

KOZLODUY NPP EAD Kozloduy

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Call for market consultation No. 53048 with the following subject matter: “Design, procurement and commissioning of dry cask system for storage and transportation of spent nuclear fuel from WWER-1000 reactors”

Kozloduy NPP EAD hereby informs all interested parties that in connection with the preparation for awarding a public procurement and determining an estimate value, on the grounds of Article 44 of the Public Procurement Act, collects indicative proposals for “Design, procurement and commissioning of dry cask system for storage and transportation of spent nuclear fuel from WWER-1000 reactors”.

The proposals shall include:

1. Total cost and price for the implementation of each stage, as per Attachment 1 – Terms of Reference No. 22.XOΓ.T3.53/01;
2. Information on the equipment manufacturer;
3. Information about service implementation deadlines;
4. Exact address and contact person, telephone, fax, e-mail, website.

Inquiries regarding the market consultations may be made by 23.02.2024 at the following e-mail: commercial@npp.bg and the clarifications shall be published in the Buyer’s profile - Commercial Activities/Public Procurements/Market Consultations Section.

Deadline for the receipt of the indicative proposals: 01.03.2024 at the following e-mail address: commercial@npp.bg.

The indicative proposals and any other information exchanged during the market consultations held shall be published in the Buyer’s profile - Commercial Activities/Public Procurements/Market Consultations Section.

By submitting an indicative proposal, each participant in the market consultations agrees that the proposal and any other information provided as a result of the market consultations shall be made available to the public in the Buyer’s profile.

The Contracting Authority retains the rights to use indicative proposals received in the course of market consultations for awarding public procurements up to the value thresholds of Article 20, para. 4 of the PPA.

Any further information may be obtained from Violetka Dimitrova, Head of Contracts Department, Commercial Division, telephone: +359 973 7 3977

Enclosures:

1. Terms of Reference No. 22.XOΓ.T3.53/01.

TERMS OF REFERENCE

No. 22.XOF.T3.53/01

For design and construction and/or design, procurement, installation, and commissioning

SUBJECT: Design, procurement, installation and commissioning of a cask system for dry storage and transportation of spent nuclear fuel from VVER-1000 reactors.

These Terms of Reference (ToR) contain a technical specification in accordance with the Public Procurement Act.

1. Summary of the Terms of Reference

1.1. Subject of these Terms of Reference is to stipulate the conditions and requirements of design, procurement, installation and commissioning of a dry cask system (36 casks) for storage and transport of spent nuclear fuel (SNF) from VVER-1000 reactors. A project for dry storage of spent nuclear fuel from VVER 440 reactors has been implemented at Kozloduy NPP.

1.2. The scope of the Terms of Reference covers the following:

- Design of a metallic dual-purpose cask for transport and storage of SNF;
- Design of handling and transport equipment and facilities;
- Preparation of safety analyses for normal operation and emergencies;
- Preparation of operating instructions;
- Supply of SNF casks and equipment;
- Installation and commissioning;
- Training;

Project implementation stages:

- Preparation and acceptance of the project, analyses and operating instructions by Kozloduy NPP EAD and their approval by the NRA;
- Manufacture and factory testing of casks and equipment;
- Initial delivery and installation of casks and equipment. Receiving inspection;
- Start-up operations and staff training;
- Phased delivery of casks.

The casks shall be stored in the Dry Spent Fuel Storage Facility (DSFSF) of Kozloduy NPP EAD.

1.3. Cask parameters shall ensure long-term (at least 50 years) safe dry storage and transportation of SNF with an option for extension of this period. The Contractor shall review and analyse the conditions and parameters of the implemented project for storage, loading, preparation for storage and transportation SNF from VVER-440 reactors. The cask transport routes and loading and unloading locations shall also be inspected in order to adapt the new project to the existing constraints and conditions.

Taking into account the dual purpose of the cask – transport and storage, the closure system (cask lids) shall be bolted. The cask shall be equipped with at least 2 airtight lids, and the space between them shall be filled with helium. A system shall be provided to continuously measure and monitor the pressure and leaks between the two lids to ensure leaktightness and prevent the spread of radioactive substances into the environment. Considering the global and domestic experience, the cask basket shall accommodate at least 19 leaktight fuel assemblies, and the total capacity of the cask shall be at least 20 kW.

1.4. The project shall cover:

- Design of the cask and related equipment and activities considering the parameters of the SNF subject to dry storage; The generated SNF which is to be stored has the following parameters:
 - Fuel rod initial enrichment of up to 5%wt 235U;
 - Average assembly burnup of up to 62.6 MWd/kgU;
 - Heavy metal content of up to 484 kg;
- Design of the handling equipment;
- Instructions for the activities related to transport, cask loading, storage preparation, storage, unloading (fuel retrieval), inspections, monitoring; Nuclear safety analyses (ensuring main safety functions – subcriticality, residual heat removal, containment of radioactive products within the physical barriers) and radiation protection during transport and storage;
- Design of systems for cask parameter monitoring during storage, radiological release monitoring, and leaktightness monitoring;
- Design documentation of the casks and equipment;
- Justification of the cask and equipment classification/qualification, required for the Safety Analysis Report (SAR);
- Analyses of the impact of the used cask storage system on the environment and the public;
- Preparation of the relevant licensing documents in respect of this project;

1.5. The delivery shall cover:

- Initial delivery of casks and equipment;
- Installation and commissioning of casks and equipment;
- Delivery, installation and commissioning of systems for cask parameter monitoring during storage, radiological release monitoring, and leaktightness monitoring.
- Phased delivery of casks.

1.6. Personnel training (theoretical and practical) on cask handling, treatment, and monitoring.

1.7. The Project shall:

- Consider all the existing conditions and constraints – site, buildings, lifting and transportation equipment.
- Reflect the provisions of the existing Environmental Impact Assessment Report (EIAR). The casks shall be equipped with sufficiently reliable barriers against the spread of radioactive substances into the environment. Cask leaktightness shall be ensured based on continuous monitoring. Containment of radioactive substances shall be ensured;
- Determine the capacity of the DSFSF (number of casks) if both storage technologies (VVER-440 and VVER-1000) are combined;
- The characteristics of the cask system shall meet the general and specific requirements for SNF dry storage and transportation as stipulated in the regulations as well as the safety requirements during normal operation and design basis accidents. The design shall employ the conservative approach principle.

1.8. The activities under this ToR shall be completed in 3,870 calendar days:

Submittal of input data - 40 calendar days (10 days to request and 30 days to provide the data);

Design and acceptance without remarks by the Expert Technical Council – 730 calendar days;
Approval by the NRA and initial delivery of casks (4 pcs.) – 730 days.

Personnel training and adjustments – 180 calendar days from equipment receipt. Subsequent cask delivery frequency – at least 6 casks per 360 calendar days (32 pcs. for a period of 2,190 calendar days, until reaching the total of 36 casks).

1.9. The Contractor shall determine the SNF storage capacity in the following cases:

- 1) Storage in the existing DSFSF – Stage IA (e.g. 36 casks with parameters comparable to the available CONSTOR 440/84 casks and in the presence of CONSTOR 440/84 casks during Stage I);
- 2) Stage I plus Stage IA (without CONSTOR 440/84 casks during Stage I). The Project shall ensure maximum space utilisation in the SNF storage facilities.

1.10. The Contractor shall provide engineering and technical assistance and consultancy services to Kozloduy NPP EAD in the preparation of documents based on the prepared project and analyses until the licensing process is completed (SNF management activities require licensing by the NRA).

2. Requirements to the Project

Basis for Project initiation.

To ensure trouble-free operation of Units 5 and 6 of Kozloduy NPP EAD in terms of SNF management, it is necessary to provide enough space for storage in the Spent Fuel Pools (SFPs) as well as in the Spent Fuel Storage Facility (SFSF).

For that purpose, a proper cask shall be provided (in conjunction with the required technology, equipment and activities) for dry storage of SNF from VVER-1000 reactors, complying with the requirements for dry storage and transportation and the capability for disposition in the DSFSF.

Cask parameters shall ensure long-term (at least 50 years) safe dry storage and transportation of SNF with an option for extension of this period.

The criteria for selection of casks for dry storage and transport and the relevant activities shall consider the constraints resulting from the conditions in the Wet Spent Fuel Storage Facility (WSFSF) and Dry Spent Fuel Storage Facility (DSFSF).

The Dry Spent Fuel Storage Facility (DSFSF) is a separate independent facility at the site of Kozloduy NPP EAD designed to ensure safe storage of spent nuclear fuel (SNF). The implemented project for storage represents a cask system with natural air convection cooling. The DSFSF building ensures the physical protection and protection against natural impacts of the SNF storage casks, equipment, personnel and transportation and storage activities. For that purpose, the DSFSF is equipped with the relevant lifting and transportation equipment.

Requirements to the Project.

The SNF Management Project shall provide for the long-term storage of fuel assemblies from VVER - 1000 reactors in dry storage casks (with natural air convection cooling) and transport, taking into account the existing conditions in the WSFSF and DSFSF of Kozloduy NPP EAD and in compliance with the regulatory requirements and international standards, the conditions of the license for storage of CONSTOR-440/84 casks and operational storage conditions.

The Project shall:

- Consider the existing condition and allow for possible future extension of the DSFSF;
- Consider the operating experience of similar Dry Spent Fuel Storage Facilities.
- Provide for storage of both cask types in the DSFSF – CONSTOR 440/84 and the newly designed one for VVER-1000.
- Provide for compatibility between the new and existing equipment during handling operations.
- Adapt the cask system to the technologies available on the market;
- Take into account the existing limits of the main parameters, criteria and requirements to the long-term safe storage of SNF from VVER-1000 reactors.
- Ensure stability of the casks when placed in the DSFSF; The casks shall be designed to retain their design position in the event of a design-basis earthquake;
- Upgrade the existing project for SNF storage from VVER-400 reactors in terms of loading and preparation for storage (the activities are performed in the WSFSF).
- Include provisions related to radiation protection, radiological monitoring and emergency planning.

The provisions guaranteeing nuclear safety during SNF management shall ensure as a result of the basic safety functions:

- Subcriticality;

- Residual heat removal;
- Containment of radioactive products within physical barriers. The casks shall demonstrate the following safety functions and operational characteristics:
 - Safe storage of SNF in shielded, sealed, robust and accident tolerant casks, which can be easily inspected, handled and transported;
 - Radioactive materials shall be hermetically sealed. There shall be no release of radioactive materials (“zero release” concept) even after low probability events;
 - A list of initiating events for safety analysis shall be prepared, considering the site-specific natural phenomena and probability of internal and external events as well as combination of events;
 - The decay heat shall be transferred by conduction and radiation from the fuel rods to the cask surface, and from the surface by natural air convection. No active systems for decay heat dissipation shall be used during normal operation and emergency situations;
 - Fuel rod cladding integrity shall be ensured by maintaining inert gas medium inside the cask. Even after long-term storage, the condition of fuel the assemblies shall allow for safe retrieval and transport. Cask leaktightness during storage shall be ensured by continuous monitoring of cask integrity, temperature, leaks, and radiological parameters;
 - The codes used for temperature analysis shall be experimentally validated and approved;
 - The design and disposition of the SNF assemblies in the basket shall ensure their subcriticality even in the event of an emergency;
 - When designing the casks and materials used in them, the safety related functions, both for long-term storage and for emergencies, shall be performed;
 - No secondary waste shall be generated from the casks during the long-term storage;
 - Protective shielding shall protect the personnel during normal operation and emergencies;
 - Multiple barriers (at least 2) shall be provided to prevent radioactive releases to the environment;
 - Damage to safety-related components resulting from failure in adjacent, non-safety-related equipment shall be prevented;
 - Maintenance activities shall be designed in accordance with the ALARA principle.

Project implementation stages:

- Preparation and acceptance of the project, analyses and operating instructions by Kozloduy NPP EAD and their approval by the NRA;
- Manufacture and factory testing of casks and equipment; Initial delivery and installation of casks and equipment. Receiving inspection; Start-up operations and staff training;
- Phased delivery of casks.

2.1. Requirements to the individual parts of the Project

Concerning the implemented project and its upgrade for storage of SNF from VVER-1000 reactors:

- Assess the condition of existing buildings and facilities in terms of handling, transport and storage of SNF;
- Assess the existing transport and handling equipment (refuelling machine, cranes, lifting beams, vehicles, up-ender, shock absorber, ...);

- Assess the activities related to cask loading, preparation for storage and/or transport, sealing, handling and transport;
- Assess the activities related to the unloading of SNF from the casks;
- Analyse the requirements and constraints arising from the licence conditions and EIA Report and adapt the Project to those requirements;
- Analyse the operating requirements during normal operation and emergencies (operating parameters during storage);
- Provide for the constraints arising from radiation protection requirements;
- Assess the storage capacity – number of casks stored in the DSFSF;
- Justify the need to amend and/or supplement the design of the WSFSF and DSFSF as well as the SAR and prepare the relevant analyses and parts of the SAR.

Concerning the cask for dry storage and transport:

- Cask intended purpose – double use (storage and transport), ensuring all safety functions and criteria for normal operation and emergencies;
- Type, model, design, components ...;
- Materials, dimensions, weight (specifications and properties, where applicable);
- Type of spent nuclear fuel and fuel assemblies, parameters and characteristics;
- Number of fuel assemblies – non-leakers and leakers loaded into the cask;
- Loading SNF into the casks – activities, location, duration;
- Critical conditions/limits;
- Storage period (at least 50 years with an option for extension);
- Technology and cask preparation for storage – closure, bolts, medium, sealing;
- Radiological parameters and releases to the environment, shielding, contamination monitoring;
- Heat parameters and analyses;
- Nuclear safety provisions, subcriticality analyses;
- Capability to safely retrieve (unload) the fuel;
- Shock absorbers/dampers for handling and transport, if required;
- Types of tests and impacts (for normal operation and emergencies during storage and transportation), types of loads and combinations of loads;
- Test methods (experimental, computational, mathematical models and codes);
- Periodic inspection during storage, criteria, measures;
- Medium conditions and effects during storage;
- Operating conditions, leaktightness monitoring, technological and radiological characteristics, measurement and control during storage;
- Safety analyses required for all cask handling activities during transport and storage;
- Analyses required for the licensing of the DSFSF and WSFSF by the NRA for handling and storage of SNF.
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Concerning the transport and handling activities:

- Loading/unloading of SNF in the WSFSF, placement location, activities;
- Existing equipment and facilities which can be used with the selected cask;
- Additional equipment and facilities required;
- Existing and required vehicles for on-site transportation (WSFSF-DSFSF);
- Cask unloading activities;
- Cask handling and lifting in the WSFSF;
- Cask preparation for storage and transport, sealing, provision of inert medium and leaktightness;
- Protection against radiological contamination (if applicable);
- Measures ensuring nuclear and radiation safety when performing activities with the cask in the WSFSF;
- Activities during cask transfer from the WSFSF to the DSFSF;
- Cask handling and transport in the DSFSF;
- Equipment maintenance – procedures, spare parts, schedules;
- Handling, monitoring and inspection platforms shall be provided at the loading and storage areas.

Concerning the casks and transport and handling equipment, the design is a single phase – detailed design phase.

The project parts contain an explanatory note, computational note and graphics (drawings) with their specifications. The relevant requirements are specified in Clause 2.3.

2.2. The technology-related project parts are as follows:

2.2.1 Architectural Part

Irrelevant.

2.2.2 Structural Part

Irrelevant.

2.2.3 Electrical Part

Irrelevant.

2.2.4 I&C Part

In respect of cask process parameter monitoring, the Project shall cover the monitoring systems and relevant requirements.

The scope of documents that shall be prepared is stipulated in Chapter 11 of Regulation No. 4 on the Investment Projects' Scope and Content.

2.2.5 WSS (Water-Supply and Sewerage) Part

Irrelevant.

2.2.6 HSHVAC (Heat Supply, Heating, Ventilation, and Air-Conditioning) Part

Irrelevant.

2.2.7 Energy Efficiency Part

Irrelevant.

2.2.8 Geodetic Surveying Part (layout plan and vertical levelling)

Irrelevant.

2.2.9 Engineering Part

The Project shall cover the requirements for mechanical equipment, reflecting the intended use, activity specifics, operating conditions and lifetime.

The documentation shall be in accordance with Chapter 17, Sections I, II and III of Regulation No. 4 of 21 May 2001 on the Investment Projects' Scope and Content. The Engineering part shall also cover the preparation of mechanical design drawings of non-standard and non-catalogue components which are to form a separate independent section – “Mechanical design of non-standard equipment”.

2.2.10 Traffic Organisation and Safety Part

Irrelevant.

2.2.11 FS (Fire Safety) Part

Irrelevant.

2.2.12 SHP (Safety and Health Plan) Part

Irrelevant.

2.2.13 Construction Waste Management Plan Part

Irrelevant.

2.2.14 Radiation Protection Part

The requirements in this part of the Project shall be in accordance with the Regulation on Ensuring the Safety of Nuclear Power Plants, Regulation on Radiation Protection and Regulation on Ensuring Safety in the Management of Spent Nuclear Fuel.

2.2.15 SAR (Safety Analysis Report) Part

The SAR parts related to the WSFSF and DSFSF shall be assessed in respect of the implementation of the technology for dry storage and transport of SNF form VVER-1000.

The assessment shall comply with the Regulation on Ensuring the Safety of Nuclear Power Plants. The safety assessment scope for the individual stages is stipulated in the Regulation on Issuance of Licences and Permits for the Safe Use of Nuclear Energy, adopted by CM decree No. 93 of 4 May 2004, and Regulation on Ensuring Safety in the Management of Spent Nuclear Fuel, adopted by CM decree No. 196 of 2 August 2004.

The proposal for modification of the SAR Part shall contain, but shall not be limited to, the following requirements:

- Technology description according to the prepared detailed design;
- Justification of the new equipment classification and qualification;
- WSFSF and DSFSF safety analyses;
- Analyses related to radiation protection;
- WSFSF and DSFSF operational limits and conditions;
- Analyses related to the environmental and public impact assessment;
- Analyses related to the modifications of the SAR sections concerning the WSFSF and DSFSF as a result of the dry storage technology implementation.

2.2.16 Software Part

Irrelevant.

2.2.17 Other Project parts

Irrelevant.

2.3. Requirements to the content of the Project parts

For each Project part, the Contractor shall submit the following:

Explanatory note (Description of the design solution)

The approved design solutions and functions of the relevant part of the project shall be described, as well as the operating modes, layout solutions, selected process equipment and environmental protection measures that shall be observed during project implementation, regulations and internal procedures, discharge limits, license conditions and/or other environmental restrictions, etc.

The scope of the notes shall cover at least the scope defined in Chapters 8 to 17 of Regulation No. 4 of 21 May 2001 on the Investment Projects' Scope and Content.

Interfaces with the previously completed project

The Project shall consider the existing conditions and constraints on the storage, handling, and transport of SNF in the WSFSF and DSFSF.

Equipment operation requirements

Describe the specific requirements related to equipment operation in respect of its future use in conjunction with the previously completed project for SNF storage.

- Equipment maintainability;
- Requirements to the scope and content of the specifications for delivery that are to be prepared as a result of the design process;
- Requirements for the conduct of periodic tests;
- Maintenance intervals and periodic testing requirements.

Computational note and calculations

The calculations justifying the design solutions in terms of reliability, robustness, seismic resistance, availability, etc. shall be presented. The note shall contain justification of the project functionality during all operating modes and transients. It shall include a description of the performed inspection (verification) of technical compliance. When specific methods have to be used for calculation and verification, model testing, validation and verification testing of software important for safety or other special requirements, they shall be explicitly stated.

Drawings, diagrams and graphics

The required graphic images of the approved design solutions shall be available. All graphics shall also be prepared in electronic dwg file format. Each drawing and diagram shall have a unique number for easy identification.

Mechanical design drawings of non-standard and non-catalogue components shall be included;

Specifications

Prepare specifications of the cask and of equipment and materials to be used as well as specifications of spare parts if necessary. The specifications shall include requirements to the characteristics of equipment and materials (technical parameters, safety classification, compliance assessment, manufacture process or method, use, safety, dimensions, requirements to the identification of the goods on the market, terminology, symbols, testing and testing methods, packaging, marking, labelling, operating procedures, compliance assessment procedures, etc.).

Specifications shall be prepared for each part of the project, separately.

Bills of quantities

The bills of quantities shall contain all the activities, start-up operations, equipment and additional materials required to complete the project. The bills of quantities shall be prepared using codes of the Building Manager application or based on CLR (construction labour rates), CCR (consolidated calculation rates), UERC (unified engineering rates in construction) and AEC (Association for Electronic Communications) for the individual types of works, while for the works not considered in the above, analyses shall be prepared with specified quantitative labour, mechanisation, and material costs. Bills of quantities shall be prepared for each part of the project, separately.

List of codes and standards

The project shall comply with the national law stipulating the safe management of SNF.

- Safe Use of Nuclear Energy Act (State Gazette, issue 63 of 28.06.2002).
- Regulation on Ensuring Safety of Nuclear Power Plants (adopted by Council of Ministers Decree No. 245 of 21.09.2016, State Gazette, issue 76 of 30.09.2016).
- Regulation on Ensuring Safety in the Management of Spent Nuclear Fuel (adopted by Council of Ministers Decree No. 196 of 02.08.2004, State Gazette, issue 71 of 13.08.2004).
- Regulation on Radiation Protection (adopted by Council of Ministers Decree No. 20 of 14.02.2018, State Gazette, issue 16 of 20.02.2018).
- Regulation No. 4 of 21.05.2001 on the Scope and Content of Investment Projects;
- Regulation on Issuing Licences and Permits for Safe Use of Nuclear Energy, adopted by Council of Ministers Decree No. 93 of 04.05.2004.
- IAEA Safety Standards, Regulations for the Safe Transport of Radioactive Material, Specific Safety Requirements No. SSR-6, IAEA 2018.

The specific requirements to the equipment and conditions shall comply with the relevant standards. When introducing restrictions and requirements into the project, the relevant standards they comply with shall be indicated.

The Contractor shall provide a list of the codes and standards used as a basis when establishing the requirements for cask selection indicated in the project. When specifying such codes and standards, their ID and full title shall be written down.

The regulations shall be included in a design basis list used by the Designer as part of the Project documentation;

3. Requirements to the supply of equipment and materials

The casks and equipment (the equipment) shall be delivered to Kozloduy NPP EAD. The Contractor shall specify the requirements for cask and equipment packaging, conservation, handling, transportation and storage.

3.1. Equipment classification

The Contractor shall determine the safety class of the delivered SSCs and make reference to the regulation stipulating the safety classification criteria.

- "Safety Classification of Structures, Systems and Components in Nuclear Power Plants", SSG-30, IAEA, Vienna, 2014;
- Regulation on Ensuring the Safety of SNF Management, State Gazette, issue 71, of 13.08.2004.

3.2. Seismic category

Irrelevant.

3.3. Equipment qualification

The Contractor shall qualify the equipment to guarantee its reliable operation and performance of its intended functions during its lifetime considering the possible environmental impacts and conditions expected for all operating modes and emergencies.

3.4. Physical and dimensional characteristics

The equipment under this Project shall comply with the conditions and constraints resulting from the existing buildings (height, width of buildings and loading bay doors and hatches, load bearing capacity of floors and structures) and existing main equipment (cranes, vehicles).

The Project shall consider the fact that casks will be loaded/unloaded in the WSFSF and stored in the DSFSF.

3.5. Material characteristics

The Contractor shall indicate the characteristics of the materials used in the implementation of the Project.

3.6. Chemical, mechanical, metallurgical and/or other properties

The Contractor shall ensure equipment reliability in accordance with the working conditions and design lifetime. Any delivered equipment shall be compatible with the existing lifting, transport and other equipment in the WSFSF and DSFSF.

3.7. Requirements to the operation in ionizing radiation environment

The equipment will work in an ionising radiation environment and the Contractor for this Project shall consider the impact of the environment on the equipment.

Surfaces shall facilitate easy decontamination.

When loading/unloading SNF in/from the cask at the SNF loading bay, a system for protection against surface radioactive contamination or coating (system) facilitating easy decontamination shall be provided.

3.8. Requirements to the cask storage period and equipment service life

The dry storage and transport casks shall provide for at least 50 years of SNF storage with an option for extension.

The equipment service life shall correspond to the cask storage period.

3.9. Additional characteristics

Irrelevant.

3.10. Requirements to delivery and packaging

The delivered equipment and materials shall meet the quality and parameter specifications of the detailed design.

The equipment and materials shall be delivered to Kozloduy NPP EAD in packaging that prevents damage during transport or handling operations.

Place of delivery – Kozloduy NPP site.

3.11. Handling operations

The Contractor shall submit a detailed description of the requirements for handling operations, connection points, lifting methods, temporary storage, additional protection, removing and storage conditions.

3.12. Transportation

The Contractor shall provide a detailed description of the conditions and requirements for equipment transportation: covered and open transport, temperature, positioning during transportation, safety provisions and ensuring health and safety at work.

3.13. Storage conditions

The Contractor shall submit instructions for short-term, medium-term and long-term storage of the delivered equipment. Description of the activities, required consumables and recommended deadlines. The instructions shall consider the expected long-term (50 years or more) operation of the equipment and SNF storage.

4. Requirements to the manufacturing

4.1. Regulations, standards, manufacturing and testing procedures

The Contractor shall use regulations, standards, procedures and programmes for manufacturing and testing.

The manufacturing requirements of all the documents in the quality system of the equipment manufacturer shall be met. The technological process sequence of operations during manufacturing, inspection and testing (receiving inspection of materials, testing during fabrication, acceptance testing, etc.) shall be reflected in the Inspection and Test Plan with identified witness points on behalf of the Contractor and Contracting Authority.

4.2. Testing of products and materials during manufacturing

The Contractor shall perform specialised receiving inspection and/or review of the certificates for the materials used in the equipment fabrication.

The Contractor shall conduct equipment acceptance tests in the presence of representatives of Kozloduy NPP.

The cask design characteristics shall be tested under normal and emergency conditions.

The Contractor shall submit the testing programme, testing methods and permissible deviations to the Contracting Authority. The testing programme shall be submitted to the Plant before commencement of the cask and equipment manufacturing.

The Contractor shall concur with the Contracting Authority each modification to the design, parameters and testing conditions having effect on the test results.

The Contractor shall warrant that, during the manufacturing process, the manufacturer will manage nonconformances by segregating and properly marking products not fit for use or subject to rework in order to bring them to conformity.

4.3. Control by Kozloduy NPP EAD during manufacturing

Representatives of Kozloduy NPP EAD shall be entitled to attend or observe the manufacturing process, inspection and/or testing of materials and products.

4.4. Safety measures against contamination with radioactive substances and dangerous products

The Project shall stipulate the requirements to the safety measures against radioactive contamination based on the Radiation Protection Part of the Project.

4.5. Responsibilities during commissioning

Following the equipment delivery to the Plant, the Contractor, together with Contracting Authority representatives, shall conduct equipment performance testing as well as training (theoretical and

practical) with the issue of the relevant certificates.

4.6. Condition of the surfaces and coating

The equipment surfaces shall allow for decontamination. When SNF is loaded in/unloaded from a cask in the pool, the cask shall be protected from surface contamination – protective cover or coating facilitating easy decontamination.

4.7. Safety provisions

Irrelevant.

5. Requirements to the construction works

Irrelevant.

5.1. Supervision of construction and installation works

Irrelevant.

5.2. Construction work implementation plan

Irrelevant.

5.3. Requirements to be observed and activities to be performed by Kozloduy NPP EAD

Irrelevant.

5.4. Requirements to be observed and activities to be performed by the Contractor

When performing activities on the Kozloduy NPP site, the Contractor shall:

- Follow the rules and requirements specified in the Kozloduy NPP EAD internal documents concerning the relevant site, the Health and Safety at Work Act, Radiation Protection, Nuclear and Fire Safety, Technical Surveillance, and Metrological Assurance regulations;
- Be held responsible for the staff safety when performing the activities under the Contract;
- Be held responsible for the environmental protection measures to be followed when performing the activities.

5.5. Installation and commissioning

The Contractor shall perform the installation and commissioning activities under the approved project.

The Contractor shall determine the scope and types of equipment tests to be conducted following installation, prior to commissioning and during operation. This scope shall comply with the regulations on SNF management and demonstrate equipment complies with the design requirements. The Performance Testing Programme shall be approved by Kozloduy NPP EAD before commencement of the installation works.

6. Requirements to other activities under the Project

Irrelevant.

7 . Regulatory and technical documents applicable to construction and installation works and commissioning

The Contractor shall observe the regulations currently in force:

- Safe Use of Nuclear Energy Act (State Gazette, issue 63 of 28.06.2002);
- Regulation on Ensuring Safety of Nuclear Power Plants (adopted by Council of Ministers

Decree No. 245 of 21.09.2016, State Gazette, issue 76 of 30.09.2016);

- Regulation on Ensuring Safety in the Management of Spent Nuclear Fuel (adopted by Council of Ministers Decree No. 196 of 02.08.2004, State Gazette, issue 71 of 13.08.2004);
- Regulation on Radiation Protection (adopted by Council of Ministers Decree No. 20 of 14.02.2018, State Gazette, issue 16 of 20.02.2018);
- Regulations for health and safety at work in non-electric installations of electricity and heat generation power plants and on heat networks and hydro engineering facilities, 2004;
- Regulations for health and safety at work in electric installations of electricity and heat generation power plants and on electrical grids, 2004;
- Any other laws, bylaws, standards and technical documents currently in force in Bulgaria and Kozloduy NPP which concern the subject of these Terms of Reference.

8 . Documents to be submitted upon delivery, installation and commissioning

8.1. Upon delivery, the Contractor shall submit all the required documents related to the installation and commissioning of the delivered equipment. The documents accompanying the delivery shall be submitted in two hard copies (in the original language as well as in Bulgarian) and on a CD containing: document files in their original format and pdf files generated by scanning – 1 copy. Certificates, reports, and declarations shall be submitted in the original language with a Bulgarian translation. The Contractor shall be liable for the accuracy and quality of translated documents.

Translated documents shall be signed by the translator and verified in accordance with the national law.

The documents are (without being limited to):

- Cask and equipment design data sheet;
- Technical documentation, drawings, diagrams, specifications, bills of quantities;
- test reports;
- compliance declarations/certificates (operating parameters declarations) combined with the quality certificates; declarations/certificates of origin of the equipment, materials and consumables, of the inputs, machinery, electrical equipment and other items required by the regulations in force in the Republic of Bulgaria;
- document describing the storage conditions and shelf life;
- warranty certificate;
- list of the non-conformances identified during the manufacturing process;
- updated design documents based on the amendments, reissued with a revision number.

8.2. Upon installation and commissioning, the Contractor shall submit reports on the work performed.

9. Input data

9.1. The Contractor, in consultation with the Contracting Authority, shall prepare a list of the documents to be submitted as input data. The input data shall be submitted to the Contractor upon conclusion of a contract.

9.2. The input data required for the implementation of the activities under these Terms of Reference shall be submitted to the Contractor in the form and format available in Kozloduy NPP

EAD, in compliance with ‘Quality procedure. Transfer of input data to Contractors’, ДОД.ОК.ИК.1194.

9.3. In the absence of input data, the Contractor shall prepare them at its own expense with the assistance of the Contracting Authority.

9.4. The required input data that are not available as documents (the existing equipment and present situation in the WSFSF and DSFSF related to the development of the current project) shall be collected by the Contractor in the field, via walkdowns, while adhering to the requirements for the provision of access and work at the Kozloduy NPP EAD site as stipulated in ДБК.КД.ИН.028 and radiation protection requirements, in compliance with the ‘Procedure for radiation protection in the Kozloduy NPP EAD dry spent fuel storage facility’, 50.СХОГ.ИР3.01 and ‘Procedure for radiation protection in the Kozloduy NPP EAD wet spent fuel storage facility’, 50.ХОГ.ИР3.01.

9.5. Kozloduy NPP EAD shall provide any available information required to support the project implementation.

10. Receiving inspection

The delivered equipment shall be subject to general receiving inspection as per ‘Quality procedure for receiving inspection of raw materials, materials and accessories supplied at Kozloduy NPP EAD’, 10.УД.00.ИК.112.

11. Contract deliverables

Upon completion of the contract, the Contractor shall submit at least the following documents:

11.1. Design.

- Cask and equipment design;
- Transport and handling equipment design;
- Design of the system for monitoring of cask parameters during storage and monitoring of releases to the environment.
- Instructions for the activities related to cask transportation, loading, preparation for storage, storage, unloading, inspections, repair and testing;
- Safety and radiation protection analyses concerning transportation and storage (analyses for all activities involving the cask during normal operation and emergencies);
- Justification of the classification/qualification required for the SAR. Amendments to the SAR;
- Analyses justifying the impact of the cask system on the environment and the public;

11.2. Delivery.

- Cask and equipment design data sheet;
- Technical documentation of the equipment, drawings, diagrams, specifications, bills of quantities;
- Compliance declarations/certificates (operating parameters declarations) combined with the quality certificates; declarations/certificates of origin of the equipment, materials and consumables, of the inputs, machinery, electrical equipment and other items required by the regulations in force in the Republic of Bulgaria;
- Document describing the storage conditions and shelf life;
- Warranty certificate;

- List of the non-conformances identified during the manufacturing process;
 - Updated design documents based on the amendments, reissued with a revision number.
- 11.3. Installation and commissioning.
- Installation procedures;
 - Performance testing programme;
 - Installation and testing reports, certificates, records and deliverables required under the current procedures at Kozloduy NPP EAD;
 - Methodology: for control, measurement and calibration of the monitoring system. The documents prepared in connection with the project shall be considered accepted by Kozloduy NPP EAD upon consideration and acceptance without remarks by the Expert Technical Council. The documents subject to approval by the NRA shall be considered accepted upon their approval by the NRA.

12. Work acceptance criteria

12.1. The design activities shall be considered completed upon detailed design review and acceptance without remarks by Kozloduy NPP EAD and approval of the design by the NRA.

At Kozloduy NPP EAD, the Design shall be accepted by a specialised Expert Technical Council (ETC), for which a Report shall be drawn up. The next stage shall commence upon approval of the Detailed Design Acceptance Report without remarks and subsequent approval by the NRA.

The approved Report shall be submitted to the NRA for subsequent approval.

The modifications in the approved design shall be documented and agreed by the Contracting Authority.

12.2. The delivery shall be considered completed upon completion of a general receiving inspection in accordance with the established procedure at Kozloduy NPP EAD stipulated in 'Quality procedure for receiving inspection of raw materials, materials and accessories supplied at Kozloduy NPP EAD', 10.УД.00.ИК.112./* and based on a signed report for completed receiving inspection without remarks.

12.3. Completion of all installation activities to the required quality standards and submitted deliverables.

12.5. Successfully completed tests and commissioning of the equipment as per a programme prepared by the Contractor and approved by the Contracting Authority as well as submitted deliverables.

12.6. Successful staff training and submitted records.

12.7. As-built documentation submitted within 30 calendar days of commissioning.

13. Quality assurance requirements

13.1. Contractor's management system (MS)

The Contractor shall apply a management system in accordance with БДС EN ISO 9001:2015, 'Quality management systems – Requirements' or equivalent covering the activities in these ToR.

The Contractor shall notify Kozloduy NPP EAD of any structural changes or changes to the Contractor's MS documentation related to the activities performed under the contract.

13.2. Quality assurance programme (QAP)

13.2.1 The Contractor shall draw up a Quality Assurance Programme (QAP) for the activities performed within the scope of these ToR. The QAP shall be updated throughout the performance of the contract.

13.2.2 The QAP shall describe the management system applied for performance of the activities. The Programme shall include a detailed time-schedule, responsibilities concerning each of the tasks under the contract, and procedure for their implementation. The QAP may refer to Contractor's internal documents whose copies shall be submitted to Kozloduy NPP EAD upon request.

13.2.3 The Contractor shall submit the QAP to Safety and Quality Directorate within 20 calendar days following contract signing. The Programme shall be a prerequisite for the commencement of contractual activities, subject to review and approval by Kozloduy NPP EAD, and prepared on the basis of:

- These Terms of Reference and the contract;
- Contractor's management system;
- A sample table of content provided by the Contracting Authority;
- Other standards and regulations related to quality assurance, depending on the type of work.

13.3. Quality control plan (QCP) / Inspection and testing plan (ITP)

13.3.1. The Contractor shall prepare a QCP/ITP (independently or appended to the QAP) for the performance of the works on each individual stage.

13.3.2. The QCP/ITP shall cover all the key activities in respect of project quality and the witness points on behalf of Contractor and Contracting Authority shall be specified for each of the activities covered by the Plan.

13.3.3. When reaching a witness point, the Contractor shall suspend the activities until completion and documentation of the control planned to be exercised by the Contractor and Kozloduy NPP EAD. The contractual activities shall be resumed upon a positive outcome of the control.

13.3.4. The QCP/ITP (when not appended to the QAP) shall be submitted for review and approval by Kozloduy NPP EAD not later than 20 calendar days prior to the Contractor's preparedness to initiate work on the respective site.

13.3.5. The QCP shall be prepared as per the template provided by Kozloduy NPP EAD.

13.3.6. The QCP/ITP shall be submitted as a deliverable upon service acceptance by the Contracting Authority.

13.4. Audit by Kozloduy NPP EAD (second-party auditing)

13.4.1 Kozloduy NPP EAD shall be entitled to audit the Contractor before commencement of the works under a signed contract and during the implementation of the contractual works.

13.4.2 Kozloduy NPP EAD shall audit the Contractor in compliance with the provisions of 'Quality procedure. Organising and auditing of external organisations (second-party auditing), 10.0иП.00.ИК.049.

13.5. Management of non-conformances

The Contractor shall notify Kozloduy NPP EAD of any non-conformances found during implementation of contractual activities.

The Contractor shall maintain a list of non-conformances identified during manufacturing. For the cases when corrective actions have to be taken to bring the cask and equipment in compliance with

their design documentation, the Contractor shall notify the Contracting Authority of the decision taken for each specific case. A copy of the list of non-conformances shall be submitted to the Contracting Authority upon delivery of the equipment.

The manufacturer shall warrant that non-conformances are managed during manufacture by segregating and properly marking products that are not fit for use or products that are subject to rework/reprocessing to bring them into conformity with the design specification.

13. 6. Professional competence (qualification) of the Contractor's personnel

In respect of design activities, the Contractor shall employ at least one fully qualified designer for the specific project parts.

The Contractor's personnel who will perform activities on the Kozloduy NPP site

shall be aware of and comply with the safety culture requirements and shall be instructed on the impact of their actions on safety.

13.7. Specific quality assurance requirements

13.7.1. The software codes and models to be used for calculations or analyses shall be verified and validated and that shall be documented. The design shall demonstrate the feasibility of those software codes and models, limitations on their use and their applicability for the specific task.

The Contractor shall submit documentation proving the purchase of the used software codes.

The computer programmes, analytical methods and models used for the safety assessments shall be verified and validated.

13.7.2. Specific requirements:

- The prepared design shall be subject to an independent verification by Designer's staff who have not participated in its preparation. The verification scope and methods shall be determined based on the safety significance of the design as well as on the complexity and uniqueness of the design solutions. The following design verification methods shall be used: design analysis, alternative calculations; comparative analyses, qualification tests for technical compliance; independent design verification by a third party;
- Equipment identification in the design shall be based on the procedure for assigning technological identification;
- The identification of documents prepared by the Contractor as per the ToR shall include the indication of the ToR or contract number. Each document shall bear a unique ID given by the developer/designer and a revision number;
- Corrections in the design documentation shall be affected based on a decision of the ETC by issuing a new revision or making amendments (remarks from the written statements) while keeping the current revision. Control over design modifications shall be performed by the members of the ETC assigned in the order. The control over design modifications shall be documented;
- The design shall be submitted in seven copies in Bulgarian and a copy in the original language if not Bulgarian. The design output shall be certified with a fully qualified designer's stamp for the specific project part;
- The design shall also be submitted in a digital form (a CD containing: files in the original format of the documents and pdf files created using a scanning device);
- The design shall contain a list of all design basis documents used by the Designer, clearly referring to document title, document clause specifying the relevant requirements, and requirements as per the ToR. The data from the documents provided by Kozloduy NPP EAD containing input data shall also be included in this list;
- The design shall contain a list of all documents resulting from the design activities with their titles, index, date of approval and last revision as at the moment of their submittal – at the

respective stage or final;

- Kozloduy NPP EAD shall accept the prepared design at a session of the specialised Expert Technical Council (ETC). The design acceptance by the ETC shall not absolve the Designer of its responsibility, but shall serve only to determine the feasibility and acceptability of the presented design solutions;

13.7.3. The raw materials, materials and accessories used in the design shall meet the requirements regarding the prohibition and restrictions on the use of certain dangerous substances, preparations and items introduced by Annex XVII of Regulation (EC) No. 1907/2006 of 18 December 2006 on Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH).

13.7.4. The specific requirements to the equipment and conditions shall comply with the relevant standards. When introducing restrictions and requirements in the design, the relevant standards shall be mentioned.

13.8. Training of Kozloduy NPP EAD personnel

The Contractor shall provide training (theoretical and practical) in all activities related to loading, handling, transportation, preparation for storage and storage of the casks as well as training in the activities related to equipment maintenance.

The training aids shall be submitted to the Contracting Authority.

For each activity, at least two specialists from the Kozloduy NPP EAD Spent Fuel Storage Facility Department shall be trained.

Training shall be at the Contractor's expense.

Training shall take place under actual working conditions at the WSFSF and DSFSF after the initial delivery of the cask(s) and equipment, during the performance tests.

Training shall be organised and carried out as per the established procedure at Kozloduy NPP EAD.

13.9. Required Contractor's licenses, permits, certificates, etc.

The person/entity performing the equipment pre-commissioning shall be certified as a C/A type control body in compliance with БДC EN ISO 17020:2012 or equivalent standard covering the subject of these Terms of Reference in the I&C part.

14. Warranty

14.1. The warranty period of the dry storage and transportation casks shall be consistent with the planned SNF storage period – at least 50 years.

14.2. The equipment warranty period (transportation equipment, technological equipment, monitoring systems, etc.) shall be at least 24 months as of the date of commissioning and shall be consistent with the intended use. All costs incurred in remedying any non-conformances found during the warranty period shall be borne by the Contractor. The deadline for remedy of detected defects shall not exceed one month from the written notification date.

14.3. The warranty period of the spare parts shall be at least 24 months as of the date of signing the report for completed receiving inspection without remarks.

14.4. The Contractor shall ensure supply of spare parts and consumables for a period of at least 10 years.

15. Control by Kozloduy NPP EAD

Kozloduy NPP EAD shall be entitled to inspect and review any outsourced activities. The Contractor shall provide access to personnel, premises, facilities, tools and documents used by the outsourced organisations and their subcontractors.

16. Organisational requirements

16.1. Prior to commencement of the works under the Contract, a meeting shall be held between the Contractor and representatives of Kozloduy NPP EAD in order to agree on the terms, responsible persons and communication during implementation of the individual parts of the Contract.

16.2. The Contractor shall ensure at their own expense the attendance of their own competent personnel at the working and expert meetings to be conducted on the Kozloduy NPP EAD site in relation to the design being prepared.

16.3. Working meetings between the Contractor and representatives of the Contracting Authority may be held at any time, upon request by either party to the Contract.

17. Additional requirements

The Contractor shall be experienced in:

- Designing and manufacturing a cask system for dry storage and transportation of SNF;
- The process of licensing transportation and storage casks in accordance with the EU regulations – the completed projects shall be within the EU.

In order to demonstrate their experience, the Contractor shall provide references to successfully operated casks for dry storage of SNF and transport and handling equipment in EU countries. The references shall be to operable storage facilities with the relevant licences or equivalent authorisations issued by an EU regulatory body.

Due to the fact that such projects have a longer duration from start to finish, the Contractor shall provide evidence of having completed one or more projects in the last 7 years.

18. Requirements to the Contractor when using subcontractors/third parties

When using subcontractors/third parties, the main Contractor shall:

- Be liable for the compliance with the ToR on behalf of the subcontractors/third parties in respect of the activities performed by them as well as the quality of their work;
- Define the channels for communication and interaction with their subcontractors/third parties as well as the means of control over the subcontracted activities and the persons in charge of such control;
- Properly and adequately define the provisions of the ToR applicable to the subcontractors/third parties under the contract depending on the activities they perform;
- Define the minimum requirements to the subcontractors'/third parties' management system (MS): need for QAP, applicable codes and standards, non-conformance management procedure, scope of the documentation, tests and inspections, etc.;
- Approve the subcontractors'/third parties' QAP and submit the approved QAP to Kozloduy NPP EAD for information;
- Include all aforementioned requirements in the documentation under the contract with subcontractors/third parties.

