# MAIN CONTRACT No.1

## TERMS OF REFERENCE

## ENGINEERING SERVICES ASSOCIATED WITH DISMANTLING OF IGNALINA NUCLEAR POWER PLANT REACTOR CORES

## STAGE 1 ENGINEERING SERVICES

2019 m. _____ ___d. Nr._____
Visaginas

### SECTION I

### SPECIFIC BACKGROUND INFORMATION

1. The main purpose of the activities defined in these Terms of Reference is to develop the concept of future engineering and licensing and preparation of information for project management decisions.
2. Dismantling of the INPP reactor cores is on the critical path of the whole INPP decommissioning schedule. The dismantling concept to be developed shall be in line the commitments made regarding the end date of INPP's decommissioning programme or sound arguments must be provided for the overall schedule to be changed (framework project schedule is provided in Annex S1-1, together with anticipated time periods for submission of deliverables as per these Terms of Reference).

### SECTION II

### SPECIFIC OBJECTIVES

3. The specific objectives of this main contract are:
   - 3.1. to evaluate whether the available radiological characterization data and other technical information about the facility to be dismantled are sufficient and reliable for the implementation of this contract and to identify and coordinate with SE Ignalina NPP (hereinafter referred to as Client) additional investigations (if needed);
   - 3.2. to perform screening of all practically possible dismantling and waste management options according to agreed methods and criteria, shortlist a limited number of viable scenarios and recommend a technically appropriate, safe and cost-effective solution for the dismantling of INPP Unit 1 and Unit 2 reactor cores and management of relevant waste streams;
   - 3.3. to develop the solution, selected by the Client, into a Conceptual Design at a level of detail sufficient for the final decision making by the stakeholders concerned on further project development;
   - 3.4. to identify the actions necessary on the part of the Client to put in place the solution adopted in the Conceptual Design;

3.5. to perform and document an Environmental Impact Assessment for the solution adopted in the Conceptual Design according to national and international requirements;

3.6. to assist the Client in interactions with regulatory bodies and other stakeholders relevant to the above.

## SECTION III

## SCOPE OF SUPPLY AND DESCRIPTION OF SERVICES

4. The activities aimed to reach the specific objectives of Stage 1 are subdivided into the following five tasks:

   Task 1: Preparatory Activities and Data Collection for Stage 1;

   Task 2: Preparation of Design Options Report;

   Task 3: Development of Conceptual Design

   Task 4: Preparation of Gap Analysis Report(s);

   Task 5: Preparation of Environmental Impact Assessment Report.

5. In addition to providing deliverables under Task 1-5, the Consultant shall assist the Client in responding to, and resolving, questions raised by state institutions, regulatory bodies, public and financial stakeholders for agreement and / or approval of key results of Tasks 1-5. This assistance may take the form of providing presentations, consultations and support in writing or in meetings and amending of documents which shall be agreed by the regulatory bodies and stakeholders.

6. The Consultant shall nominate a Task Manager for each of Task 2, 3, 4, 5. The Task Manager for Task 5 shall not be the same person as for any other task. Task 1 shall be under supervision of the Team Leader.

7. General provisions regarding work on site and other issues regarding work organisation are provided in Framework Agreement. Specific provisions regarding Stage 1 work organisation are as follows:

   - Contract review meetings are to be held once a month at the premises of INPP. Every second time participation at the meeting can be arranged by means of teleconferencing. Upon agreement of the Client contract review meeting can be arranged at Consultant's office ones a year;
   - If necessary additional teleconferencing may be initiated by both parties upon prior notification and agreement on the agenda;
   - the Consultant should foresee the need for an on-site representative during certain phases of the activities to be agreed with the Client.

### Task 1 Preparatory Activities and Data Collection for Stage 1

8. **Preparatory Activities.** The Consultant shall prepare, in consultation with the Client, an implementation methodology for the Stage 1 activities as set out in Main Contract No.1. The Consultant shall, in particular:

   - based on the tender proposal and in consideration of international recommendations and best practices, develop an optioneering methodology, including procedure for screening and evaluation of design options and selection of optimal scenario (e.g. built on Multi-Attribute Decision Making (MADM) / Multi-Objective Decision Making (MODM), their combination or other);
   - set out and, where necessary, refine the specification of the Stage 1 deliverables to ensure a common understanding with the Client of their content and purpose;

- propose detailed arrangements for the presentation of Additional Data Requests to the Client and the structure and indexing of the Design Basis Document;
- define the detailed activities and resources required to fulfil the contract;
- designate responsible persons from the Consultant's team, showing their fields of expertise, responsibilities and organizational interfaces;
- on the basis of the Project Framework Schedule (see Annex S1-1), detail the service tasks (activities of the Consultant) according these requirements:
  - schedule quality shall be in line with DCMA 14 point schedule assessment;
  - schedule model shall be resource- and cost-loaded and contain significant milestones;
  - the level of detail shall be sufficient to ensure monthly reporting and contract management using the earned value method (EVM);
  - schedule model shall be provided in English in electronic form compatible with Primavera version P6.1 software and accompanied by an explanatory note.
- identify potential risks that may affect implementation of tasks and set out measures to mitigate them;
- develop a Quality Assurance Plan (QAP, to be prepared in accordance with the requirements provided in https://www.iae.lt/teisine-informacija/vidiniai-teises-aktai/103). The QAP shall include provisions for the integration of the Client's Quality Assurance and auditing activities of the Consultant and its sub-contractors.
- provide a preliminary list of modelling calculations and cases for analysis which have to be developed under the contract;

The Consultant shall set out the above in a single draft document (hereinafter the "Implementation Methodology Document for Stage 1" or "IMD-1") and submit it to the Client for approval not later than within 20 working days after the effective date of Main Contract No.1.

9. Upon submission of IMD-1 to the Client, the Consultant shall, together with the Client, arrange a kick-off meeting for the Stage 1 activities at which the Consultant shall make a presentation of the draft implementation methodology to the Client and stakeholders invited by the Client. The kick-off meeting shall be held at the premises of the Client.
10. IMD-1 shall be presented in the English language only.
11. Unless otherwise agreed, IMD-1 shall be approved by the Client before proceeding to the subsequent activities within Main Contract No.1.
12. IMD-1 may be amended or expanded in the course of Stage 1 activities by agreement between Client and Consultant where this does not infringe the terms of the Main Contract No.1 or of the Framework Agreement.
13. Data Collection.
    13.1. The Consultant shall ensure that the Stage 1 activities are conducted on the basis of data and information that is sufficient and reliable.
    13.2. The Consultant shall, in particular, review the radiological characterization reports provided by the Client:
    - In preparation for dismantling of the reactors, the Client has performed radiological characterization of materials on the basis of which waste classification has been made (presented in Annex F2). In view of the importance of this input data, the Consultant shall perform verification of waste distribution by class and identify whether data provided are sufficient and reliable enough for implementation of the Stage 1 activities.

- If the data are not sufficient and/or not reliable, the Consultant shall develop and agree with the Client a methodology for any additional radiological characterization survey(s) to be performed by the Client.

13.3. The Consultant shall further, in the course of implementation, identify any other additional data or other information required for Stage 1 that has not already been provided in the frame of tendering. The Consultant shall present these requirements to the Client by written request (hereinafter an "Additional Data Request") explaining, and providing safety, engineering, economic, environmental impact related justifications for the need of additional data/ information according to the terms of reference of the contract and detailed arrangements set out in the approved Implementation Methodology Document.

14. The Consultant shall, in respect of the collection of data and assessment of its sufficiency and reliability, compile the "Design Basis Document", that shall be a living document throughout Stage 1, and a reference document thereafter, comprising:

- the Consultant's assessment of the Client's radiological characterization reports, together with the reports themselves and the results of any further surveys or analysis performed;
- all Additional Data Requests together with the data/information received from the Client in fulfillment thereof and any risks or uncertainties associated with this data/ information identified by the Consultant or by the Client;
- where the data/ information requested under an Additional Data Request is not available, the justified assumptions made by the Consultant to overcome the lack of data/ information and any risks or uncertainties associated with these assumptions; and
- all data/information provided to the Consultant in the frame of tendering.

15. The structure and indexing of the Design Basis Document shall be as set out in IMD-1.

**Task 2: Preparation of Design Options Report**

16. The Consultant shall prepare, in close consultation with the Client, a Design Options Report (hereinafter referred to as the DOR) which will overview and rank the design options to create a limited set of complete scenarios. These scenarios then shall be examined in greater detail, in particular in terms of cost and risks, and one shall be selected by the Consultant and justified as the recommended scenario.

17. In preparing the DOR, the Consultant shall:

17.1. develop and agree with the Client a comprehensive set of design options comprising those proposed by the Client and those proposed by the Consultant based on his engineering experience for each process defined in Section IV to be used in the optioneering analysis;

17.2. based on the agreed Methodology and in consideration of national laws, international recommendations, and requirements of the Client, perform screening out of non-viable (formally disallowed or unacceptably disadvantageous) design options;

17.3. develop and agree with a Client a compatibility matrix to show how the viable design options for each process can be combined into coherent, all-embracing, viable scenarios for Zone R3 dismantling and relevant waste management;

17.4. following the procedure agreed in the Methodology, rank viable scenarios such that, unless otherwise agreed by the Client, not less than 2, and not more than 4, distinct shortlisted scenarios are taken forward for further analysis (shortlisted scenarios shall be considered "distinct" where they differ in one or more design-option(s));

17.5. perform a more detailed analysis of the shortlisted scenarios in terms of characteristics provided in Section V of these Terms of Reference, broken down by process as appropriate;

17.6. based on the results of the more detailed analysis of the shortlisted scenarios and on the Consultant's own expert judgement, select one recommended scenario the choice of which is justified and balanced against an assessment of the advantages and disadvantages of the other shortlisted scenarios.

18. The analysis performed above may be combined or restructured in any way agreed with the Client that yields the requisite shortlisted scenarios.

19. The Consultant and Client may agree upon an iterative approach such that shortlisted scenarios are added or removed as a consequence of more detailed analysis on condition that, unless otherwise agreed by the Client, not less than 2, and not more than 4, scenarios appear in the finalized DOR.

20. In respect of the RWISF, the DOR shall set out the key aspects of its specification according to the respective scenario. The key aspects of the RWISF specification are:

- the requirement for packaging, processing (if any), characterization, etc. of waste within the RWISF and (if so) the estimated floor area to be set aside for this purpose;
- the estimated volume of packaged waste, including floor area and floor loading for its storage, setting out plus-or-minus uncertainties on these figures;
- the maximum loading of any required cranes or lifting mechanisms;
- any shielding requirements imposed upon the boundary or internal walls of the RWISF;
- any other special features in general or necessitated by the scenario concerned;
- a cost calculation for the civil construction/reconstruction works using the SISTELA database or other construction-cost database agreed with the Client.

21. The optimal engineering solution, which will form the basis for the subsequent Conceptual Design and EIAR, shall be selected from the shortlisted scenarios by Client following consultation with the regulatory and financial stakeholders. The scenario recommended by Consultant may, or may not, be taken forward as the optimal engineering solution.

22. If it is found by the Consultant that there are no viable scenarios, the Consultant shall document this conclusion and shall not proceed with the activities of Tasks 3 and 5.

23. Coordination of the DOR with regulatory and financial stakeholders is under the Client's responsibility but shall be assisted by the Consultant.

24. The DOR shall be presented in the English language only.

### Task 3: Development of Conceptual Design

25. The Consultant shall prepare, in consultation with the Client, the Conceptual Design including a Design Proposal for the RWISF.

26. The Conceptual Design shall describe the selected optimal engineering solution, after its agreement in Task 2, at a level of detail sufficient for the final decision making by the stakeholders concerned on its further development.

27. The Consultant shall refine and expand upon the scenario for reactor Zone R3 dismantling and associated radioactive waste management that has been selected as the optimal engineering solution and present the Conceptual Design according to the outline structure and headings in Annex S1-2. The Consultant shall, in particular:

27.1. present all design assumptions and requirements for Zone R3 dismantling and Reactor Waste Interim Storage Facility;

27.2. where INPP data were not available, summarize the assumptions, support methods, modelling and calculations used to overcome this;

27.3. demonstrate that the ALARA principle will be maintained at all stages of the Zone R3 dismantling and waste management;

27.4. except where there is compelling technical justification to the contrary, be guided by waste hierarchy in development of the waste management strategy;

27.5. provide a radioactive waste inventory forecast, including consideration of the chemical composition and physical properties of the waste;

27.6. demonstrate that the availability (integrity, operability) of the systems, structures and components that may not be dismantled are not compromised;

27.7. where implementation of operations may affect the loading, integrity and stability of existing buildings / load-bearing structures, perform relevant expertise to exclude any risks of structural degradation or collapse under postulated initiating events;

27.8. demonstrate by means of modelling and visualization that the solution adopted in the Conceptual Design is practicable and free of spatial and interactional conflicts;

27.9. to the extent technically achievable and economically rational, assume that workforce for Zone R3 dismantling and operation of the RWISF shall be provided by the State Enterprise INPP and optimise it to avoid abrupt fluctuation of level;

27.10. provide clear and comprehensive justification as to whether and why any physical models (mock-ups) will be required;

27.11. estimate capital costs of equipment, costs of main consumables, costs of modifications of existing infrastructure, costs to implement RWISF storage, labour costs and waste processing costs. Summarize all costs associated to Zones R3 dismantling and arising waste management and provide the cost distribution over time;

27.12. develop an overall Unit 1 and Unit 2 Zone R3 D&D project schedule.

28. The Consultant shall ensure that solutions set out in the Conceptual Design shall not cause any degradation of the safety of other INPP facilities nor shall, under any normal circumstances, radiological exposure of staff exceed the maximum allowable doses set for INPP employees.

29. Coordination of the Conceptual Design with regulatory and financial stakeholders is under the Client's responsibility but shall be assisted by the Consultant.

30. The Conceptual Design shall be presented in the English language only.

**Task 4: Preparation of Gap Analysis Report**

31. In parallel with, and supporting, the Conceptual Design, the Consultant shall prepare the Gap Analysis Report. The purpose of the Gap Analysis is to provide information on measures that are required to proceed with further implementation of the Framework Agreement and an early indication of measures that will be required to achieve the solution as defined in the Conceptual Design. The Consultant shall identify gaps, define actions to overcome identified gaps and rank these actions according to priority.

32. The Gap Analysis Report shall be presented in the English language only no later than with the Conceptual Design.

**Task 5: Preparation of Environmental Impact Assessment Report**

33. The Consultant shall prepare Environmental Impact Assessment Report (hereinafter referred to as EIAR) to ensure that options and proposals for Zone R3 dismantling and waste management comply with national procedure for evaluating the likely impact of a proposed activity on the environment.

34. Requirements for environment impact assessment of proposed economical activities in Lithuania are harmonized with EU requirements. Lithuanian EIA requirements are published on website of Ministry of Environment http://am.lrv.lt/lt/veiklos-sritys-1/poveikio-aplinkai-vertinimas (mainly in Lithuanian, but some documents in English).
35. EIAR shall be prepared in accordance with the EIA Programme (provided at INPP website: https://www.iae.lt/data/public/uploads/2019/03/en_pav__programa_en.pdf).
36. The Client will make available to the Consultant EIARs associated with other related facilities and activities conducted in the frame of INPP decommissioning.
37. Based on EIAR Consultant shall provide presentations about its results in the course of presenting the proposed economic activity to the public. The Consultant's representatives shall be present in all the public presentations of EIAR. The EIAR will be also examined in the transboundary context of the Espoo Convention.
38. Coordination of the EIAR with regulatory bodies is under Client responsibility but shall be assisted by the Consultant.
39. The EIAR shall be developed in the English and Lithuanian languages. In addition, a non-technical summary shall be developed in Russian and Polish languages.

## SECTION IV

## TECHNOLOGICAL PROCESSES FOR OPTIONS ANALYSIS AND ASSOCIATED REQUIREMENTS

40. The entirety of activities related to dismantling and waste management of Zone R3 materials are broken down into the following processes:
    1. Gaining access to the graphite stack and other components;
    2. Dismantling and retrieval;
    3. Waste processing and packaging;
    4. Waste package dispatch;
    5. RWISF solution;
    6. Completion and clean-up.
41. These processes shall be considered by the Consultant when developing the Design Options Report (Task 2) and shall be reflected in the Conceptual Design (Task 3).
42. A description of the object to be dismantled is provided in Annex 1. Information about waste inventory, waste management facilities and associated requirements are provided in Annex 2.

### Process 1 – Gaining access to the graphite stack and other components

43. The Consultant must identify and examine ways and methods of organizing access to Zone R3 components. The options for access to be taken into account are:
    - Option 1.1: Access from the top compartments;
    - Option 1.2: Access from the side and bottom compartments;
    - Option 1.3: Combination of Option 1.1 and Option 1.2;
    - Option 1.4: Any other option(s) based on the Consultant's engineering experience.
44. While evaluating the options the following must be performed:
    44.1. work sequence, techniques and equipment shall be proposed and justified;
    44.2. demonstration that the process will not compromise the integrity of structures and subsequent waste processing shall be provided.

### Process 2 – Dismantling and retrieval

45. The Consultant shall specify the method(s) for all Zone R3 components to be dismantled and retrieved. The main components to be considered by the Consultant under Process 2, with respective requirements and options identified by the Client referenced in parentheses, are:
    - Irradiated graphite stack (refer to clause 48 below)
    - Metal structures and components (refer to clause 49 below)
    - Solid fillings (refer to clause 50 below)
    - Water filling (refer to clause 51 below)
    - Residual wastes from Zone R1/R2 dismantling (refer to clause 52 below)

    The options for dismantling and retrieval to be taken into account are:
    - Option 2.1: Techniques for dismantling/retrieval identified by INPP; and
    - Option 2.2: Techniques for dismantling/retrieval identified by the Consultant.

46. In the evaluation of the options, the Consultant shall:
    46.1. propose and justify the work sequence, techniques and equipment;
    46.2. demonstrate that the process will not compromise the integrity of structures and subsequent waste processing.

47. In all options/sub-options the Consultant shall consider the following:
    47.1. re-use of existing equipment at INPP, in particular cranage;
    47.2. remote, semi-remote tools for hazardous areas and applications;
    47.3. hand-guided tools for conventional areas and applications.

48. Irradiated graphite stack: The specific requirements related to graphite stack dismantling and graphite retrieval are:
    48.1. unless overarching reasons are presented by the Consultant to the contrary, it is required that the graphite retrieval is to be performed in air, brick-by-brick and layer-by-layer;
    48.2. to the extent technically achievable, graphite bricks and rods are to be withdrawn in an unbroken condition, specifying the proposed method(s) and equipment for such removal and demonstrating that the forces applied thereby do not compromise the integrity of the bricks, rods and columns of the graphite stack;
    48.3. justification shall be provided for any proposed intentional destruction of graphite bricks or rods (for example, during controlled unblocking of graphite bricks or during retrieval of graphite rods from the radial periphery);
    48.4. a solution for the retrieval of all graphite from broken bricks and rods already present or arising during retrieval and any possible graphite residues (e.g. fragments and dust) shall be provided.

49. Metal structures and components: the specific requirements and options related to metal structures and components are:
    49.1. Cutting techniques to be considered:
        – mechanical cutting (milling cutters and circular saws, band saws, hydraulic jaw cutters, reciprocal saws, abrasive discs, nibblers, diamond wire saws, diamond core drilling, etc.);
        – thermal cutting (plasma torches, arc saws, laser cutting, etc.).
    49.2. Retrieval options to be considered:
        – final cutting in situ and retrieval of pieces ready for processing;
        – pre-cutting and retrieval as large items with subsequent final cutting for processing.
    49.3. Handling equipment to be considered:
        – hoists and cranes available at INPP;

- build for purpose remote tools;
- ordinary hand-guided tools.

50. Solid fillings: The specific requirements and options related to solid fillings are:
    50.1. To the extent technically achievable and economically rational, fillings with different radiological properties shall not be mixed;
    50.2. Retrieval options for solid filings to be considered:
        - suction into transportation drums; transportation FIBC containers; transportation boxes; disposal containers.
        - solidification and piecewise cutting for processing.
51. Water filling*:* The retrieval options for water filling to be considered are: discharge to INPP drainage system by top-installed pump or by bottom-installed drain.
52. Residual wastes from Zone R1/R2 dismantling*:* The specific requirements for residual wastes from Zone R1/R2 dismantling are:
    52.1. all items to be disaggregated, processed and packaged according to the solution(s) developed under this project; and
    52.2. all secondary waste, including any temporary cases for storage inside SPH, to be fragmented, processed and packaged as radioactive solid waste.

**Process 3 – Waste processing and packaging**

53. Taking into consideration waste inventory and waste management facilities available at INPP (as described in Annex F2), the Consultant shall overview, qualify and rank the options for waste packaging and transfer to the appropriate waste management facilities, storages and disposal sites available.
54. The Consultant shall consider technology for the processing and packaging of components resulting from the prior dismantling of reactor Zones R1/R2 transferred to the pools of the respective Storage Pool Hall (SPH).
55. In the frame of predecessor projects workshops for handling (fragmentation, sorting and loading of fragments into transport containers) and temporary storage of short-lived (and CNRW) waste will be established in reactor buildings of Unit 1 and Unit 2. This infrastructure shall be reused to the extent possible for processing of waste, arising from Zone R3 dismantling.
56. For long-lived waste the Consultant must propose a way how to handle such waste (the key topic is selection of the container for interim storage) aligned with interim storage solution (limited capacities are available at INPP for handling and storage of such waste and shall be utilised to the possible extent).
57. For long-lived waste the Consultant must consider the following packaging options including any forms of sub-packaging (liners, spacers, shielding, etc.):
    - ILW-LL container;
    - F-ANP container;
    - KTZ-3.6 (container;
    - another container already designed and manufactured for any purpose (market survey thereof) that may be approved for storage in the RWISF;
    - a custom-built container (including conceptual design thereof);
    - a combination of above or any package identified by the Consultant agreed by the Client.
58. Processing and packaging workshops to be considered taking into account shielding, volume, waste-form properties and environmental conditions:
    - only Central Hall compartments;
    - Central Hall and former Drum-Separator compartments;

- Central Hall and former Spent Fuel Pools Hall compartments;
- any other location or combination of locations agreed by the Client subject to appropriate analysis based on the Consultant's engineering experience.

59. Processing and packaging operations to be considered (subject to the choice of dismantling and retrieval, containers and workshops):
    - raw material sorting, size-reduction, sorting, decontamination of short-lived waste with surface contamination (if reasonable), radiological measurements and assay/characterization, packaging, accumulation of packages;
    - any other processing and packaging operations agreed by the Client subject to appropriate analysis based on the Consultant's engineering experience;
    - subject to the Consultant's assessment of waste origin, classification, inventory forecast and reasonable viability, treatment options for NSR disposal (excluding irradiated graphite).
60. The Consultant shall give especial consideration to:
    - the significant amount of fillings (bulk materials);
    - the potential for decontamination of thick steel pieces with complex geometry;
    - radiological characterisation and packaging of high-density Class A waste as their characterisation might be technically challenging (for the time being INPP does not have a methodology to perform radiological characterisation of such waste, but it is under development currently) and the HHISO / 1CX container is not an efficient package for disposal of such waste because due to weight limitation (24 t) useful volume of the container (15.3 m3) will be used only partially (appropriate solutions shall be found in upcoming dismantling project for Zones R1/R2 and this experience shall be applied to the R3 project;
    - Class D and E waste containers and buffering / temporary storage, especially in case where an appropriate interim storage facility will not be available when dismantling of activated components starts.
61. Primary waste management will cause generation of secondary waste. The Consultant shall ensure that the generation of such waste should be as small as possible. Minimization of secondary waste must be demonstrated, amounts of secondary waste shall be evaluated and their management routes defined in the scope of this project.
62. For all waste streams the Consultant shall, if possible, aim to achieve a "one step" procedure whereby the wastes streams are, as close as possible to their point or origin, processed and placed in their respective final packaging in the form that is to be used for their interim storage or, where available, disposal according to the lowest possible waste classification.
63. Where a "one step" procedure is not possible, and it is necessary for any reason to use intermediate packaging, this shall be described by the Consultant considering any forms of sub-packaging inside the intermediate packaging. Options of further processing shall be described. Places of further processing and accumulation areas / buffer storages may, in agreement with the Client, be inside the reactor units or in other suitable INPP buildings.

**Process 4 – Waste package dispatch**

64. The Consultant shall consider the following options for the dispatch of packages from their place of packaging (to be described in Process 3) to the INPP facility for their further decontamination, characterization, interim storage, buffer storage, disposal or release:
    - Option 4.1: Class 0 (conditionally non-radioactive) waste in transport packages to be dispatched to an existing INPP facility for measuring the radioactivity of materials for uncontrolled free-release. All waste from Zone R3 dismantling, intended for free release,

shall be prepared so as to be compatible with established free-release facilities and procedures;

- Option 4.2: Class A waste to be dispatched for further decontamination to Class 0 (if feasible and justified) or in disposal packages to an existing INPP facility which is equipped with the appropriate characterization equipment prior to Landfill disposal;
- Option 4.3: Class B and C waste to be dispatched for further decontamination to Class A / Class 0 (if feasible and justified) or in disposal packages to an appropriate INPP facility for grouting and buffer storage prior to NSR disposal (quantity of Class B+C waste is minor, nevertheless waste distribution per classes is subject to uncertainty and shall be verified in the course of this contract);
- Option 4.4: Class D and E waste storage packages to be dispatched, via buffer storage if required, to the RWISF.
- Option 4.5: Dispatch routes for the waste identified by the Consultant:

65. The Consultant shall identify options for the route and means by which the respective waste streams are transferred within the reactor buildings and to the respective facilities ensuring that sufficient transportation capacity exists to prevent any disruption of Zone R3 dismantling. Transport of waste packages shall use the existing technological roads of INPP (not public roads).

66. Where a "one step" processing / final packaging procedure in close proximity to the point of origin is not possible, the Consultant shall consider and describe the options concerning any places of further processing and / or transfer from intermediate to final packaging, and any *en route* places of transfer between handling means and of storage. Places of further processing and / or packaging and of accumulation areas / buffer storage may, in agreement with the Client, be inside the reactor units and/or in other INPP buildings.

67. The Consultant shall, to the extent that this is economically rational, make use of existing cranage, handling methods / routes and transport vehicles for the dispatch of materials.

68. In respect of any storage / accumulation of waste, the Consultant shall consider the normal rates and timings at which the packages can be accepted at their place of interim storage, buffer storage or disposal, and realistic risks to these rates and timings, such that sufficient waste accumulation / buffering is available to prevent disruption of dismantling activities.

69. Unless there is compelling technical justification to the contrary, the respective WAC of the Free Release Measuring Facilities (Class 0), Landfill Facility (Class A) and Near Surface Repository (Class B/C) shall not be altered.

**Process 5 – Reactor waste interim storage facility (RWISF) solution**

70. The Consultant shall define the solution for a RWISF for the interim storage of the following:
    - Class D graphite waste (approx. 3766 tonnes);
    - Class D+E steel waste (approx. 2300 tonnes);
    - Class D filling waste (approx. 1030 tonnes).

71. In defining the RWISF solution, the Consultant shall duly take into account:

    71.1. The RWISF must be suitable for the storage of reactor waste in general providing structural stability over the storage period of at least 50 years and for the chosen containers in particular (e.g. cranage, transportation vehicle(s), dose rate from package).

    71.2. The storage facility may be created by: (a) the repurposing of an existing building; (b) the construction of a new building; (c) any justified combination of (a) and (b).

    The only candidate building according to option (a) is Facility B4S – the storage facility for short-lived waste intended for the storage of KTZ-3.6 containers pending their disposal in the Near Surface Repository (NSR). At the present time facility B4S can be accessed only via the conveyor systems of B3. However, it is the plan of INPP to create

a direct, equipped access at the earliest opportunity. The availability of direct access is a pre-assumption for the optioneering.

71.3. At INPP there is another building (Building 158/2) that could be considered for use as buffer storage if the timescales for creation of the required storage are such as to necessitate this. Bldg. 158/2 entered service in 2006 as part of the overall project to introduce the cementation of LRW at INPP. It has a capacity of 6300 F-ANP- containers, however the F-ANP waste packages will be progressively transferred for disposal in the NSR as soon as it becomes available. The main drawback of this building is its very close proximity to the Bituminized Waste Storage Facility (BWSF / Building 158). Depending on the proposed design solution for converting the BWSF into a repository, Bldg. 158/2 may have to be demolished; therefore, this building is nominally available for possible buffer storage use until 2034 at the latest.

71.4. In considering the use of existing Facility B4S or Building 158/2, the Consultant shall specify any required modifications that must be made.

71.5. For new building construction, the Consultant shall define the exact location, dimensions and key structural and operational requirements. However, it is a requirement that the storage facility must be on the B3/4 site to take advantage of the existing infrastructure (e.g. road network, utilities, physical protection, etc.) and simplified site evaluation due to prior investigation in the frame of the B3/4 EIAR and SAR. The consultant will be provided by the relevant documentation for construction of facility B4S for consideration of possible adaptation.

71.6. Operation of the RWISF shall not impact deleteriously on the operation of Facility B3/4 (and *vice versa*).

72. Where the option(s) considered for creation of the RWISF are not reasonably achievable within the required timescale of the first planned receipt of the waste streams concerned, the Consultant shall propose suitable buffer storage of appropriate volume for those waste streams such that the overall schedule of reactor Zone R3 dismantling is maintained. Any additional expenses to be incurred due to buffer storage (e.g. extra transport, buffer storage licensing) must be included in the cost of the options.

**Process 6 – Completion and clean-up**

73. The Consultant shall consider the clean-up and decommissioning actions necessary for the orderly completion of Zone R3 dismantling implementation and waste management in the frame of, and beyond, the INPP Final Decommissioning Plan.

73.1. Clean-up refers to the actions performed in order that any subsequent dismantling and demolition in the areas affected by this project but outside its scope may be planned and executed. The clean-up after Zone R3 dismantling implementation will depend on the decisions taken for the above processes and shall, unless otherwise agreed by the Client, cover:

- the removal of any tools, engineering barriers, containers, infrastructure, etc., specified by this project which have been installed at the INPP site;
- the achievement of a level of contamination and infrastructure operability in the areas affected by this project not worse than before implementation.

73.2. Decommissioning refers to the required end-of-life actions for the RWISF (dismantling and demolition) occurring after the end of the period of interim storage. Decommissioning of the RWISF will depend on a type and a number of storage containers, and the design and size of the facility itself.

## SECTION V

## OPTIONEERING CRITERIA

74. In agreement with the Client the following criteria and their respective attributes shall be considered during the optioneering in the screening and evaluation of options and selection of scenarios and during development of the Conceptual Design:

| Criteria | Attributes | Descriptions |
|---|---|---|
| **Safety** | Collective dose during normal operations | Ensuring of low public and occupational dose under normal conditions |
| | Maximum releases to the environment during normal operation | |
| | Collective dose in the case of most severe accident | Ensuring of low public and occupational dose under abnormal conditions and in accidents. |
| | Maximum releases to the environment in the case of most severe accident | |
| | Other safety issue identified by the Consultant | |
| **Project Cost** | Development cost (engineering, licensing, mock-up, etc.) | Where costs are presented, they shall follow the structure hierarchy and associated accuracy of International Structure for Decommissioning Costing (ISDC) of Nuclear Installations from OECD[1] |
| | Tools and equipment cost | |
| | Operation cost (labour, parts, consumables, etc.) | |
| | Waste management cost (packages, storage, disposal, etc.) | |
| | Clean-up / decommissioning cost | |
| | Other cost issue identified by the Consultant | |
| **Risk value** | Risk of increased costs | Proven engineering practice, need for mock-up, i.e. the extent to which solutions have already been applied in an analogous area, whether they have prototypes, have been properly analysed and their applicability confirmed. |
| | Risk of increased duration | |
| | Other risks identified by the Consultant | Evaluation of any other aspects such as physical protection, public acceptance, personnel conditions, etc |
| **Duration** | Design and implementation schedule | The R3D schedule will cover all the stages from design to clean-up. R3D schedule will be integrated with the overall INPP decommissioning megaproject schedule which the Consultant shall aim to improve |

## ANNEXES

1. Annex S1-1. Project Framework Schedule.
2. Annex S1-2. Conceptual Design outline

[1] https://www.oecd-nea.org/rwm/reports/2012/ISDC-nuclear-installations.pdf