Your Partner for Nuclear Engineering Solutions
NUKEM Technologies GmbH
## Key Facts

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation of NUKEM</td>
<td>1960</td>
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<tr>
<td>Spin-off of NUKEM Technologies</td>
<td>2006</td>
</tr>
<tr>
<td>Employees*</td>
<td>approx. 270</td>
</tr>
<tr>
<td>Order Backlog in m €*</td>
<td>261.7</td>
</tr>
<tr>
<td>Main Activities</td>
<td>Waste Treatment, Spent Fuel Handling,</td>
</tr>
<tr>
<td></td>
<td>Decommissioning, Engineering &amp; Consulting</td>
</tr>
<tr>
<td>Location</td>
<td>Alzenau, Germany</td>
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<tr>
<td>Shareholder</td>
<td>ROSATOM (through JSC Atomstroyexport)</td>
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</tbody>
</table>

*As of December 2012
History - Experience

From the very beginning of the nuclear industry, NUKEM has been involved in

- own fuel element production facilities, plant design, workshops
- comprehensive, valuable R&D work
- complete spectrum of engineering/supplier services for customers for new build, operation, refurbishment, decommissioning

Waste Management since 50 years

- Research Facilities, Power Reactors, Reprocessing
- other Fuel Cycle Industries
NUKEM Technologies At A Glance

Core Competencies

- Waste Management
- Spent Fuel Management
- Decommissioning
- Engineering & Consulting
- HTR Fuel Technology

Customers

- Nuclear power plants
- Nuclear research centers
- Nuclear fuel cycle industry
- Governments / Ministries / Organizations

Key Markets

- Eastern Europe
- Western Europe
- South Africa
- Asia

Close to our Customers

- Headquarters in Alzenau, Germany
- Offices in
  - Russia / Ukraine
  - China
  - Lithuania / Bulgaria
  - France / Spain / Italy
  - Great Britain
Radioactive Waste Management

- From Concept Development to Turn-key Construction
- Radioactive Waste Treatment Technologies and Facilities for all types of waste generated in nuclear installations
- Monitoring Systems
Technologies for Radioactive Waste Management

- Evaporation
- Concentration
- Cementation
- Vitrification
- Nuclide separation
- Pyrolysis
- Pyrohydrolyse

- Biological treatment of waste water
- Sorting / segregation
- Compaction
- Incineration
- Radioactive waste monitoring systems
Reference Project Waste Management
Kursk NPP, Russia

- **Scope of Contract:** Turn-key design, delivery and commissioning of the process facilities for the new Kursk NPP waste treatment center, i.e.:
  - Acceptance and segregation of low and intermediate level solid radioactive waste
  - Decontamination of low and intermediate level radioactive metals
  - High-force compactor
  - Incineration facility
  - Pyrolysis facility for ion-exchange resins
  - Brine evaporator facility for secondary liquid waste
  - Cementation facility
  - Drum monitoring system and tracking system

- **Contract Value:** € 70 m
- **Project Duration:** 2012 - 2015
  - **Phase I:** Preparation of the planning documentation fit for approval for the technological equipment (2.3 m € in 2012)
Reference Project Waste Management
Ignalina NPP, Lithuania

- **Scope of contract:** Turn-key construction of a waste treatment center for solid radioactive waste
  - Retrieval and sorting / segregation facilities
  - Treatment facilities like cementation, high-force compaction, incineration
  - Storage facilities
- **Contract Value:** € 122.9 m, Ignalina International Support Fund (IIDSF); managed by EBRD
- **Duration:** 2005 - 2018
Reference Project Waste Management
Chernobyl NPP, Ukraine

- **Scope of contract:** Construction of facilities for the management of solid radioactive waste:
  - Retrieval facilities
  - Sorting/segregating plant
  - Various treatment facilities (incineration, high-force compaction, cementation)
  - Near surface disposal

- **Contract value:** € 47 m

- **Duration:** 2001 – 2009
  (With the handover to the customer in April 2009, NUKEM was the first western contractor to finish a waste treatment project at the Chernobyl location)
Reference Project Waste Management
Leningrad NPP, Russia

• **Scope of contract:** Engineering, procurement and supervision project for a waste treatment center for solid radioactive waste
  - Sorting and sizing of LLW
  - Sorting of ILW
  - Incinerator
  - High force compactor
  - Drum meter GME
• **Contract value:** € 21 m
• **Duration:** 2002 - 2011
Reference Project Waste Management
EU Research Center ISPRA, Italy

- **Scope of contracts**: Delivery of several systems
  - Monitoring system
  - Drum transfer system and
  - Abrasive blast unit
- **Contract value**: € 3.2 m (total)
- **Projects completion**: in 2006
Reference Project Waste Management
Rovno NPP, Ukraine

- **Scope of contracts**: design, delivery and commissioning of a high-force compactor and sorting facilities for radioactive waste
- **Contract value**: € 5.5 m (total)
- **Duration**: 2009 - 2014
Technologies – Spent Fuel Handling

- Comprehensive spectrum from concept study to delivery of Turn-key projects
- Different kind of storage technologies
  - Casks, together with our partner GNS
  - Vaults
  - Underground
- Handling facilities
- Technologies for characterization of spent fuel elements
  - Fuel assembly monitoring systems
  - Defect classification systems
- Systems for handling and preparation for storage of defect and heavily damaged spent fuel elements
- Successfully executed projects around the world
Reference Project Spent Fuel Handling
Kozloduy NPP, Bulgaria

- **Scope of contract:**
  - Turn-key construction of storage building for preparation, control, storage and monitoring of spent fuel elements
  - Delivery of 34 CONSTOR® casks for 84 VVER-440 spent fuel assemblies each
  - Contract amendment for storage extension

- **Contract value:** € 70.8 m
  - Consortium with GNS, led by NUKEM
  - Financed by the Kozloduy International Support Decommissioning Fund; managed by the EBRD

- **Duration:** 2004 – 2011

(The facility was opened by the Bulgarian Prime Minister in May 2011. The acceptance certificate was issued in October 2013.)
Reference Project Spent Fuel Handling
Ignalina NPP, Lithuania

• **Scope of contract:**
  - Design and construction of an Interim Spent Nuclear Fuel Storage Facility
  - Delivery of 190 CONSTOR® RBMK 1500/ M2 casks to store 17,000 fuel assemblies
  - Design and delivery of a System for handling of heavily damaged Fuel Elements

• **Contract value:** € 193 m
  - Joint venture partnership NUKEM and GNS
  - Financed by the Ignalina International Support Fund (IIDSF); managed by EBRD

• **Duration:** 2005 - 2015
Decommissioning

- From Concept Development to General Contractor Projects
- Segmentation Techniques
- Facility Upgrading
- Decontamination
- Site Characterization and Remediation
Technologies for Decommissioning Tasks

- **Segmentation techniques**
  - Underwater milling machines
  - Underwater shear and compaction
  - Manipulator systems
  - Water jet cutting
  - Flame cutting
  - Plasma-arc cutting
  - Mechanical cutting tools
  - Remote handling techniques

- **Decontamination techniques**
  - Mechanical decontamination
  - Chemical decontamination
Reference Project Decommissioning Brennilis, France

- **Scope of contract:** Dismantling of the Reactor Block
  - Reactor vessel, built-in units, biological shields and related systems
- **Consortium:** ONET Technologies Grand Projets and NUKEM
- **Contract value:** 76.8 € m
- **Duration:** 2008 - 2016
Reference Project Decommissioning Kahl NPP, Germany

- **Scope of contract:** Total responsibility for the decommissioning of Germany’s first nuclear power plant
  - Removal of the inner and outer reactor building concrete structure
  - Dismantling of contaminated systems
  - Removal of the steel-made reactor containment and free release
  - Dismantling of controlled area buildings of the plant
- **Contract value:** € 58.4 m
- **Duration:** 2001 - 2008
Reference Project Decommissioning Fuel Element Fabrication Hanau, Germany

- **Task:** Ground remediation of about 34,000 m²
  - All excavated ground material (concrete foundations, soil) was measured and separated
    - 200 to 300 ton / day
    - 90,000 tons in total (about 400 tons classified as radioactive waste)
- **Duration:** 2002 – 2005
Examples for Smaller Decommissioning Projects

- Research on the properties of zirconium alloy during the fragmentation, commissioned by the BMBF (Federal Ministry of Education and Research, Germany)
- Development of a waste management concept for the dismantling of the EnBW power plants
- Development of a waste management concept for the decommissioning of the RWE’s power plant Biblis
- Study on the restoration of the floating maintenance platform "Lepse"
Engineering & Consulting

- Process & Mechanical Design Solutions
- Waste Flow & Facility Optimization
- Radiation & Fire Protection
- Safety Assessment
- Instrumentation & Automatization
- Radiation Measurement Systems
- Technical Documentations
- Project Management Services
Engineering - Technologies

- Proven design for fuel plants for High Temperature Reactors
  - Identified as one of the key technologies for Generation IV reactor types
  - Based on own experience
- Various monitoring systems
  - Drum Radwaste Meter
  - Raymos (γ-ray monitoring system)
  - FAMOS (fuel element monitoring system)
  - FEMOS (fissile material monitoring system)
  - CAMOS (can monitoring system)
Reference Project Engineering
PBMR (Pty) Ltd., Project Pelindaba, South Africa

- **Scope of Contract:**
  - 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 Plant

- **Contract Value:** about € 51 m

- **Duration:** 2003 – 2009 (project was terminated due to financial restrictions of the South African Government)
Thanks for your attention!