



ROSATOM

STATE ATOMIC ENERGY CORPORATION "ROSATOM"

AKKUYU NGS AŞ

Akkuyu Nuclear Power Plant in Turkey: new options for suppliers

"Atomex-Europe 2013" Forum

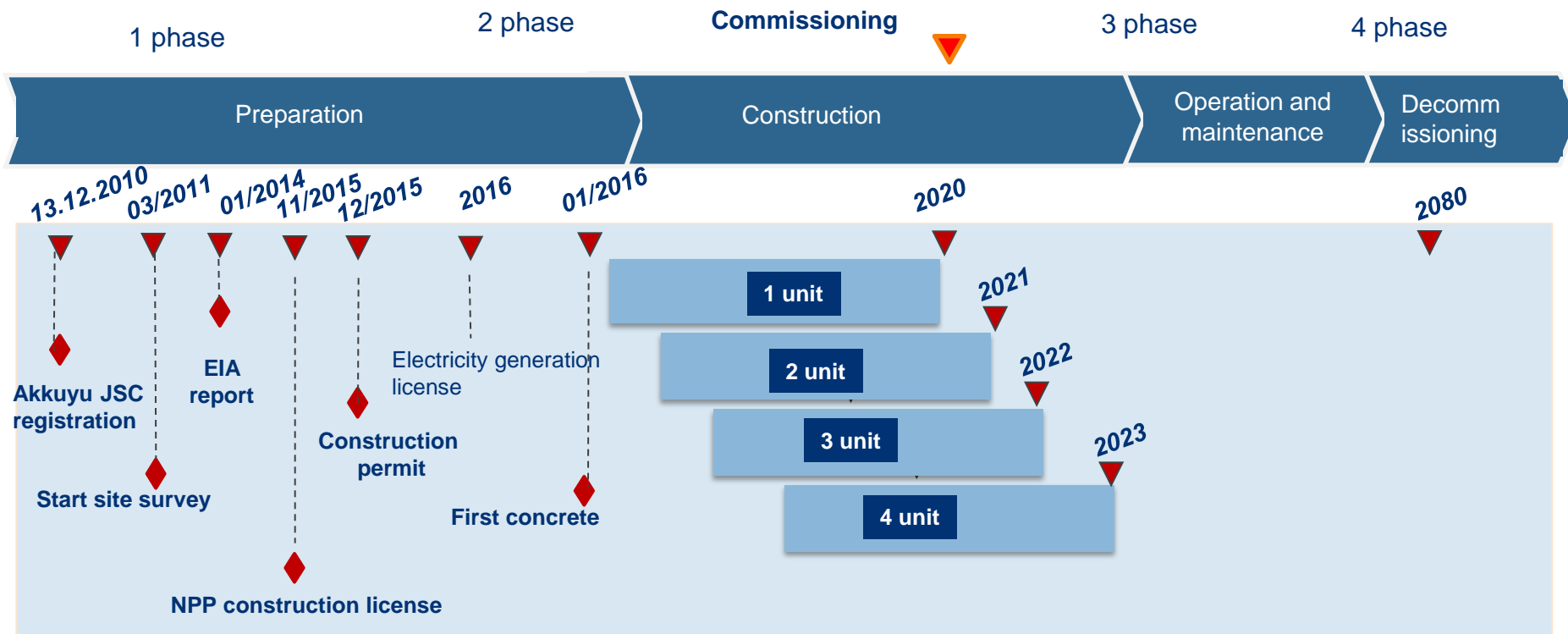
Oleg Titov
Akkuyu NPP NGS Executive Director



**Akkuyu NPP Power
Generation JSC**

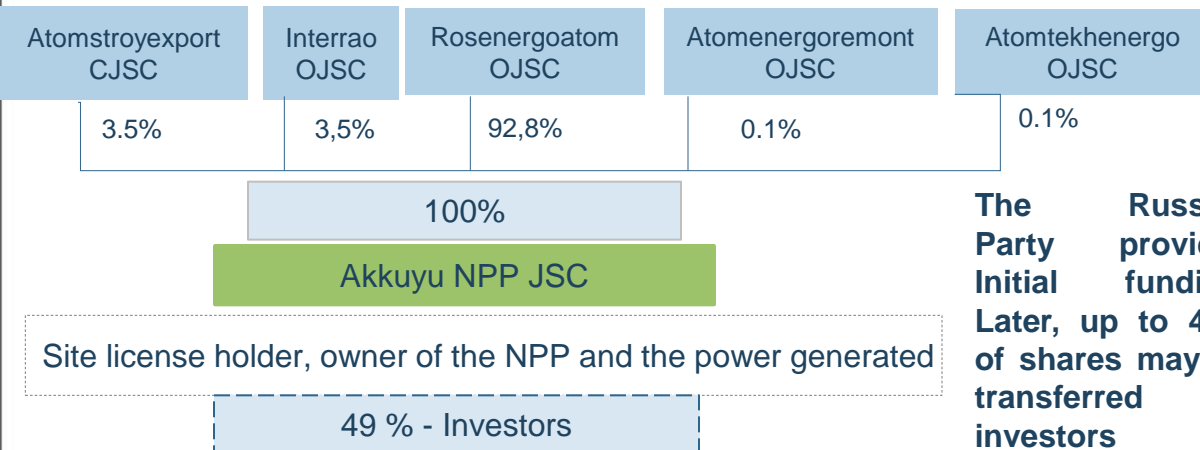
October 8-9, 2013
Brno, Czech Republic

Major Milestones of the Project



Project financial indicators and equity structure

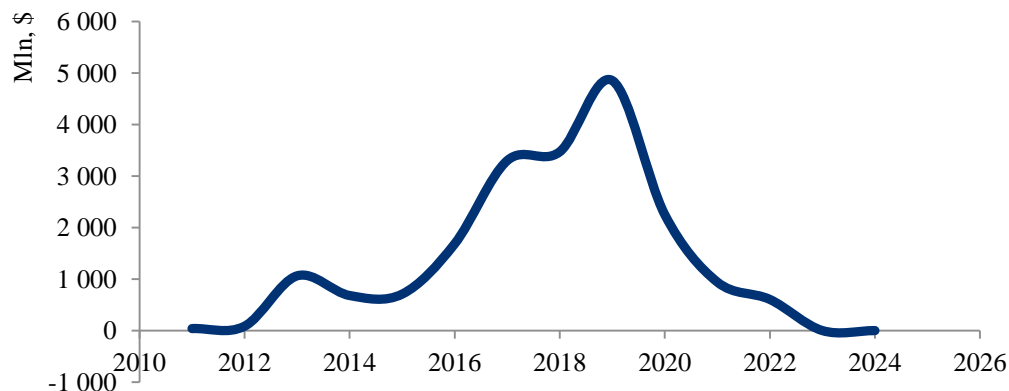
Akkuyu Equity Structure



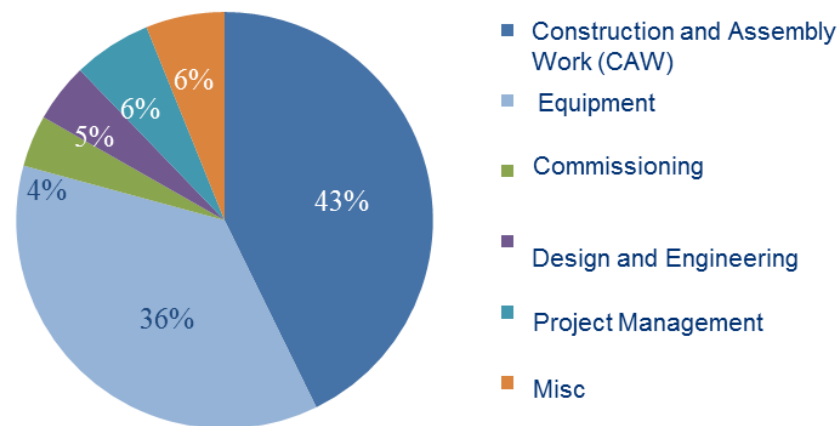
The Russian Party provides Initial funding. Later, up to 49% of shares may be transferred to investors

- Project execution period: 12 years total; 5 years from first concrete to Unit 1 commissioning
- Operational lifetime: 60 years
- Generation output : 35.2 bln. kWh/year (for four units)
- IRR > 10%
- Targeted D/E Ratio – 70/30
- CAPEX: estimated <= \$20 bln
- Payback period : 18 years
- Interest coverage ratio: 4,6
- 15 years PPA with TETAS; weighted average price 12,35 cent/kwh

Akkuyu CAPEX



Akkuyu CAPEX structure, %



Current status

- The Project Company has received the NPP construction site with effective site license
- Updated “Basic Site Selection Report” has been prepared and submitted to TAEK
- Engineering surveys have been completed for preparation of the Basic Design which enables to proceed with:
 - General layout plan
 - Hydro-technical facilities at site
 - Seismic conditions clarifications
- EIA Public Hearings have been held. The EIA Application Dossier and the EIA Report have been filed with the Ministry of Environment and City Planning. EIA Report is accepted as complying with required format. The Ministry and the public of TR started reviewing the Report.
- Started the open lime-pit/ quarry development. Stone-breaking works.
- Construction organization plan developed.
- Technical specifications (scope of work) for five design work packages of the preliminary construction period developed
- Power Generation License application has been prepared and filed.
- Consolidated report on “Reference NPP Selection Justification” has been developed and submitted to TAEK. Novovoronezh-2 NPP is approved as reference NPP.
- NPP Construction Preparatory Plan has been developed.
- Negotiations with TEIAS on power distribution scheme are in progress



EIA – Environmental impact assessment

TETAS – Turkish electricity wholesaler company

TEIAS – Turkish grid company and system operator

TAEK – Turkish nuclear regulating company

Plans for 2013-2014

- **Issuance to Project Company of the EIA Report Approval (expected by the end of 2013)**
- Engineering surveys for the “Detailed Design”
- Completion and approval of the zoning plan (planned by the end of 2013 after approval of EIA)
- Completion of the engineering design development, construction method statement
- Completion of specifications for equipment and materials
- Completion of Akkuyu site seismic hazard assessment consolidated report
- Completion of engineering of five design work packages for the preliminary construction period by the end 2013.:
 - Water supply pipeline
 - Site road infrastructure
 - Modular-erection facilities
 - Temporary accommodation village for construction period
 - Temporary sea jetty (West side)
- Signing EPC Contract with General Contractor (Atomstroyexport) by Dec 2013
- Completion of negotiations with TETAS on Power Purchase Agreement (PPA)
- Updated “Basic Site Selection Report” to be approved by TAEK



Plans for 2013-2014

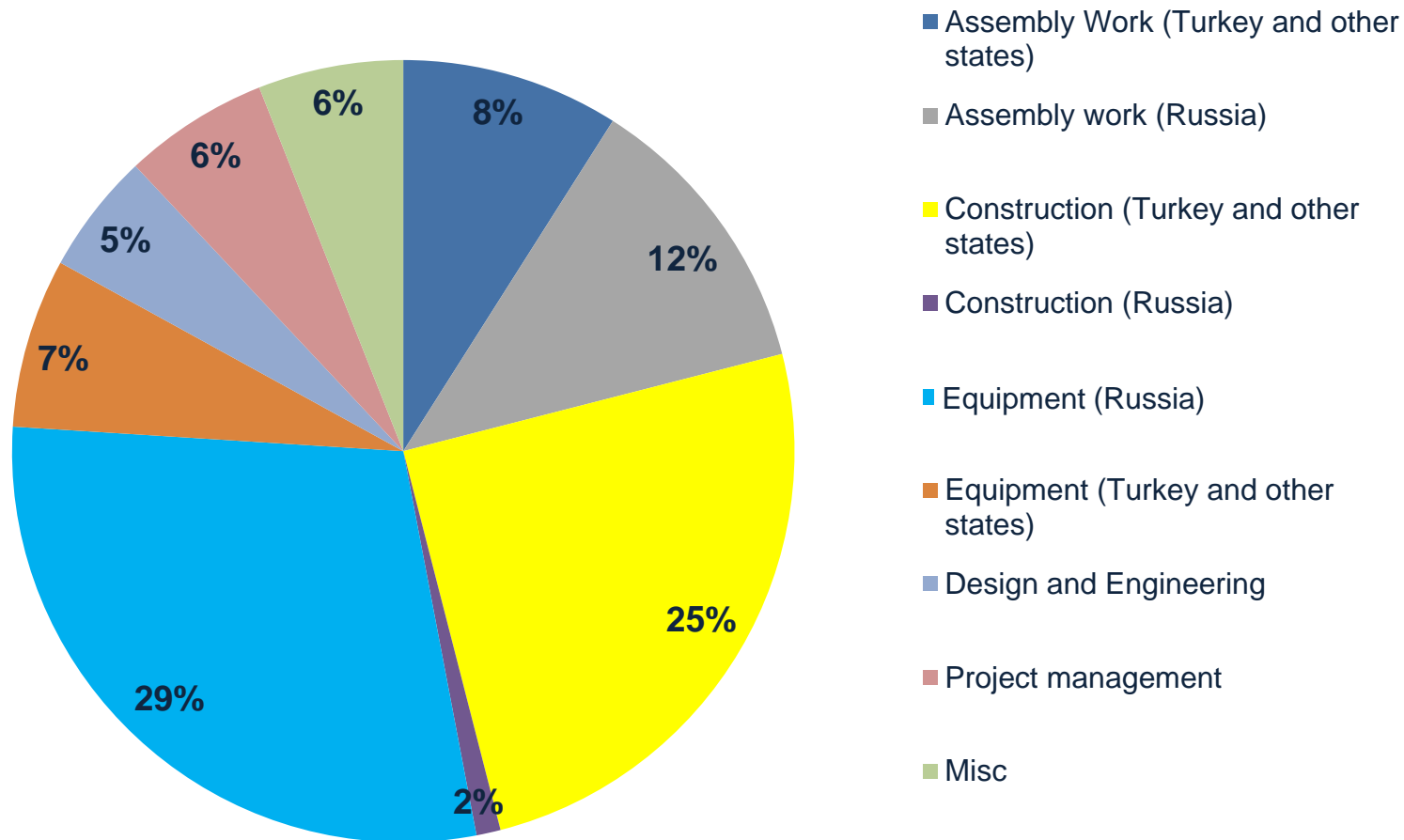
- “Site Parameters Report” development and submission to TAEK.
- Filing documents for obtaining limited construction license and submitting to TAEK
- Work with TAEK in the WGs for organization of Project licensing and permitting activities on Turkey territory (by mid. 2014)
- Performance of the engineering surveys for detailed design phase
- Tender for the Owner’s Engineer services (tender starts in October 2013)
- **Tender for long-lead equipment (planned by the end of 2013)**
- Approval of power distribution scheme and NPP grid connection to Turkey energy system

When EIA is in place - with special construction permits - the civil construction (site leveling) starts (other than NPP itself)



Equipment and services estimated cost breakdown

Opportunity for the international companies to participate in Akkuyu NPP construction



Preliminary equipment cost breakdown

Opportunity for the international companies to participate in Akkuyu NPP construction

Equipment supply

1 Russia's supply

2 Equipment + funding
(Export Credit Agencies support)

Investment/ shareholding +
equipment

3 Competitive tender

2 Equipment supply and ensuring financing

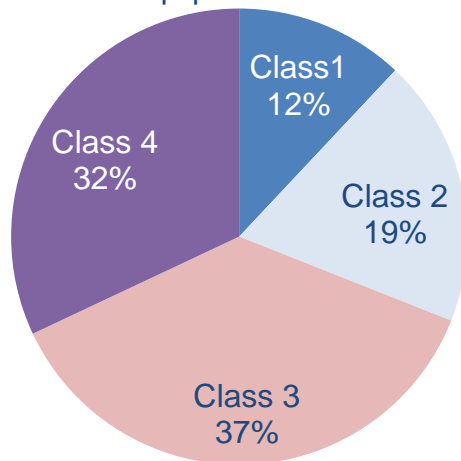
Equipment supply supported by the Czech Government loans. Participation of EGAP, the Czech Republic export credit insurance agency.

In 2011 23% of EGAP insurance coverage – for export to Turkey (2nd country in terms of amount of export credits insured – after Russia), mostly energy equipment. B 2000-2003 EGAP already provided insurance coverage for thermal power construction in Turkey (4x360 MW), supplier - Škodaexport, insured export – 6,2 bln. CZK

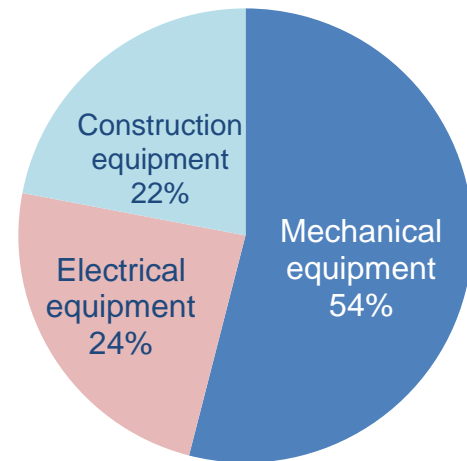
Funding conditions:

- up to 85% of the contract sum
- up to 100% of the insurance premium

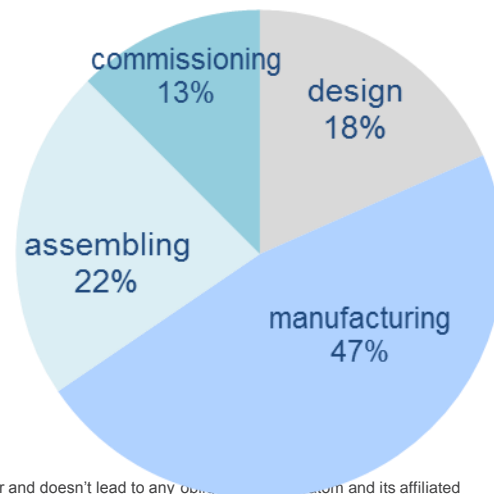
Equipment cost breakdown by class of equipment



Equipment cost breakdown by type of equipment

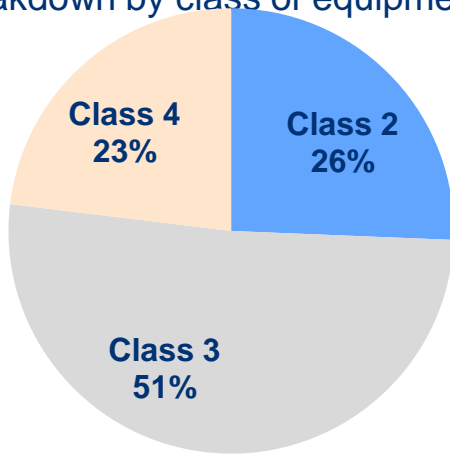


Equipment cost breakdown by type of work

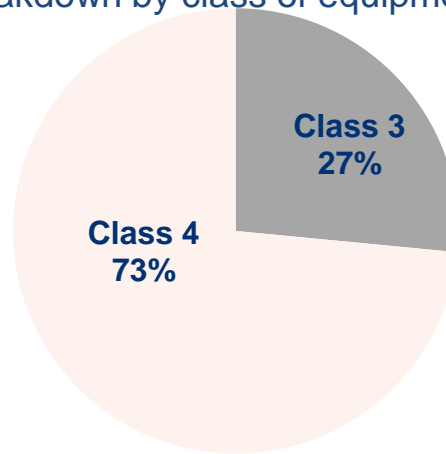


Preliminary equipment cost breakdown

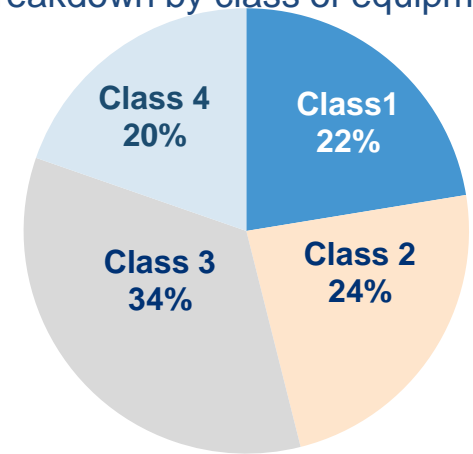
Electrical equipment cost breakdown by class of equipment



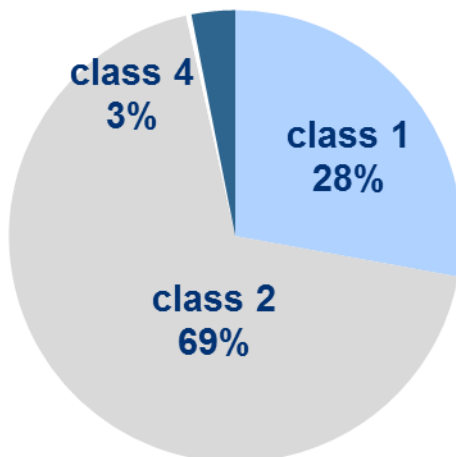
Construction equipment cost breakdown by class of equipment



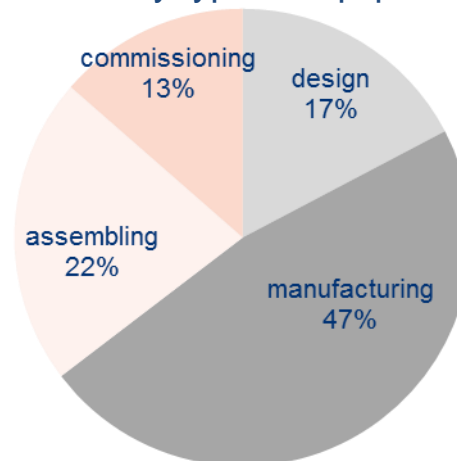
Mechanical equipment cost breakdown by class of equipment



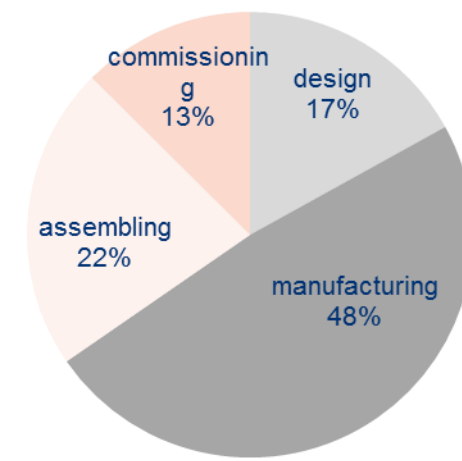
Long-lead equipment cost breakdown



Mechanical equipment cost breakdown by type of equipment



Electrical equipment cost breakdown by type of equipment



Russia's supply (preliminary)

- **Nuclear steam generating plant (NSSS)**
- **Equipment of turbine hall**
 - Turbine condenser
 - Moisture separator-reheater
 - Condensate pumps
 - Set of low-pressure heaters
 - Deaerator
 - Feed pumps
 - Set of high-pressure heaters
 - System water heaters
 - Circulation pumps
 - Process water supply pumps
 - Main steam valve unit
 - Pipes of main steam system (LBA)
- **Instrumentation and control system**
 - System for collecting, processing and reporting of data from radiation monitoring system
 - Automated personal dosimetry system (APDS)
 - Automated radiation monitoring system (ARMS)
 - Automated radiation monitoring system for prevention of contamination spreading (ARMS PCS)
 - Hardware and software of the systems for comprehensive analysis and information support for operator
 - Hardware and software of the comprehensive diagnostic system
- **Equipment for fresh nuclear fuel handling**
 - Devices for storing fresh fuel assemblies
 - Fuel pool equipment
 - Pool lining leakage monitoring system
 - Fuel pool cooling system
 - Water purification system for fuel pool and boron water storage tanks
 - Fuel elements tightness control system
 - Pipeline system for media supply to casings of defective fuel assemblies detection system
 - Defective fuel assemblies detection system
 - Equipment for repair of fuel assemblies and other elements of the core
- **Equipment for spent nuclear fuel management**
 - Equipment of chamber for cutting spent fuel assemblies
 - Console crane
 - Platform
 - Rope trolley
 - Lifting device with turnover device
 - Milling and cutting machine
 - Packaging for separated SFA
 - Ampoules for bundles of fuel elements (including substandard ones)
 - Containers (storage packaging UKH, metal-concrete container MBK)
 - Specialized technological equipment of cutting department (traverse-turner, protective damping casing for MBK, etc.)

Opportunities for other suppliers (preliminary)

Equipment of turbine hall

- Steam turbine
- Generator
- BRU-K valve kit (turbine bypass)
- Condenser vacuum pumps
- Ball cleaning system
- Pipes and pipe fittings (intraturbine)
- Electrical equipment
- Control and measuring instruments and equipment for secondary systems of turbine and generator
- Cable connections between IACS included in the Supplier's scope of supply and local junction boxes
- Spring assemblies of shock absorbers of the upper foundation slab
- Generator Circuit Breaker set
- Closed bus duct (10 kV)
- Isolated phase bus duct (24 kV)
- Transformer
- Turbine hall crane

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Electrical equipment

- Gas-insulated switchgear assembly
- Busbar system of switchgear
- Modular flexible connection
- Lines, conductors
- Other elements of switchgear and control gear
- Coupling autotransformer
- Switchgears for voltage 0.23 - 10 kV
- Transformers 330/10.5-10.5 ... 6/0.4-0.23 kV
- Distribution assemblies, AC voltage stabilizers of lighting system
- Inverters, uninterrupted power supply units
- Batteries, battery chargers
- DC boards

Instrumentation and control system

- Communication and alarm systems
- Plantwide telephone communication system
- Public address and telephone system
- Personnel warning and search system
- Fire protection monitoring and control system, including fire alarm (FP MCS)
- Master clock system
- Wired broadcasting system
- Video surveillance system of the main technological equipment
- Trunked radio system
- TV broadcast system
- System of operational cordless phones
- System for operating communications logging
- Physical protection system
- Information collection and processing system
- Public address system
- Access control and alarm system
- Closed-circuit television system (CCTV)
- Direct telephone connection system
- Security lighting system
- Hazmat detection system (metal, explosive, nuclear, radioactive)
- Operational radio communication system
- Electrical power supply system
- Information security system
- Cable conduit system

Opportunities for other suppliers (preliminary)

Diesel generator units (DGUs)

- Diesel generator units
- DGU for emergency power supply 6.3 MW
- DGU for normal operation 6.3 MW
- DGU for physical protection system 0.5 - 1.0 MW

Ancillary equipment of NPP unit

Pumping equipment

- Technical water supply pumps
- Intermediate circuit pumps
- Primary circuit feed pumps
- Pumps for emergency and planned shutdown cooling of the primary circuit
- Pumps of SNF pool circulating and cooling system
- Pumps of emergency boron injection system
- Chemical pumps
- Pumps for hydraulic tests of steam generators, primary circuit piping, ECCS tanks
- SG blowdown water pumps
- Tight pumps
- Metering pumps
- Artesian well pumps

Equipment of unit-pump stations (UPS)

- Cooling tower with a set of process equipment
- Hydraulic equipment of UPS (machine with rotating grids, of intake screens, etc.)

Other tank equipment (outside NSGP or turbine hall)

- Tanks 0.09 - 390 m3
- Balance tanks
- Receivers
- Expansion tanks
- Holding tanks
- Trays
- Hydraulic locks
- Devices with a stirrer
- Gauging tanks

Ventilation equipment

- Forced-draft fans
- Axial fans
- Centrifugal roof fans
- Air conditioners (central, autonomous)
- Ventilation fittings
- Ventilation network elements
- Air filters with special properties
- Devices for ventilation channel closure
- Equipment for coarse particles removal from the air
- Aerosol filters

Filtering equipment

- Water treatment filters
- Special water treatment filters
- Filter-adsorber
- Filter-absorber
- Mixed bed filter
- Filter trap
- Zeolite filter
- Self-cleaning filter
- Cation filter

Heat-exchange equipment

- Plate heat exchangers
- Shell-tube heat exchangers
- Condenser-degasser
- Heaters

Metal products of carbon steel, stainless steel, non-ferrous metals and alloys

- Sheet metal
- Metal profiles
- Shaped metal
- Pipes
- Forgings, stampings
- Hardware products
- Welding consumables

Opportunities for other suppliers (preliminary)

Cables and wires

Cable 220 kV

Cable 6.10 kV

Test cable

Control cable

Power cable

Radio-frequency cable

Special cable:

– Non-flammable cable,
flame retardant cable;

– Cable with smoke
emission;

– Cable with low
halogen content

Wire

Pipeline accessories

High-speed pressure reducing installations,
pressure reducing and cooling installations

Safety valves

Control valves, throttling control valves

Bellows-off valves

Gate valves

Shut-down swing gates

Check gates and check valves

Cranage

Electric overhead traveling crane, lift.cap. 180-
200 t

Crane of fresh fuel storage lift. cap.50 t

Set of cranes of equipment reception areas, lift.
cap.30-100 t

Set of auxiliary cranes of the reactor and auxiliary
reactor compartments lift. cap.5-30 t

Set of auxiliary cranes of turbine hall, lift. cap.5-
75 t

Set of cranes of other buildings, lift. cap.5-30 t

Set of cranes of open areas (gantry cranes) lift.
cap.5-30 t

Other cranes, lift. cap. 1-3 t

Electric hoists lift. cap.0.5-3.2 t

Test equipment for cranes (hydro loaders)

Compressor equipment

Compressors

Purification and air drying units

Equipment for radioactive waste (RW) management

- Evaporators for concentration of RW with high and intermediate level activity
- Incinerators
- RW incinerators
- Incinerator for liquid flammable RW
- Installation for regeneration and incineration of liquid RW
- Installation for cementing of liquid and solid RW
- Installation for sorting, crushing and pressing solid RW
- Transport and processing equipment for RW management

Thank You for Attention!

Oleg Titov

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