPC, EPC (m) within the Nuclear New Build

2. EPC, EPC (m) within the Non-nuclear

3. Project Management Consulting and Execution Support (Nuclear and Non-nuclear facilities)

4. Solutions for Waste and Spent Fuel Management, (EPC, and flexible BFOO approaches)

The content of this presentation is for discussion purposes only, shall not be considered as an offer and doesn't lead to any obligations to NIAEP-ASE and its affiliated companies. NIAEP-ASE disclaims all responsibility for any and all mistakes, quality and completeness of the information.
THANK YOU!

Dmitry Vysotski
Head of Strategy, ASE-NIAEP /
Director, Global Integration, NUKEM Technologies
e-mail: d.v.vysotskiy@atomstroyexport.ru
Dmitri.Vysotski@nukemtechnologies.de
tel.: +49-6023-1339