ANNEX I

QUESTIONNAIRE FOR THE DECLARATION OF THE BASIC TECHNICAL CHARACTERISTICS OF THE INSTALLATIONS

A. REACTORS

Date 1.3.2016

IDENTIFICATION OF THE INSTALLATION

1. **Name.**

   Nuclear Power Plants - Mochovce Units 3,4

2. **Location, exact address with telephone and fax numbers and e-mail address.**

   Slovenské elektrárne, a.s.
   závod 3. a 4. blok Elektrárne Mochovce
   935 39 Mochovce
   Slovakia
   Telephone +421 36 6361111 , +421 36 6362369
   Fax +421 36 6391108, +421 36 6362422
   E- mail: tomas.bobak@enel.com

3. **Owner (legally responsible body or individual).**

   Slovenské elektrárne, a.s.

4. **Operator (legally responsible body or individual).**

   Slovenské elektrárne, a.s.
   závod 3. a 4. blok Elektrárne Mochovce

5. **Present status (e.g. under construction, in operation or closed down).**

   Under construction

6. **Purpose and type.**

   Purpose - power production
   Type - Light water reactor VVER 440, type - V 213

7. **Operating mode influencing its production (shift system adopted, approximate dates of operating periods in year, etc.).**

   Three shift operating mode is planed.
   250 ÷ 330 full power days

8. **Area layout (map showing the installation, boundaries, buildings, roads, rivers, railways, etc.).**

   Appendix No 1a, 1b, 1c (Location plan "Area 1"), 1d (Location plan "Area 11")

9. **Layout of installation:**

   (a) **structural containment, fences and access routes;**
   Appendix No 1b
   (b) **incoming-material storage area;**
   Appendix No 5a
   (c) **reactor area;**
   App
   (d) **test and experiment area, laboratories;**

Not applicable

(e) **outgoing-material storage area;**

Appendix No 9a, 9b

(f) **nuclear waste disposal area.**

Not applicable

10. Additional data per reactor:

(a) **nominal thermal output;**

Unit 3 - 1375 MW

Unit 4 - 1375 MW

(b) **source material and special fissile material;**

Uranium enriched in uranium 235, plutonium

(c) **initial core enrichments;**

2,32 %

(d) **moderator;**

Light water

(e) **coolant.**

Light water

GENERAL ARRANGEMENTS AT THE INSTALLATION, INCLUDING THOSE RELATING TO MATERIAL USE AND ACCOUNTANCY, CONTAINMENT AND SURVEILLANCE

Description of nuclear material[(*)]

11. Description of the use of nuclear material (Article 3(1)).

Power production in reactors

12. Outline drawings of fuel assemblies, fuel rods/pins, fuel plates etc., in sufficient detail to indicate general structure with overall dimensions. (Provisions for pin exchange should be described, if applicable, and an indication given if this is a routine operation.)

IFA (Independent Fuel Assembly) and CFA(Control Fuel Assembly) is consisting of 126 fuel rods in hexagonal tube from Zr alloy with 2,5% Nb.
Control fuel assembly (CFA)-consists of the analogical fuel part as IFA but different shape of the head enabling connection with absorber. The core contains 312 IFA and 37 CFA.
Appendix No 3a, 3b, 3c, 3d

13. Fuel material (including material in control or shim assemblies, if applicable):

(a) **chemical composition or main alloy constituents;**

Physical form: sintered pellets

Chemical form: UO_2

(b) **average enrichment per assembly;**

FA - fuel assemblies

IFA enrichment:

First core 1,6 (±0,05)%, 2,4 (±0,05)%, 3,6 (±0,05)% non profiled fuel

Subsequent cores 4,87 (±0,05)% - profiled fuel with Gd content (Appendix No 3e)

CFA - control fuel assemblies

First core 1,6 (±0,05)%, 2,4 (±0,05)% non profiled fuel

Subsequent cores 4,87 (±0,05)% - profiled fuel with Gd content (Appendix No 3e)

(c) **nominal weight of nuclear material per assembly, with design tolerances.**

IFA: (126,3 ± 1,9) kg U in one assembly

CFA: (120,3 ± 1,9) kg U in one assembly

14. Cladding material.

Fuel rod is formed by the tube from alloy Zr +1% Nb, with diameter 9,1 mm.

15. Method of identifying individual assemblies, rods/pins, plates etc., if applicable.

Absence of NDA measurements of the material contained in fresh fuel assemblies. The accountancy will be based on the shipper's input data contained in the fuel assembly certificates.

16. Other nuclear material used in the installation (briefly state material, purpose and method of use, e.g. as booster rods).

None.

Flow of nuclear material

17. Flow sheet showing: points where nuclear material is identified or measured; material balance areas and inventory locations used for material accountancy; and the estimated range of nuclear material inventories at these locations under normal operating conditions.

Planned as follows: see Appendix No.4, No.2

Flow KMP codes:
KMP 1 - Receipt of the fuel
KMP 2 - Nuclear material production and loss
KMP 3 - Shipment of the fuel

Inventory KMP codes:
KMP A - Fresh fuel storage
KMP B - Reactor core unit 3
KMP C - Spent fuel storage, unit 3
KMP D - Reactor core unit 4
KMP E - Spent fuel storage, unit 4
KMP F - Other locations

Estimated range of nuclear material inventories under normal operating conditions:

- Fresh fuel storage max 200 assemblies for two reactors
- Reactor core 349 assemblies
- Spent fuel storage 300 ÷ 500 assemblies

18. Expected nominal fuel cycle data, including:

(a) **reactor core loading;**

Total IFA + CFA = 349 assemblies, 312 IFA and 37 CFA

(b) **expected burn-up;**

- average: 58 700 MWd / tU
- maximum: 64 500 MWd / tU

(c) **annual refuelling amount;**

- 4 - 6 years exploitation of the FA
  and 2 - 5 years of the FPCA
- refuelling once per year
- quantity of the discharged assemblies 60-90

(d) **refuelling interval (on-load or off-load);**

off-load

refuelling time 5 - 10 days

(e) **forecast of throughput and inventory, and of receipts and shipments.**

El. energy production - 3 TW/year - per unit

Receipts - app. 66-90 assemblies / per unit

Shipments – app.132 assemblies / per year

Total inventory of enriched uranium – expected value 180÷190 tons

Handling of nuclear material

19. Layout of the fresh fuel storage area, drawings of fresh fuel storage locations, and description of packaging.

Appendix No.5a, 5f, 10
Transport containers will be placed in the fresh fuel storage that is situated in the special room of the reactor hall.
4 assemblies in one transport container each assembly in a cotton bag.
Capacity of the store: max.524 assemblies

20. Drawings of fresh fuel preparation and/or assay room and reactor loading area.

Appendix No.5a, 5b, 5f
Transport containers will be reversed to vertical position by revolving equipment and then IFA or CFA will be pulled out from the transport containers and they will be inserted into storage racks or fresh fuel canisters.

21. Drawings of transfer equipment for fresh and irradiated fuel, including refuelling machines or equipment.

Appendix No. 5a, 5b, 5c, 5d, 5e, 5f, 5g

- refuelling machine
- 250/32/2 ton crane in the reactor hall will be used for the transport of the canister with 30 assemblies from the fresh fuel storage to the pit (beside of the spent fuel storage) and for the spent fuel-shipping cask to the transport wagon
- 3,2 ton crane in the fresh fuel storage

22. Drawings of reactor vessel showing location of core and openings in vessel; description of method of fuel handling in vessel.

Appendix No.6
Reactor vessel - inner diameter: 3,542 mm
- outer diameter: 3,840 mm
The reactor vessel mass: 215 127 kg
All handlings in the vessel will be performed by refuelling machine.

Appendix No. 6a – Active core basket
Appendix No. 6b – Core barrel
Appendix No. 6c – Core barrel bottom

23. Drawing of core showing: general layout, lattice, form, pitch and dimensions of core; reflector; location, shapes and dimensions of control devices; experimental and/or irradiation positions.

Appendix No. 7

- lattice of the fuel assembly: triangular
- pitch of the assemblies: 14,7 cm

24. Number and size of channels for fuel assemblies and control devices in the core.

- total number of the hexagonal assemblies: 349
- number of the fuel assemblies in the core: 312
- number of the control rod assemblies (FPCA + absorber):37

25. Spent fuel storage area:

(a) drawing of storage area;

Appendix No.5c, 5d, 5e, 9a, 9b

(b) method of storage;

Irradiated assemblies will be placed under water into the spent fuel storage for 3 - 6 years and after this time irradiated assemblies will be transported into intermediate fuel storage.

(c) design storage capacity;

- capacity of the basic-bottom rack: 682 FA + 17 hermetic boxes/per unit
- capacity of the emergency-upper rack: 296 FA + 54 hermetic boxes/per unit

(d) drawing of equipment for handling irradiated fuel;

Appendix No. 5c, 5d, 5e

(e) **minimum cooling time before shipment of spent fuel;**

Normal cooling period - 6 years

Minimum cooling period - 3 years

(f) **drawing and description of shipping cask for spent fuel (e.g. to determine whether sealing is possible).**

Appendix No.5c, 5d, 5e, 11

Cylindrical cask for 30 or 48 spent fuel assemblies

We don't have shipping cask, we will use shipping cask from intermediate storage facility.

26. Nuclear material testing area (if applicable):

Not applicable

(a) **brief description of the activities performed;**

(b) **description of main equipment (e.g. hot cell, fuel assembly decladding and dissolving equipment);**

(c) **description of shipping containers for nuclear material and of waste and scrap packaging (e.g. to determine whether sealing is possible);**

(d) **description of storage area for non-irradiated and irradiated nuclear material;**

(e) **drawings of the above, if not covered elsewhere.**

Coolant data

27. Coolant flow diagrams as required for heat balance calculations (indicating pressure, temperatures and mass flow rates at main points).

Appendix No.8

NUCLEAR MATERIAL ACCOUNTANCY AND CONTROL

Accountancy system

28. Description of nuclear material accountancy and control system (describe item and/or mass accountancy system, including assay methods used and assessed accuracies, supplying specimen blank forms used in all accountancy and control procedures). Period during which such records must be retained should be stated.

At the nuclear power plant the nuclear material accounting system will be fulfilled according to the Law No.541/2004 Coll., On Peaceful Utilisation of Nuclear Energy (the Atomic Act) issued by NRA of Slovak Republic and Regulation No. 302/2005 issued by the EURATOM.

No nuclear material is present at Mochovce unit 3 and 4. First fresh fuel delivery is planned not earlier then in September 2017.

From the point of view of accountancy both units 3 and 4 will be created one MBA. The main identificator will be assembly serial number, fixed in all accountancy records.

The nuclear material accountancy will be performed by means of the personal computers. Based on the primary documents (passports) and the operational records, the accountancy reports will be worked out by the chief of accountancy.

More accurately description of the accountancy system will be provided later.

Receipts

The receipt consists of the fresh fuel assemblies from supplier. Basic information in the time of receipt will be consisting of data from the fuel vendor passports. The chief of accountancy will be recorded this data into the accountancy file (personal computer). Basic data content:

- the date of production
- the serial number
- the enrichment
- the mass of uranium and uranium 235

Shipments

Only the fresh and the spent fuel are supposed to be shipped away from the NPP. Shipping documents will be prepared by the chief of accountancy.
Data about content of the isotopes of uranium and plutonium will be obtained from calculation and are performed for all irradiated FA or FPCA.

Nuclear loss and production

The spent fuel isotopic composition will be calculated after discharging from the reactor using relations between assemblies burn-up and isotopic composition that will be supplied by the fuel vendor. The assemblies burn-up will be calculated from the reactor thermal power distributed for each assembly using measured output coolant temperature from assemblies and the coolant flow through the reactor

The measurements of the nuclear materials or fuel assemblies will not be performed at NPP. The quantity of nuclear material will be determined using passport data. Measurement methods and equipments used:

- KMP A - direct item counting and identification
- KMP B, D - item counting and identification using under water TV system
    - neutron flux measurement
    - burn-up calculation
    - nuclear loss and production calculation
- KMP C, E,F - item counting using under water TV system

Period during which such records must be retained will be min. 5 years.

Physical inventory

29. Description of: procedures, scheduled frequency and methods for operator's physical inventory taking (both for item and/or mass accountancy, including main assay methods and expected accuracy); access to nuclear material in the core and to irradiated nuclear material outside the core; expected radiation levels.

Physical inventory will be performed once a year. The command to take of physical inventory willl be issued by NRA SR.
Physical inventory will be performed by direct identification and determination of amount and the type of fuel that will be in the fresh fuel storage. Verification of the reactor core will be taken after refuelling by means of the refuelling machine under water TV system. This means will be used also during physical inventory at spent fuel storage.

All KMP will be possible to utilize for physical inventory taking.

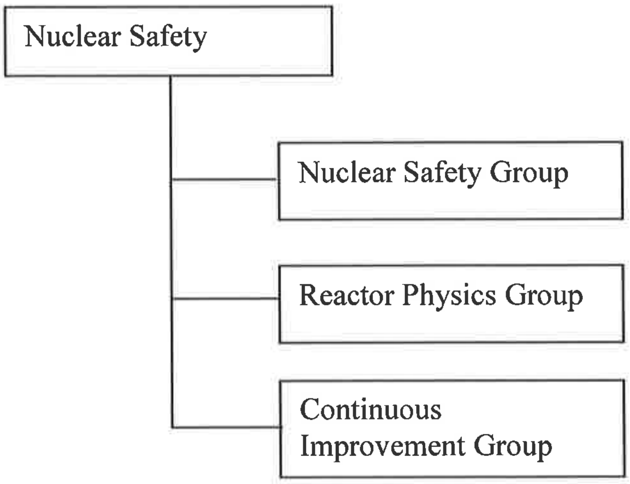
- KMP A - direct access anytime
- KMP B, D - access only during reactor refuelling
- KMP C, E, F - direct access anytime

Expected radiation level is very low.

OTHER INFORMATION RELEVANT TO APPLICATION OF SAFEGUARDS

30. Organisational arrangements for material accountancy and control.

According to the Mochovce NPP Organization Chart, the accountancy and control of nuclear materials is carried out by the 2 persons in the Reactor Physics Group.



Nuclear Material Accountancy Specifics

Some aspects of nuclear material accounting and control system at the Mochovce3,4 NPP are as follows:

➢The fuel assemblies will be considered as accounting items

➢Absence of NDA measurements of the nuclear material contained in fresh fuel assemblies. The accountancy will be based on the shipper's input data (source data) contained in the fuel assembly certificates

- All the nuclear material in the reactor core will be considered as fresh until the fuel is transferred into the fuel pond for its storage. When an irradiated fuel assembly will be recycled back from the spent fuel pond to the reactor core it will be considered to be fresh again, and acquires the original certificate data for accounting reasons

- The fuel burn-up, the nuclear losses and the nuclear production in fuel assemblies will be calculated

31. Information on the health and safety rules which have to be observed at the installation, and with which the inspectors must comply.

According to the IAEA standards inspectors will be every time accompanied by chief of accountancy.

Rules of labour safety and fire Protection for visitors of Mochovce3,4 NPP

1. Only marked communications and facilities have to be used on Mochovce3,4 NPP site.
2. All warnings and symbols must be obeyed.
3. Manipulating with machinery and equipment for which you are not qualified or authorised for is forbidden.
4. Rules and regulations of fire protection /like non-smoking area, prohibition to use open fire /in offices and marked territories have to be followed.
5. Your behaviour should not endanger your life and lives of the personnel on the Mochovce3,4 NPP site.
6. In determined areas you shall wear individual protection devices in accordance with the Mochovce personal requirements.
7. In case of labour injury on the territory of the organization, you are obliged to report it to your contact person in Mochovce3,4 NPP.